

COMMODITY FUTURES TRADING COMMISSION

TIME AND DATE: 11:30 a.m., December 18, 1987.

PLACE: 2033 K Street, NW., Washington, DC, 8th Floor Conference Room.

STATUS: Closed.

MATTERS TO BE CONSIDERED: Enforcement matters.

CONTACT PERSON FOR MORE

INFORMATION: Jean A. Webb, 254-6314.

Jean A. Webb,

Secretary of the Commission.

[FR Doc. 87-27495 Filed 11-25-87; 10:56 am]

BILLING CODE 6351-01-M

COMMODITY FUTURES TRADING COMMISSION

TIME AND DATE: 11:00 a.m., December 24, 1987.

PLACE: 2033 K Street, NW., Washington, DC, 8th Floor Conference Room.

STATUS: Closed.

MATTERS TO BE CONSIDERED: Market Surveillance matters.

CONTACT PERSON FOR MORE

INFORMATION: Jean A. Webb, 254-6314.

Jean A. Webb,

Secretary of the Commission.

[FR Doc. 87-27496 Filed 11-25-87; 10:56 am]

BILLING CODE 6351-01-M

COMMODITY FUTURES TRADING COMMISSION

TIME AND DATE: 11:00 a.m., December 24, 1987.

PLACE: 2033 K Street, NW., Washington, DC, 8th Floor Conference Room.

STATUS: Closed.

MATTERS TO BE CONSIDERED: Enforcement matters.

CONTACT PERSON FOR MORE

INFORMATION: Jean A. Webb, 254-6314.

Jean A. Webb,

Secretary of the Commission.

[FR Doc. 87-27497 Filed 11-25-87; 10:56 am]

BILLING CODE 6351-01-M

FEDERAL COMMUNICATIONS COMMISSION

Deletion of Agenda Item From November 24th Open Meeting

November 24, 1987.

The following item has been deleted from the list of agenda items scheduled for consideration at the November 24, 1987, Open Meeting and previously listed in the Commission's Notice of November 17, 1987. This item was deleted at the request of the Chairman's Office.

Agenda, Item No., and Subject

Mass Media—2—Title: AM Stereophonic Broadcasting. Summary: The Commission will consider three petitions for rule making and two reports issued by the National Telecommunications and Information Administration concerning AM stereophonic broadcasting.

Additional information concerning this item may be obtained from Sarah Lawrence, Office of Public Affairs, telephone number (202) 632-5050.

Issued: November 24, 1987.

Federal Communications Commission.

William J. Tricarico,

Secretary.

[FR Doc. 87-27516 Filed 11-25-87; 12:59 pm]

BILLING CODE 6712-01-M

FEDERAL DEPOSIT INSURANCE CORPORATION

Pursuant to the provisions of subsections (e)(2) of the "Government in the Sunshine Act" (5 U.S.C. 552b(e)(2)), notice is hereby given that at its open meeting held at 2:00 p.m. on Tuesday, November 24, 1987, the Corporation's Board of Directors determined, on motion of Chairman L. William Seidman, seconded by Director C.C. Hope, Jr. (Appointive), concurred in by Director Robert L. Clarke (Comptroller of the Currency), that Corporation business required the withdrawal from the agenda for consideration in open session and the addition to the agenda for consideration at the Board's closed meeting held at 2:30 p.m. the same day, of the following matter:

Recommendation regarding the liquidation of a bank's assets acquired by the Corporation in its capacity as receiver, liquidator, or liquidating agent of those assets:

Case No. 47,128

Denver Consolidated Office, Denver, Colorado

In voting to move this matter from open session to closed session, the Board further determined, by the same majority vote, that the public interest did not require consideration of the matter in a meeting open to public observation; that the matter could be considered in a closed meeting by authority of subsections (c)(4) and (c)(9)(B) of the "Government in the Sunshine Act" (5 U.S.C. 552b(c)(4) and (c)(9)(B)); and that no earlier notice of the change in the subject matter of the meeting was practicable.

Dated: November 25, 1987.

Federal Deposit Insurance Corporation.

Margaret M. Olsen,

Deputy Executive Secretary.

[FR Doc. 87-27528 Filed 11-25-87; 2:12 pm]

BILLING CODE 6714-01-M

FEDERAL DEPOSIT INSURANCE CORPORATION

Pursuant to the provisions of subsection (e)(2) of the "Government in the Sunshine Act" (5 U.S.C. 552b(e)(2)), notice is hereby given that at its closed meeting held at 2:30 p.m. on Tuesday, November 24, 1987, the Corporation's Board of Directors determined, on motion of Chairman L. William Seidman, seconded by Director C.C. Hope, Jr. (Appointive), concurred in by Director Robert L. Clarke (Comptroller of the Currency), that Corporation business required the addition to the agenda for consideration at the meeting, on less than seven days' notice to the public, of a recommendation regarding the Corporation's assistance agreement with an insured bank.

The Board further determined, by the same majority vote, that no earlier notice of the change in the subject matter of the meeting was practicable; that the public interest did not require consideration of the matter in a meeting open to public observation; and that the matter could be considered in a closed meeting by authority of subsections (c)(4) and (c)(9)(B) of the "Government in the Sunshine Act" (5 U.S.C. 552b(c)(4) and (c)(9)(B)).

Dated: November 25, 1987.

Federal Deposit Insurance Corporation.

Margaret M. Olsen,

Deputy Executive Secretary.

[FR Doc. 87-27529 Filed 11-25-87; 2:12 pm]

BILLING CODE 6714-01-M

FEDERAL TRADE COMMISSION

TIME AND DATE: 2:00 p.m., Tuesday, December 1, 1987.

PLACE: Room 432, Federal Trade Commission Building, 6th Street and Pennsylvania Avenue, NW., Washington, DC. 20580.

STATUS: Open.

MATTER TO BE CONSIDERED: Budget review session.

CONTACT PERSON FOR MORE

INFORMATION: Susan B. Ticknor, Office of Public Affairs: (202) 326-2179; Recorded Message: (202) 326-2711.

Emily H. Rock,

Secretary.

[FR Doc. 87-27517 Filed 11-25-87; 12:53 PM]

BILLING CODE 6750-01-M

SECURITIES AND EXCHANGE COMMISSION

"FEDERAL REGISTER" CITATION OF PREVIOUS ANNOUNCEMENT: (52 FR 44671 November 20, 1987).

STATUS: Closed meeting.

PLACE: 450 5th Street, NW., Washington, DC.

DATE PREVIOUSLY ANNOUNCED: Monday, November 16, 1987.

CHANGES IN THE MEETING: Additional item.

The following additional item was considered at a closed meeting on Thursday, November 19, 1987, at 10:00 a.m.:

Litigation matter.

Commissioner Peters, as duty officer, determined that Commission business required the above change.

At times changes in Commission priorities require alterations in the scheduling of meeting items. For further information and to ascertain what, if any, matters have been added, deleted or postponed, please contact: Kevin Fogarty at (202) 272-3195.

Jonathan G. Katz,
Secretary.
November 20, 1987.

[FR Doc. 87-27518 Filed 11-25-87; 12:57 pm]
BILLING CODE 8010-01-M

SECURITIES AND EXCHANGE COMMISSION

Notice is hereby given, pursuant to the provisions of the Government in the Sunshine Act, Pub. L. 94-409, that the Securities and Exchange Commission will hold the following meetings during the week of November 30, 1987:

A closed meeting will be held on Tuesday, December 1, 1987, at 10:30 a.m.

The Commissioners, Counsel to the Commissioners, the Secretary of the Commission, and recording secretaries will attend the closed meeting. Certain staff members who are responsible for the calendared matters may also be present.

The General Counsel of the Commission, or his designee, has certified that, in his opinion, one or more of the exemptions set forth in 5 U.S.C. 552b(c)(4), (8), (9)(A) and (10) and 17 CFR 200.402(a)(4), (8), (9)(i) and (10), permit consideration of the scheduled matters at a closed meeting.

Commissioner Grundfest, as duty officer, voted to consider the items listed for the closed meeting in closed session.

The subject matter of the closed meeting scheduled for Tuesday, December 1, 1987, at 10:30 a.m., will be:

Formal orders of investigation.
Settlement of injunctive action.
Institution of injunctive action.
Opinion.

At times changes in Commission priorities require alterations in the scheduling of meeting items. For further information and to ascertain what, if any, matters have been added, deleted or postponed, please contact: Nancy Morris at (202) 272-2468.

Jonathan G. Katz,
Secretary.
November 23, 1987.

[FR Doc. 87-27519 Filed 11-25-87; 12:57 pm]
BILLING CODE 8010-01-M

Corrections

Federal Register

Vol. 52, No. 229

Monday, November 30, 1987

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

DEPARTMENT OF HEALTH AND HUMAN SERVICES

Food and Drug Administration

21 CFR Parts 436 and 442

[Docket No. 87N-0317]

Antibiotic Drugs; Cefuroxime Axetil Tablets

Correction

In rule document 87-25584 beginning on page 42431 in the issue of Thursday, November 5, 1987, make the following corrections:

§ 436.215 [Corrected]

1. On page 42432, in the first column, in § 436.215(c)(9)(i), in the third line, "weight" should read "weigh".

§ 442.19 [Corrected]

2. On the same page, in the third column, in § 442.19(b)(1)(i)(A), in the third line, "ammonium" should read "of ammonium".

3. On the same page, in the same column, in § 442.19(b)(1)(i)(D), in the 10th line "methoxy-" was misspelled, and in the 11th line "iminoacetamido" was misspelled.

4. On page 42433, in the first column, in § 442.19(b)(1)(iv)(A), in the formula, the bottom line should read " $R_s \times C_u \times (100 - m)$ ".

§ 442.119 [Corrected]

5. On page 42434, in the first column, in § 442.119(b)(1)(iii), in the formula, the top line should read " $R_u \times P_s \times d$ ".

BILLING CODE 1505-01-D

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

Office of the Assistant Secretary for Policy Development and Research

[Docket No. N-87-1746; FR-2389]

Supplemental Assistance for Facilities to Assist the Homeless; Program Guidelines and Notice of Funds Availability

Correction

In notice document 87-24242 beginning on page 38880 in the issue of Monday, October 19, 1987, make the following corrections:

1. On page 38881, in the first column, in paragraph (a), in the ninth line, "positions" should read "provisions".

2. On page 38882, in the third column, in paragraph (3), in the fourth line, "The term does not" should begin a new line.

3. On page 38892, in the first column, in paragraph (9), in the fourth line, after "person" insert "or".

4. On the same page, in the same column, in the same paragraph, in the sixth line, after "individual," insert "family".

5. On page 38898, in the first column, in paragraph (4), in the first line, after "force" insert "or".

BILLING CODE 1505-01-D

DEPARTMENT OF THE INTERIOR

Minerals Management Service

30 CFR Part 208

Sale of Federal Royalty Oil

Correction

In rule document 87-25103 beginning on page 41908 in the issue of Friday, October 30, 1987, make the following correction:

§ 208.2 [Corrected]

In § 208.2, on page 41914, in the second column, in the 13th line, "eligible" should read "ineligible".

BILLING CODE 1505-01-D

Electrical Safety

Monday
November 30, 1987

Part II

Department of Labor

Occupational Safety and Health
Administration

29 CFR Part 1910

Electrical Safety-Related Work Practices;
Proposed Rule

DEPARTMENT OF LABOR

Occupational Safety and Health Administration

29 CFR Part 1910

[Docket S-016]

Electrical Safety-Related Work Practices

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

ACTION: Proposed rule.

SUMMARY: The Occupational Safety and Health Administration (OSHA) is proposing a new standard on electrical safety-related work practices for general industry. This performance-oriented proposal would complement the existing electrical installation standards. The proposal includes requirements for work performed on or near exposed energized and deenergized parts of electrical equipment; use of electrical protective equipment; and the safe use of electric equipment. Compliance with these safe work practices will reduce the number of electrical accidents resulting from unsafe work practices by employees.

OSHA is also proposing amendments to the general industry standards which would: (1) Change existing regulations referring to the 1971 National Electrical Code so that they would refer instead to OSHA's electrical standards; (2) remove existing electrical work-practice requirements from other parts of the general industry standards so that all general electrical safety-related work practices would be covered in the electrical safety standards; and (3) remove an existing provision relating to construction from the general industry electrical safety standards. These changes would promote uniformity and reduce redundancy among the general industry standards.

DATES: Written comments and requests for a hearing on these proposed rules must be postmarked by February 29, 1988.

ADDRESS: All comments, objections and hearing requests should be sent in quadruplicate to Docket Officer, Docket S-110, Rm. N3670; OSHA, U.S. Department of Labor, 200 Constitution Avenue, NW., Washington, DC 20210.

FOR FURTHER INFORMATION CONTACT: Mr. James F. Foster, U.S. Department of Labor, Occupational Safety and Health Administration, Room N3637, 200 Constitution Avenue, NW., Washington, DC 20210 (202-523-8148).

SUPPLEMENTARY INFORMATION:

I. Background

A. Electric Shock

It is well known that the human body will conduct electricity, and that if direct contact is made with an electrically energized part while a similar contact is made simultaneously with another conductive surface which is maintained at a different electrical potential, a current will flow, entering the body at one contact point, traversing the body and then exiting at the other contact point, usually the ground. Each year many workers suffer pain, injuries, and death from such electric shocks. OSHA estimates that there are more than 300 electrical fatalities in general industry each year.

The effects that electric shock will have on an individual will depend upon the type of circuit, its voltage, resistance, and amperage, the pathway through the body, and the duration of the contact. For example, electric shocks produced by alternating currents of powerline frequency (normally 60 Hertz) passing through the body of an average adult from hand to foot for 1 second can cause various effects, starting from a condition of being barely perceptible at 1 milliamperes to involuntary muscular control from 9 to 25 milliamperes. The passage of still higher currents can produce ventricular fibrillation of the heart (cessation of rhythmic pumping action) from 75 milliamperes to 4 amperes, and finally immediate cardiac arrest at over 4 amperes. Nearly instantaneous fatalities from electrical shock can result from either direct paralysis of the respiratory system (at 20 milliamperes or more), failure of the heart to pump due to ventricular fibrillation (at 75 milliamperes or more), or immediate and complete heart stoppage (at 4 amperes or more). Even if the shocking current does not pass through vital organs or nerve centers, severe injuries such as deep internal burns can still occur. In some cases, injuries caused by electric shock can be a contributory cause of delayed fatalities.

Burns suffered in electrical accidents are also of great concern. These burns may be of three basic types: electrical burns, arc burns and thermal contact burns. Electrical burns are the result of the electric current flowing in the tissues and may be either skin deep or may affect deeper layers (muscles, bones, etc.) or both. Tissue damage is caused by the heat generated from the current flow; if the energy delivered by the electric shock is high, the body cannot dissipate the heat and the tissue is burned. Typically, such electrical burns

are slow to heal. Arc burns, on the other hand, are the result of high temperatures produced by electric arcs or by explosions in close proximity to the body. These burns are similar to burns and blisters produced by any high temperature source. Finally, thermal contact burns are those normally experienced from the skin's contacting hot surfaces of overheated electrical conductors, conduits, or other energized equipment. All types of burns may be produced simultaneously.

Electric shock currents, even at levels as low as three milliamperes, can also cause injuries of an indirect or secondary nature. In this case, the involuntary muscular reaction from the electrical shock can cause bruises, bone fractures, and even death resulting from collisions or falls.

B. Hazards Associated With Electricity

Most electrical systems use the earth to establish an electrical voltage reference system with respect to ground. This is done by connecting a portion of the circuit to ground. Since these systems use conductors which have voltages to ground, a shock hazard exists for persons who are in electrical contact with the earth and are exposed to the conductors. If a person comes in contact with an ungrounded conductor while that person is in contact with the ground, he or she becomes part of the circuit and current passes through his or her body.

In addition to the shock hazard, electricity poses other hazards to employees. For example, when a short circuit occurs or current flow is interrupted, hazards are created from the resultant arcs. If the current involved is great enough, these arcs can cause injury or can start a fire. Fires can also be created by overheating equipment or by conductors carrying too much current. Extremely high-energy arcs can damage equipment causing fragmented metal to fly in all directions. In atmospheres which contain explosive gases or vapors or combustible dusts, even low-energy arcs can cause violent explosions.

C. Nature of Electrical Accidents

Electrical accidents, when initially studied, often appear to be caused by circumstances which are varied and peculiar to the particular incidents involved. However, further consideration usually reveals the underlying cause to be a combination of three possible factors; i.e., work involving unsafe equipment and installations, workplaces made unsafe by the environment, and unsafe work performance (unsafe acts).

For purposes of convenience, the first and second accident causing situations are sometimes combined and simply referred to as unsafe conditions. Thus, electrical accidents can be generally considered as being caused by unsafe conditions, unsafe acts, or, in what is usually the case, combinations of the two. It should also be noted that inadequate maintenance can cause equipment or installations which were originally considered safe to deteriorate, resulting in an unsafe condition.

Some unsafe electrical equipment and installations can be identified, for example, by the presence of faulty insulation, improper grounding, loose connections, defective parts, ground faults in equipment or unguarded live parts. The environment can also be a contributory factor to electrical accidents in a number of ways. For example, environments containing flammable vapors, liquids or gases, areas containing corrosive atmospheres and wet and damp locations are some unsafe environments affecting electrical safety. Finally, some unsafe acts can be recognized as, typically, the failure to deenergize electrical equipment when it is being repaired or inspected, the intentional use of obviously defective and unsafe tools, or the use of tools or equipment too close to energized parts.

D. Protective Measures

There are various general ways of protecting employees from the hazards of electric shock, including insulation and guarding of live parts. Insulation provides an electrical barrier to the flow of current. To be effective, the insulation must be appropriate for the voltage, and the insulating material must be undamaged, clean, and dry. Guarding prevents the employee from coming too close to energized parts. It can be in the form of a physical barricade, or it can be provided by installing the live parts out of reach from the working surface. (This technique is known as "guarding by location.")

Grounding is another method of protecting employees from electric shock; however, it is normally a secondary protective measure. To keep guards or enclosures at a common potential with earth, they are connected, by means of a grounding conductor, to ground. In addition, grounding also provides a path of low impedance and of ample capacity back to the source to pass enough current to operate the overcurrent devices in the circuit. If a live part accidentally comes in contact with a grounded enclosure, any current flow is directed back to earth, and the circuit protective devices (e.g., fuses and

circuit breakers) can interrupt the circuit.

These protective measures help ensure the safe installation of electric equipment and are prescribed by the regulations presently contained in Subpart S. Addressing common unsafe conditions, these rules cover such safety considerations as guarding and insulation of live parts, grounding of equipment enclosures, and protection of circuits from overcurrent.

However, even though equipment may be in compliance with the installation requirements of Subpart S, the employee is still exposed to electrical hazards. An unsafe work practice can increase the gravity of the hazards, while under normal conditions the hazards would be controlled and would pose no serious risk to the worker. For example, an employee carrying a ladder could approach exposed live parts guarded by installation beyond normal reaching distance. The employee's bringing the ladder close to the live parts exposes the worker to hazards greater than those present under usual working conditions. When employees are working with electric equipment, they must use safe work practices. Such safety-related employee work practices include keeping a prescribed distance from exposed energized lines, avoiding the use of electric equipment when the employee or the equipment is wet, and locking-out and tagging equipment which is deenergized for maintenance.

Another important safety practice involves the use of electrical protective devices, such as rubber gloves and rubber mats for the purpose of insulation against live parts, or live-line tools for purposes of both insulation and manipulation of energized parts from a distance. However, to assure the protection of the employee, this equipment must be properly manufactured and maintained. Regular maintenance is an important consideration in order to keep this equipment for deteriorating into an unsafe condition.

E. Need for Proposed Regulation

The current electrical safety standards contained in Subpart S of Part 1910 provide employees protection from hazards posed by electrical installations. By requiring such protective measures as guarding of live parts and grounding of equipment enclosures, the current regulations make most types of electrical equipment reasonably safe under normal conditions.

However, even normally safe equipment can pose hazards under certain conditions. A few illustrations

may help to underscore this point. To guard overhead power line from contact by the public, electric utility companies install the lines at heights which cannot be reached by persons standing on the ground. This protective measure serves its purpose well, until someone approaches a power line with a long ladder or a crane. Since the overhead power lines were not designed to provide complete protection under such circumstances, safe work practices (e.g., maintaining a safe distance) must be used to minimize the hazards involved.

Another common example of a normally safe installation posing hazards is equipment undergoing maintenance. Under normal operating conditions, live parts of equipment are required to be guarded from contact by employees. However, when the equipment must be disassembled for maintenance or repair, the normally enclosed electrical parts become exposed. Therefore, during maintenance, certain work practices must be used to prevent contact with the necessarily exposed parts while they are energized. Typical safety-related work practices used in such situations include equipment deenergizing, lockout and tagging procedures, and the use of personal protective equipment.

Electric equipment can also be used under circumstances that pose unexpected hazards. For example, using an ordinary portable electric drill, a worker can ignite flammable vapors from paint thinner being used nearby. The existing electrical safety standards contain provisions dealing with electrical installations in hazardous locations. However, they do not directly address the hazards involved with the use of electric equipment in areas in which hazardous concentrations of flammable gases or vapors may accumulate temporarily and infrequently. In such circumstances, safety-related work practices must be used to control the hazards involved. With respect to the electrical hazards, such practices could include the use of additional ventilation or the shutdown of electric equipment while hazardous quantities of the vapors are present.

As previously noted, the current electrical standards in Subpart S of the General Industry Standards cover electrical installations rather than work practices; the few safety-related work practice standards that do exist are distributed in other subparts of Part 1910. However, although unsafe work practices appear to be involved in most workplace electrocutions, OSHA has very few regulations addressing work practices necessary for electrical safety.

Unsafe work practices appeared to be a factor in over half of the electrocutions that were analyzed in OSHA's limited survey which is discussed in the next section of the preamble. Because of this, OSHA has concluded that undertaking rulemaking procedures to minimize these hazards is most appropriate.

Various national consensus standards address electrical safety-related work practices for particular types of equipment and operations. For example, American National Safety Code for Crawler, Locomotive, and Truck Cranes, ANSI B30.5, requires a minimum clearance of 10 feet for cranes operated near overhead power lines. Similarly, ANSI Z49.1, Safety in Welding and Cutting, contains electrical work practice requirements for the use of welders. OSHA has previously adopted these two consensus standards (in §§ 1910.180 and 1910.252, respectively); and, in some part, they have helped reduce electrical accidents. However, these "specialized" standards are limited in their areas of concern and do not address safe electrical work practices generally. Recently, though, the National Fire Protection Association recognized the need for a general electrical safety-related work practice standard by adopting Part II of NFPA 70E, Electrical Safety Requirements for Employee Workplaces.

Based on the considerable number of electrocutions occurring in situations for which no OSHA safety standards exist, OSHA has determined that a significant risk of death or serious injury exists (even in workplaces in compliance with existing OSHA standards), and the Agency has decided that a comprehensive electrical safety-related work practice standard is necessary for the protection of employees. Toward this end, the Agency has evaluated Part II of NFPA 70E and has determined that that national consensus standard is appropriate for OSHA to use as a basis for its proposed rule.

F. Accident Patterns

A survey of OSHA preliminary fatality/catastrophe event reports (Form OSHA-36) was undertaken to observe trends and patterns relative to causes of occupational electrocutions. These forms covered the period from January 1977 to June 1978. However, for various reasons, the OSHA fatality reports did not record all occupational electrocutions occurring in this period. For example, despite reporting requirements, some fatalities are simply never reported to OSHA. There is also evidence that, in the past, some electrocutions have been mistakenly identified as heart attacks. Presumably,

this could have occurred during the period in question. Additionally, in this survey, the reporting of fatalities from states with their own approved OSHA programs is incomplete because the reports were not required to be submitted to the Federal OSHA. In fact, only two fatalities from such states are included. Despite this under-reporting, the available fatality information indicates that there is a serious problem.

In reviewing the forms, OSHA divided them into industry groups, as given in Table 1.

The Agency is limiting this proposed rulemaking to the prevention of accidents in general industry and maritime because to include other industrial sectors (such as construction) would seriously impede the rulemaking process. Inclusion of other industries in the proposal would require the Agency to consider many possible diverse situations requiring safety-related work practices that are likely to be germane only to these industries. The construction industry, for example, is an extensive user of temporary wiring, which is frequently moved and is often used under a wide range of environmental conditions. Such situations often affect the type of electrical safety-related work practices recommended for use. Additionally, under the Construction Safety Act and 29 CFR 1911.12, OSHA is required to consult with the Advisory Committee for Construction Safety and Health before issuing proposed rules affecting construction, to assure that the unique aspects of construction work are taken into consideration by the Agency. Furthermore, OSHA has recently revised its electrical standards for construction, Subpart K of Part 1926, which incorporate various electrical safety-related work practices in addition to installation safety requirements (51 FR 25294). Reasons for excluding work on electric power generation, transmission, and distribution installations are given in Section III of this preamble.

Following promulgation of the standard for electrical safety-related work practices for general industry, the Agency plans to consider the specific safety practices needed for the electric power industries.

Therefore, of particular interest at this time are the 111 fatalities occurring in general industry. A general breakdown of the accidents, by type, is given in Table 2. A review of the circumstances surrounding the accidents appears to indicate that an unsafe work practice, or a combination of unsafe work practices,

was involved in over half of the electrical fatalities.

TABLE 1.—ELECTRICAL FATALITIES BY INDUSTRY

[January 1977 to June 1978]

Industry	Applicable standard (29 CFR)	No. of fatalities
General Industry ¹	Part 1910, Subpart S.	111
Construction ¹	Part 1926, Subpart K.	92
Telecommunications.	§ 1910.268	3
Power Transmission and Distribution.	Construction—Part 1926, Subpart V; Operation & Maintenance—Future Rulemaking.	40
Maritime	Parts 1915-1918 and Part 1910, Subpart S.	3

¹ Excluding Telecommunications and Power Transmission and Distribution.

TABLE 2.—ELECTRICAL FATALITIES BY UNSAFE EVENTS GENERAL INDUSTRY—JANUARY 1977 TO JUNE 1978

Category No.	Unsafe event	Number of fatalities
(i).....	Use of equipment or material too close to exposed energized lines—Total.	47
(a).....	Vehicles (e.g., cranes and dump trucks).	26
(b).....	Other mechanical equipment (e.g., augers and derricks).	7
(c).....	Tools and materials ¹ (e.g., ladders and tree limbs).	14
(ii).....	Failure to use personal protective equipment. ¹	5
(iii).....	Assuming an unsafe position. ¹	10
(iv).....	Failure to deenergize (and lockout/tag) equipment. ¹	14
(v).....	Use of visibly defective electric equipment.	3
(vi).....	Blind reaching, drilling, digging, etc.	3
(vii).....	No unsafe work practice or not enough information to classify properly.	29
	Total.....	111

¹ These categories contain common elements and therefore overlap. For illustration, an accident (fictitious) occurs when a painter using a long-handled paint roller makes con-

tact with a power line. This accident could be placed into any of three categories, as follows: (1) He used a tool too close to the power line; (2) he did not use personal protective equipment so that he could safely work close to the line; or (3) he assumed a working position which allowed accidental contact with the line. In such cases, the fatality was placed in the category which seemed most appropriate. The example given would have been placed in the first category (i)(c).

Unsafe work practices may result from such factors as inattentiveness, lack of training, or poor supervision. From the aforementioned reports, it is not possible to determine the level of training involved, the employers' work rules, or other secondary factors which may have contributed to the accidents. Additionally, even though unsafe work practices were involved in many accidents, unsafe conditions were sometimes present at the same time. (For example, see category (v).) The data presented here are merely being used to demonstrate that unsafe work practices are significant contributors to electrical accidents and that they should be addressed in OSHA's regulations. It should be noted that, even with 100 percent compliance with OSHA's current General Industry Standards, most of the accidents (68 percent) given in categories (i) through (vi) in Table 2 would still have occurred.

Within each category in Table 2, the accidents are very similar in nature. From the fatality reports, OSHA can describe a typical accident for each of the first six categories as follows:

(i) *Use of equipment or material too close to exposed energized lines—(a) Vehicles.* Operating a truck-mounted boom, an employee of a local trucking company was unloading concrete blocks when the boom came in contact with a 7200-volt overhead power line.

(b) *Other mechanical equipment.* An oil well service rig loading and tubing machine was working over a 900-foot well. While lowering a pole, it came in contact with an overhead 7200-volt power line. The operator was burned and the helper, who was standing alongside the rig, received a serious electrical shock and later died.

(c) *Tools and materials.* An employee of a chemical manufacturing company was on a tank at a position about 18 feet above the ground. He was measuring the fluid level in the tank with a 20 foot long metal pole. When he removed it from the tank the pole came in contact with a 12,000-volt power line, which was about 16 feet above the tank.

(ii) *Failure to use personal protective equipment.* While trimming trees near power lines, an employee of a tree service company was electrocuted. His employer was cited for failure to

provide personal protective equipment made necessary by the employee's close proximity to the lines.

(iii) *Assuming an unsafe position.* An electrician for a boiler shop was working on a bridge crane (doing repair work). He apparently gave instructions to turn on the power. When the line was energized, he was shocked, causing him to fall 30 feet to the cement floor.

(iv) *Failure to deenergize (and lockout/tag) equipment.* An employee of a steel pipe and tubing manufacturer was working on crane power lines. When he contacted one of the energized conductors, he was electrocuted.

(v) *Use of visibly defective electric equipment.* While using a vacuum pump to clear around a swimming pool, a life guard for a real estate management company was electrocuted. The employer was cited for not grounding the vacuum pump—it was equipped with a two-wire cord and was connected to the outlet by means of an extension cord with its grounding prong removed.

(vi) *Blind reaching, drilling, digging, etc.* An employee of a chemical manufacturing company climbed up on an industrial electrical outlet. While holding onto an I-beam, he reached inside a guard and accidentally contacted a 650-volt busbar.

G. Significant Risk

In order to promulgate safety regulations, OSHA must show that the hazard the Agency proposes to address presents a significant risk to employee safety. As part of the preliminary analysis for this electrical safety-related work practices proposal, OSHA has determined the population at risk, the industries and occupations presenting major risks, and the incidence and severity of the injuries attributable to the failure to establish safe work practices. Finally, in keeping with the purpose of safety standards to prevent accidental injuries and deaths, OSHA has estimated the number of accidents that would be prevented by the regulation.

Although nearly every worker in general industry is exposed to electrical hazards, some are at much greater risk than others. Employees at appreciably greater risk include, (a) those in industries that have the highest incidence rates of electrical accidents and (b) those in occupations considered high risk for electrical hazards. JACA Corporation, in their "Regulatory Assessment of the Impact of the Proposed Electrical Safety-Related Work Practices," characterized the frequency with which electrical accidents occur and tabulated the

relative risk between industries. (This document is available for inspection and copying in the Docket Office.) Among industries covered by the proposal, the highest relative risks are encountered in the following industries: lumber and wood products; rubber and miscellaneous plastics products; stone, clay, and glass products; primary metal; and miscellaneous repair services. Industries with a relatively low risk are concentrated in the finance, insurance, and real estate industries. According to the JACA report and excluding jobs not addressed by the proposal, the highest electrical accident rates are faced by electricians and apprentices, stationary engineers, mechanics and repairmen, structural metal craftsmen and welders. Low rates are encountered by personnel in the sales and clerical fields.

OSHA has estimated that more than 1,500 injuries and over 100 fatalities (concentrated within a high risk group of about 4.8 million workers) could be prevented each year through compliance with the proposed safety-related work practices. (A detailed analysis of the benefits of the proposed standard and a description of the methodology used can be found in Chapter 5 of OSHA's preliminary regulatory analysis, which is available for inspection and copying in the Docket Office.)

The particular injuries that the proposed safe work practices will prevent include electric shocks, burns, and the indirect injuries that result when electric shocks occur. (Indirect injuries are typically bruises, bone fractures, and even deaths that occur when the victim falls due to the involuntary muscular reactions that follow electric shocks.) Although some injuries only involve minor shocks and burns, many victims suffer disabling effects, some are killed by electrocution, and still others die from the indirect injuries. Therefore, the frequency and seriousness of injuries to be prevented clearly demonstrate a significant risk which will be addressed by the proposed standard.

II. Development of Proposed Standard

A. Present Electrical Standards

In 1976, the National Fire Protection Association (NFPA) created the "70E Committee" to prepare a consensus standard for possible use by OSHA in developing a proposed revision of the Agency's electrical safety standards. The 70E Committee visualized a standard consisting of four major parts:

- Part I—Installation Safety Requirements,
- Part II—Safety-Related Work Practices,
- Part III—Safety-Related Maintenance Requirements,

Part IV—Safety Requirements for Special Equipment.

The name given to this new document became NFPA 70E, "Electrical Safety Requirements for Employee Workplaces."

The NFPA 70E Committee derived Part I from the National Electrical Code (NEC). OSHA reviewed the 70E document, which the NFPA approved, and used it as the foundation for proposing a revision (44 FR 55274) to 29 CFR Part 1910, Subpart S—the electrical standards for General Industry. After a public comment period and an informal hearing, the revised Subpart S was published as a Final Rule in the *Federal Register* (46 FR 4034) on January 16, 1981. The standard covers the safe installation of electrical equipment.

While OSHA was revising its standards using NFPA 70E, Part I, the 70E Committee was completing its work on Part II.

After considering the views and recommendations of the experts on the committee and comments from the public, NFPA approved the 70E Committee's standard on electrical safety-related work practices. Thus, NFPA 70E, Part II, "Safety-Related Work Practices," become a national consensus standard.

B. Use of NFPA 70E, Part II, as a Base Standard

In the development of this proposal, OSHA evaluated NFPA's electrical safety-related work practice standard. In areas which overlapped other consensus standards not presently adopted by OSHA, the NFPA document was reviewed and was compared with those other standards with respect to consistency and with respect to effectiveness in providing employee safety. For example, the NFPA requirements on lockout of equipment were compared to ANSI Z244.1, Lockout/Tagout of Energy Sources, so that OSHA could determine what requirements could most effectively protect employees from electrical hazards. In this case, as in most others, the NFPA standard more directly addressed electrical hazards than did the ANSI document, although (in OSHA's view) NFPA 70E was sometimes overly detailed or too specification-oriented. In comparison to other national consensus standards, NFPA's electrical safety-related work practices appeared to be effective in providing employee safety and consistent with current industry practice.

OSHA also examined provisions of NFPA 70E which were comparable to

existing OSHA regulations. For example, OSHA compared §1920.180(j), dealing with the operation of cranes near overhead lines, with similar requirements in the NFPA standard. As a result, OSHA discovered that, while the 70E committee referred to OSHA's regulations in § 1910.180(j) in providing for a 10-foot minimum clearance, they provided smaller clearance distances in NFPA 70E for other types of equipment used near overhead power lines. In this area, NFPA 70E seemed to be less effective in protecting employees. In most other areas, however, the 70E requirements were at least as protective as OSHA's.

Finally, OSHA evaluated whether the requirements of NFPA 70E, Part II, were directed towards the apparent causes of electrical accidents. In addition to the previously mentioned OSHA survey, the Agency also reviewed electrical accident data provided by California, Florida, and other States. For every requirement set forth in Part II of NFPA 70E, OSHA found injuries or fatalities which were directly relevant. For instance, the lockout/tagout requirements of Chapter 4 were found to relate specifically to accidents in category (iv) presented previously in Table 2. However, it was not always possible to relate every specification in the 70E provisions on lockout of equipment to a particular causative factor presented in the accident descriptions.

OSHA has thoroughly reviewed NFPA's consensus standard on Electrical Safety-Related Work Practices and has determined that it is an appropriate document on which to base a proposed rule. Although the format and outline of the NFPA standard are not entirely suitable, the basic requirements are generally valid and relate well to causes of electrical accidents. Where necessary, OSHA has reorganized and edited the national consensus standard to fit the Agency's regulatory needs. For the most part, however, the proposed standard contains the same requirements as Part II of NFPA 70E. A performance-oriented approach addressing the causes of these accidents is thus maintained. As a consequence, the methods of compliance remain flexible.

III. Summary and Explanation of Proposed Standard

This section discusses the important elements of the proposal and explains any differences between it and the source document, NFPA 70E, Part II.

(1) § 1910.331. Section 1910.331 sets forth the scope of the proposal. According to this section, the standard

would cover electrical safety-related work practices of employees who work on, near, or with electric circuits and equipment. Types of work performed by qualified persons which would not be covered by the proposal are also listed. Although the scope is similar to that of NFPA 70E and to existing § 1910.302(a), there is a key difference. Briefly, the NFPA standard and § 1910.302(a) state certain installations¹ are not covered. OSHA is proposing that the work practice standard not apply to "qualified persons" (as defined in § 1910.399 and discussed later in this preamble) performing work on or directly associated with these same types of installations, because the work practices in this proposal do not address the types of electrical hazards faced by such workers performing this type of work. However, employees who are working at these installations but who are not "qualified" would be covered by the proposal. Safety-related work practices used by qualified employees who are performing work not covered in this proposal are addressed in other standards, such as 29 CFR Part 1926, Subpart V (power transmission and distribution); 29 CFR 1910.268 (telecommunications); and ANSI C2 (electric supply). This last standard has not been adopted by OSHA, but the Agency is currently developing a separate proposed standard for work practices to be used with electric power generation, transmission, and distribution systems.

An example of electric distribution line work that is "directly associated" with distribution lines (but that is not work "on" the lines) is line clearance tree trimming. In this activity, the work is performed on trees, but the work is directly associated with the distribution system. Thus, line-clearance tree trimming performed by a qualified person would not be covered by the proposed standard.

"Qualified person" is currently defined in § 1910.399 as: "One familiar with the construction and operation of the equipment and the hazards involved." "Qualified persons" are intended to be only those who are well acquainted with and thoroughly conversant in the electric equipment and

¹ Namely: Installation in mines; in ships and other watercraft; in aircraft; in automotive vehicles, excluding mobile homes and recreational vehicles; in railway rolling stock, including railway facilities for generation, transformation, transmission and distribution of power used for rolling stock signaling and operation; in communication facilities and in facilities for electric energy generation, control, transformation, transmission and distribution located outdoors or in building spaces used exclusively for such purposes.

electrical hazards involved with the work being performed. As used in the proposal, the term connotes different qualifications for different tasks. For example, with respect to the statement in proposed § 1910.331(c)(1) which exempts qualified linemen working on transmission lines, a qualified person would be one who understands the construction and operating characteristics of the transmission line and who has a thorough knowledge of the hazards involved in the type of work being performed on the line. On the other hand, this provision would not ordinarily exempt a transportation worker using a boom mounted on a flat bed truck to unload concrete blocks at a site near overhead distribution lines. This type of employee would not normally be expected to understand the construction and operation of the lines, nor would this person likely be completely knowledgeable in the hazards involved.

With respect to companies that own and operate the types of installations listed in paragraph (a)(3) of proposed § 1910.331 (for example, an electric utility), it is assumed that all employees whose work is on or is directly related to these installations are "qualified." OSHA has found it to be a very rare practice for an employer to allow an unqualified worker to perform work on one of these types of installations. However, it is common for an unqualified employee, such as a painter, to be engaged in unrelated work near an overhead electric power line. Because, by definition, an unqualified employee lacks sufficient training and experience, he or she faces a greater risk of electric shock while working near an electric power line than a qualified employee.

Whether an employee is considered to be a "qualified person" will depend upon various circumstances in the workplace. It is possible and, in fact, likely for an individual to be considered "qualified" with regard to certain equipment in the workplace, but "unqualified" as to other equipment. For example, an employee may have received the necessary training to be considered qualified to work on a particular machine. However, if that same employee were to work on other types of equipment for which he has not received the necessary training, he would be considered unqualified for that other equipment.

Work performed by other than qualified persons would be covered by the work practices contained in this proposal, even if the electrical installations involved are not covered by the installation safety requirements

of Subpart S. This is because unqualified persons, by definition, do not have the training nor the skills necessary to perform work safely very close of electrical installations. Additionally, there are no standards, other than the 10-foot clearance rule for cranes and similar equipment, to cover these situations at present. Work performed by other than qualified persons near these "exempted" installations (e.g., near an electric transmission line) would be covered by the proposed requirements. Thus, for example, a painter carrying a ladder near electric transmission or distribution lines would have to comply with the provisions of § 1910.333(c)(3)(i), but a qualified lineman working on the lines would not be covered.

The present installation safety requirements in Subpart S do not cover "installations under the exclusive control of electric utilities * * * for the generation, control, transformation, transmission, and distribution of electric energy" (§ 1910.302(a)(2)(v)). This exclusion, which reflects the unique hazards and work practices involved in generation, transmission, and distribution of electric energy, mirrors the provisions of the National Electrical Code and NFPA 70E. The work practices in this proposal were designed to complement the installation safety provisions in Subpart S and were not intended to cover work practices for qualified persons who work on or near electric generation, transmission, or distribution installations. Therefore, paragraph (c)(1) of proposed § 1910.331 provides that qualified persons working on these installations are not covered by the proposal. Additionally, because these types of installations involve similar hazards and work practices whether or not they are controlled by electric utilities, OSHA has determined that the proposal should not apply to qualified persons who work on or near any such installations, regardless of who owns or controls the installations. A note is provided at the end of the paragraph to emphasize that this exclusion is limited to qualified persons whose work is on or directly associated with these installations. The note states that, for other types of installations where work is to be performed on or near exposed energized parts, even qualified persons must comply with the work practices contained in this proposal. In these cases, the standard covers qualified persons who work near the energized parts as well as those workers qualified to work on the energized parts. As noted previously, OSHA is currently developing a

separate proposed rule on electric power generation and related areas.

Under proposed § 1910.331(c)(2), qualified persons engaged in telecommunications work are not covered by the proposal to the extent that the hazards are covered by § 1910.268. That section applies to employers providing telecommunication service, including but not limited to communications utilities. Since the proposal would not apply to work covered by § 1910.268, there would be no overlap between the proposed regulations and the present telecommunications standard.

The installations listed in paragraphs (c)(3) and (c)(4) of proposed § 1910.331 are provided for consistency with the coverage of the installation safety requirements of Subpart S, as set forth in existing § 1910.302(a)(2)(i) and (iii), respectively. For example, under § 1910.331(c)(3), automotive repair work involving electric conductors and equipment installed on self-propelled vehicles performed by qualified employees would not be covered by the proposal. As explained previously, whether an employee is considered to be qualified depends upon various circumstances in the workplace. For an automobile mechanic or other employee to be considered qualified (and thereby not covered under proposed § 1910.331(c)(3)), he or she would have to understand the construction and operating characteristics of automotive electrical systems and would have to have a thorough knowledge of the hazards they present.

The safety-related work practices contained in the proposed standard would in fact be implemented by employees, but it would be the responsibility of employers to ensure that these practices are followed by their employees. The employer must satisfy this obligation by providing adequate training and supervision of employees and by implementing safe work practices.

(2) § 1910.332. This section proposes training requirements. Employees would be required to be trained in (1) the safety-related work practices of the standard, as well as any other practices necessary for safety from electrical hazards, and (2) safety-related elements of their workplace environment. Inasmuch as the standard would apply to work performed on or near exposed energized parts unrelated to power generation, transmission, and distribution, such work must be performed by qualified persons, and appropriate training is required. Proposed § 1910.332(b)(3) explicitly

states what OSHA intends as a basic training requirement for such qualified persons.

In order to be as flexible as possible, the OSHA proposal accepts both classroom and on-the-job training. The NFPA 70E standard is silent on the method by which training is to be provided.

The economic impact of the proposal is limited, and the expected benefits are optimized, because the training requirements would apply primarily to employees in occupations that traditionally carry relatively high risk of injury due to electrical hazards. A review of the accidents indicates that the greatest impact on reduction of accidents would result from training employees who work in jobs which expose them to electrical hazards to a greater degree than the average worker.² Upon searching the available accident data, OSHA has determined that employees in the occupations listed in Table 3 are more likely to face a higher than normal risk of electrical accidents. (The occupations listed in Table 3 are general categories taken from the specific occupational groups given in Table 4, in Section IV of this preamble, which lists the electrical injury incidence rate for each group.) OSHA requests public comment on whether these general categories and the specific occupational groups from which they have been derived appropriately identify the high risk employees and whether any groups should be redefined, deleted, or added. The occupational groupings listed include any qualified persons who perform work covered by this proposed standard, as well as unqualified persons who also face a high risk. It is primarily these employees who would be subject to the training requirements. However, in some cases, employees in other occupational groupings may also face a relatively high risk of injury due to electric shock, and these employees would also require training. For example, a production employee may work in an area containing exposed live parts that are guarded only by location (such as overhead lines). If this worker could come in contact with these lines in the course of his or her work, then he or she would have to be trained. Training in the basic areas of hazard recognition, proper work practices, and knowledge

of the working environment can reduce the frequency of accidents involving employees in these categories, whereas training employees who face a minimal exposure to electrical hazards would result in a negligible increase in benefits. Therefore, OSHA has proposed that training be required only for employees who face the greatest risk of injury due to electric shock or other electrical hazards.

TABLE 3.—TYPICAL OCCUPATIONAL CATEGORIES OF EMPLOYEES FACING A HIGHER THAN NORMAL RISK OF ELECTRICAL ACCIDENTS

Occupation
Electricians.
Mechanics and repairers.
Electrical and electronic technicians.
Electrical and electronic equipment assemblers.
Stationary engineers.
Material handling equipment operators.
Electrical and electronic engineers.
Blue collar supervisors.
Welders.
Riggers and roustabouts.

(3) § 1910.333. Paragraph (a) of § 1910.333 proposes general requirements on the selection and use of work practices. The requirements of this paragraph mainly address accidents which involve the hazards of exposure to live parts of electric equipment. A deenergized part is obviously safer than an energized one. Because the next best method of protecting an employee working on exposed parts of electric equipment (the use of personal protective equipment) would continue to expose that employee to a significant risk of injury from electric shock, proposed § 1910.333(a) would make equipment deenergizing the primary method of protecting employees. Under certain conditions, however, deenergizing need not be employed. Employees may be allowed to work on or near exposed energized parts, if the employer can demonstrate that deenergizing would be infeasible or would introduce additional or increased hazards, e.g., interruption of life-support equipment, shutdown of hazardous location ventilation systems, or complete removal of illumination. In any case, employees working on or near energized parts must use safe work practices as required by the standard.

Paragraph (b) of proposed § 1910.333 covers work on or near exposed deenergized electric parts and includes requirements for lockout and tagging of equipment disconnecting means. The

need for adequate lockout and tagging procedures for electrical equipment is widely recognized, as demonstrated by the ANSI and NFPA standards in this area. The accidents in OSHA's survey which involved work on electrical equipment also indicate a need for proper work practices in this area. Although the lockout and tagging requirements of NFPA 70E are used as a basis, the OSHA proposal clarifies and simplifies the requirements of the NFPA standard by directing the coverage to the prevention of employee contact with energized equipment or circuits. While the NFPA 70E requirements for lockout and tagging are highly detailed, the proposed regulations are general and more performance-oriented in nature. Additionally, the NFPA requirements apply any time work is performed on or near deenergized circuit parts or equipment in any situation which presents a danger that the circuit parts or equipment might become unexpectedly energized. Thus, the NFPA requirements not only address the hazard of contact with energized parts, but also cover other hazards which are presented by unexpected start-up of equipment during maintenance operations. This is expressed in NFPA 70E, Part II, Section 1.B, second paragraph, which states:

Where the work to be performed requires employees to work on or near exposed circuit parts or equipment, and there is danger of injury due to electric shock, *unexpected movement of equipment, or other electrical hazards*, the circuit parts and equipment that endanger the employees shall be deenergized and locked out or tagged out in accordance with the policies and procedures specified in paragraph B(1) and Chapter 4 through subparagraph B(7)(b)). [Emphasis added.]

The proposal is intended to cover employee exposure to electrical hazards which might occur from the unexpected energizing of circuit parts and would not cover other equipment-related hazards which do not involve exposed live parts. Thus, the proposal would protect an electrician working on a deenergized circuit but would not address the mechanic working on the mechanical parts of an electrically powered machine.

OSHA recognizes that equipment maintenance and repair present significant hazards to employees. These hazards, which are different from those addressed by the electrical work-practices standard, would be covered by OSHA's proposed standard on the control of hazardous energy sources (lockout/tagout), which is currently under development. OSHA has written the two proposals so that they

² For a more thorough discussion of the relative risk of electrical accidents among various categories of employees and of how training reduces this risk, see Chapter IV of OSHA's Preliminary Regulatory Impact Assessment of the Proposed Electrical Safety-Related Work Practices Standard. This document is available for inspection and copying in the Docket Office.

complement one another. It is the Agency's intent that there be no conflicts between the two standards, and OSHA solicits public comments on this issue.

The application of this proposal's lockout and tagging requirements is set forth in § 1910.333(b)(2), reading as follows:

(2) *Lockout and tagging.* While any employee is exposed to contact with parts of fixed electric equipment or circuits which have been deenergized, the circuits energizing the parts shall be locked out or tagged or both in accordance with the requirements of this paragraph * * *.

OSHA has drafted its electrical lockout and tagging provisions to be more performance oriented than are the corresponding provisions of NFPA 70E. Within the range of hazards covered by the proposal, OSHA believes that the proposed lockout and tagging provisions would provide employees with electrical safety which is comparable to that which would be afforded by NFPA 70E, Part II.

OSHA has limited the application of the proposed lockout and tagging provisions to fixed equipment. (It is not clear whether the NFPA standard would apply to other than fixed equipment.) Employees can safely work on cord- and plug-connected, portable and stationary equipment which is disconnected from the circuit. Generally, such equipment is returned to the shop for repair, and the danger of accidental energizing of equipment parts is greatly reduced. Additionally, OSHA has no data indicating that there are accidents resulting from the unexpected energizing of other than fixed equipment.

The basic intent of § 1910.333 is to require employers to take one of three options to protect employees working on electric circuits and equipment: (1) Deenergize the equipment involved and lock out its disconnecting means (paragraph (b)); or (2) deenergize the equipment and tag its disconnecting means, if the employer can demonstrate that tagging is as safe as locking (paragraph (b)); or (3) work the equipment energized if the employer can demonstrate that it is not feasible to deenergize it (see discussion of § 1910.333(a) for permissible applications of this option and § 1910.333(c) for precautions to be taken when work is performed on or near energized parts). These are the same options allowed under NFPA 70E.

Paragraph (b)(2)(i) addresses the deenergizing of equipment within the lockout and tagging process. After a procedure is set for safe deenergizing, the circuits and equipment on which work is to be performed would be

required to be disconnected from all energy sources. This ensures that the circuits are completely disabled. Because they do not completely deenergize entire circuits, control devices would not be permitted to be used as the only disconnecting means. Lastly, capacitive elements in the circuit would be required to be relieved of their stored energy and would be required to be short-circuited and grounded if necessary. These requirements would protect employees from the release of electrical energy during their work on the circuits or equipment.

Paragraph (b)(2)(ii) proposes requirements on the application of locks and tags to circuit disconnecting means. To prevent the unauthorized reenergizing of a circuit on which work is being performed, the proposal would, in general, require a lock and a tag to be placed on each disconnecting means that could supply power to the circuit. The proposal would also require the tags used to contain a statement prohibiting unauthorized operation of the disconnecting means and prohibiting removal of the tag. This requirement would inform employees of the purpose of the lock and tag.

To permit maximum flexibility, the proposed requirements permit the use of locks alone or tags alone under certain conditions. Tags would be permitted to be used without locks if locks cannot be applied to a given installation or if the employer demonstrates that tagging procedures will provide safety equivalent to that of a lock. So that employees could quickly recognize the purpose of the tag, the proposal would require that tags used under these circumstances be of a standardized design that clearly indicates that the affected circuit is not to be reenergized. For this same reason, all persons who have access to the circuit controlling devices would have to be trained in and familiar with the employer's tagging procedures. However, because a person could operate the disconnecting means before reading or recognizing the tag, the standard also proposes that, where tags only are used, an additional safety measure be taken to ensure that the closing of the tagged single switch would not reenergize the circuit on which employees are working. The additional safety measure is necessary because, at least for electrical disconnecting means, tagging is significantly less safe than locking out. A disconnecting means could be closed by an employee who has failed to recognize the purpose of the tag. The disconnect could also be closed accidentally. Public comment is requested on whether the additional

safety measure is necessary when a disconnecting means is tagged and on what measures can be taken to protect employees from the accidental closing of a tagged switch. OSHA also requests public comment on situations in which tagging procedures may provide safety equivalent to that provided by locks.

When the work to be performed involves only a simple circuit and can be completed in a short time, a lock can be used safely without a tag. The proposal would limit the use of this procedure to any situation that involves one circuit or a single piece of equipment and that involves a lockout period of no more than one work shift. Additionally, affected employees would be required to be trained in and familiar with this procedure. Public comment is requested on whether there are other situations in which a tag would not be necessary if a lock is used.

Proposed § 1910.333(b)(2)(iii) contains requirements for verifying that the correct circuits have, in fact, been deenergized. The requirement for determining whether a circuit has been opened can be satisfied by operating the controls for the equipment supplied by the circuit. This method has the advantage of not exposing employees to possibly energized parts. Therefore, the proposal makes this the first step in verifying the condition of the circuit.

Of course, operating the equipment controls is not a completely reliable indication that the circuit has been deenergized. It is possible to interrupt a portion of the circuit so that the equipment will not operate even though the rest of the circuit is still alive. Therefore, the standard proposes that a qualified person use test equipment to ensure that all parts of the circuit to which employees will be exposed are deenergized. Because it is also possible, under certain conditions, to feed circuits from the "load" side, the test would be required to check for any voltage backfeed which might be present.

Voltages over 600 volts are more likely than lower voltages to cause test equipment itself to fail, leading to false indications of no-voltage conditions. To prevent accidents resulting from such failure of test equipment, the proposal would require checking operation of the test equipment immediately before and after use.

Once work has been completed, it will be necessary to reenergize the circuit. Paragraph (b)(2)(iv) of proposed § 1910.333 addresses the procedure to be used for this task. The first step that must be taken is an inspection or test (or both) of the circuits and work areas to ensure that all tools, jumpers, grounds,

and other devices have been removed. Otherwise, energizing the circuits involved could result in a short-circuit condition that injures employees. The proposal would require that such inspections and tests, if necessary, be performed by a qualified person.

To protect employees from contact with reenergized circuit parts, the proposal would require that affected employees be notified to stay clear. After all locks and tags are removed, a visual determination that employees are clear of danger would be required. Once these procedures have been followed, it is safe to reenergize the circuits.

Paragraph (b)(3) of § 1910.333 proposes requirements that restrict the manner in which interlocks may be defeated. Interlocks deenergize circuits to prevent electric shock to persons using equipment or performing minor maintenance or adjustments. However, under some maintenance conditions, the interlocks must be rendered inoperative so that tests or adjustments can be made. To prevent injury to employees who may not realize the hazards involved, paragraph (b)(3) proposes that only qualified persons be permitted to defeat interlocks. Also, when the qualified person's work is completed, the interlock system would be required to be put back into an operative condition.

Paragraph (c) applies to work on or near exposed energized parts. This paragraph proposes requirements intended to prevent accidents due to the presence of exposed live parts. Requirements are given pertaining to work near overhead lines, illumination, confined work spaces, conductive materials and equipment, portable ladders, conductive apparel, and housekeeping duties. Additionally, the proposal would allow only qualified persons to work on energized electric equipment.

Since overhead lines are a major source of occupational electrocutions (47 of 111 electrocutions in OSHA's survey), regulations dealing with work near such lines are stressed. A number of these accidents involve employees engaged in activities which place them near electric power conductors installed above ground (e.g., a painter moving a ladder). The requirements of proposed § 1910.333(c)(3) have been expanded beyond those found in the NFPA 70E section on overhead lines and are more stringent. According to proposed § 1910.333(c)(3)(i), other than qualified persons would be required to maintain a 10-foot (305-cm) minimum clearance from unguarded energized overhead lines. This clearance distance is based on the 10-foot (305-cm) clearance rules

presently contained in §§ 1910.67(b)(4), 1910.180(j), 1910.266(c)(6) (xxii), 1926.550(a)(15), and 1926.600(a)(6), which apply to the use of various mechanical equipment near electric power lines.

OSHA realizes that it is sometimes necessary for work to be performed closer to the lines than 10 feet (305 cm) when it is infeasible or impossible to deenergize them. However, since unqualified persons are not fully aware of the danger involved, such work may be performed only by qualified personnel. Therefore, for qualified persons, the proposal would allow smaller clearances, as given in Table S-5. These clearances are the same as those given in Table R-2 of § 1910.268, "Telecommunications." The smaller clearances allow qualified persons to perform tasks which require close approach to overhead lines. At the same time, the smaller clearances provide protection from arc-over with a sufficient safety factor for employees who are familiar with the construction and operation of overhead electric power lines and with the hazards involved. Additionally, if the work requires closer approach than even these smaller clearances allow, qualified persons would be permitted to approach the lines as close as necessary if insulation or guarding is provided.

Without differentiating between qualified and unqualified workers, the NFPA standard requires a "safe distance" to be maintained for any employee working in elevated positions near unguarded, energized lines but does not specify what this distance is. For employees on the ground, the consensus standard requires deenergizing or guarding any overhead line that might be contacted.

For vehicular and mechanical equipment (§ 1910.333(c)(3)(iii)), OSHA is proposing a minimum clearance of 10 feet (305 cm), while NFPA 70E allows equipment other than aerial lifts, mobile cranes, and derrick trucks³ to come as close as 4 feet to exposed, energized overhead lines. In the OSHA proposal, approaches closer than 10 feet are allowed for (1) vehicles in transit; (2) lines protected by insulating barriers; and (3) aerial lifts operated by qualified persons. These closer approach distances are based on exceptions to the 10-foot (305-cm) clearance rules presently contained in the existing OSHA standards noted previously. All of OSHA's existing standards (e.g., § 1910.180(j)(1)) require a basic 10-foot

³ For these types of equipment only, NFPA refers to OSHA's existing standards, which require a minimum clearance of 10 feet.

clearance for the specific equipment covered. Additionally, § 1926.000(a)(6) of the Construction Standards requires all mechanical equipment to keep 10 feet away from power lines. Therefore, the proposal is consistent with OSHA's existing regulations and minimizes the confusion as to what clearances are required.

The clearance distances listed in NFPA 70, as well as those given in OSHA's proposal, protect against arc-over of current from the lines to the equipment. Assuming that the equipment would never come any closer than permitted by either standard, both would theoretically provide employees with protection. However, the main concern involved in operating mechanical equipment near exposed power lines is unintended movement of the equipment which may bring the equipment too close to the lines. A 10-foot clearance provides a more reasonable margin of error compared to the distances given in NFPA 70E. Additionally, the clearance distances in NFPA 70E vary according to the type of equipment in use and the voltage of the power lines. This is unnecessarily complicated and could cause confusion and accidents.

With respect to the hazards of overhead power lines, OSHA feels that its proposal provides greater safety than the national consensus standard. In view of the fact that 47 of the 111 electrocutions studied were due to the use of equipment or material too close to exposed energized overhead lines, OSHA believes that requirements to prevent such electrocutions are of the highest priority and should provide as much safety as possible. For these reasons, and in order to promote consistency within the OSHA standards, the proposal contains a basic 10-foot (305-cm) clearance rule, with certain exceptions. If information is forthcoming demonstrating ways in which specific operations can be performed safely with clearances less than 10 feet, OSHA will consider changing the rule to provide for such situations.

Paragraph (c)(4) of proposed § 1910.333 addresses the hazards associated with working near exposed live parts where visibility would be impaired. Adequate illumination would be required by proposed paragraph (c)(4)(i) to ensure that employees could see well enough to avoid contacting exposed live parts. Specific guidance is not provided in the proposal, but OSHA requests comments and supporting data with respect to levels of illumination that are necessary for safety.

Paragraph (c)(4)(ii) prohibits the act of blind reaching into areas containing exposed live parts. Obviously, if the live parts cannot be seen, it would be difficult to avoid contact with them. Therefore, the standard proposes that employees not be allowed to work in areas which contain exposed live parts that cannot be seen because of obstructions or poor lighting.

Some installations of electric equipment provide little working space for maintenance employees. Such cramped conditions can lead to employees' backing or moving into exposed live parts. To prevent this from occurring, proposed paragraph (c)(5) would require precautions to be taken to assure that accidental contact with the parts does not occur. For example, protective blankets could be used to shield some of the live parts, or portions of the electrical installation could be deenergized. Also, doors or panels that could knock into employees and cause them to contact exposed energized parts would have to be restrained.

Handling metal ladders and other conductive materials in the vicinity of overhead lines is a leading cause of occupational electrocutions. (See category (i)(c) in Table 2 of this preamble.) Proposed paragraphs (c)(6) and (c)(7) address the hazards associated with such material handling operations. To protect employees handling conductive tools or materials near exposed live parts, paragraph (c)(6) proposes that the conductive materials or equipment be handled in a manner that will prevent their contacting the energized parts. Because moving such long metal objects as pipes and ducts can be particularly hazardous in areas containing exposed energized conductors or circuit parts, the proposal would also require the employer to institute work practices that minimize the hazards associated with handling these objects. For example, the employer could require employees to handle metal irrigation pipes so that the pipes are always in a horizontal plane. This practice would prevent the material from contacting overhead power lines.

Metal ladders can also provide a path to ground for workers who directly contact live parts. In paragraph (c)(7), OSHA has proposed to prohibit the use of metal ladders by employees who would be working where they might contact exposed energized circuit parts. This should protect these workers from electric shock. In view of the accidents occurring when metal ladders contact overhead lines, the Agency is requesting comments on whether metal ladders should also be prohibited from being

used where they might contact energized overhead electric power lines.

Proposed §1910.333(c)(8) would not allow employees to wear conductive objects, such as metallic jewelry, in a manner presenting an electrical contact hazard. Typical accident descriptions indicate that these metal objects short circuit live parts; and, as current flows through the objects, the employees wearing them are severely burned. Protective methods include wrapping the conductive apparel with nonconductive tape, use of rubber gloves, use of insulation on the live part, as well as removal of the conductive item. OSHA understands that compliance may present difficulties as many employees may not want to remove or cover certain articles of jewelry. However, given the severity of the possible consequences (e.g., loss of a finger, arm burns, or injury to adjacent coworkers), OSHA believes that some means of protecting the employee, as well as others nearby, must be provided.

Proposed paragraph (c)(9) addresses the hazards related to housekeeping duties (such as electric equipment cleaning or vegetation spraying, clipping, or trimming) performed near exposed energized circuit parts. The proposal would require the employer to adopt safeguards that prevent employees performing such duties from contacting energized parts, either directly or through conductive cleaning aids. Examples of protective measures include the use of protective insulating equipment or the provision of guards to prevent contact.

(4) §1910.334. Requirements of this section address the hazards of using electric equipment. Although the hazards common to the installation of electric equipment are covered in the existing Subpart S regulations, the accidents in OSHA's survey show that equipment is used improperly or is damaged in use. Such misuse and abuse of equipment creates hazards which the existing installation standards address only indirectly. The proposed requirements would cover these hazards more directly.

Paragraph (a) of §1910.334 proposes requirements on the use of cord- and plug-connected equipment, including extension cords, and addresses common hazards associated with their use. The proposal would require portable equipment to be handled in a manner which will not cause damage and would require visual inspection of cords, plugs, and receptacles. Additionally, paragraph (a)(2)(ii) would prohibit the use of the defective equipment. These requirements would protect employees

from electric shocks caused by damaged equipment. Such defects as missing grounding prongs on attachment plugs and poor insulation on conductors have caused injuries to employees.

To prevent the connection of mismatched or misaligned plugs and receptacles, these devices would have to be checked to ensure that they are of compatible configurations and alignment. If this is not done, an employee might force a plug of one rating into a receptacle of a different rating, leading to a lack of proper overcurrent protection or, even worse, to the application of a higher than intended voltage on connected equipment.

In paragraph (a)(3), rules ensuring the continuity of grounding conductors for cord- and plug-connected equipment are also proposed. For example, clipping the grounding prong from a plug would be prohibited. Paragraph (a)(4) would require portable electric equipment used in highly conductive locations (e.g., those inundated with water) to be approved for the use; paragraph (a)(5) would impose regulations on the connection of attachment plugs. The requirements proposed in §1910.334(a) should ensure that cord- and plug-connected equipment continues to meet the installation requirements currently contained in Subpart S and is used in its intended manner.

Proposed §1910.334(b) deals with electric circuits. To protect the operator from failure of a disconnect, the proposal would require devices used for opening circuits under load to be designed for the purpose. Circuits deenergized by the operation of a protective device (such as a fuse or circuit breaker) would have to be checked to ensure that they could be safely reenergized. Without such a check, it is possible for an employee to be injured in case of failure of the protective device and damage to the protected circuit. Lastly, this paragraph would prohibit changing (for maintenance or other purposes) overcurrent protective devices in any manner which would violate §1910.304(e), the installation safety requirement for overcurrent protection. This provision will prevent the use of a fuse or circuit breaker with a rating too high to protect the equipment or conductors involved. This provision is also intended to prevent the temporary bypassing of protective devices, which could lead to shock and fire hazards.

Paragraph (c) of proposed §1910.334 sets forth requirements on the use, rating, and inspection of electrical test instruments and equipment. Because the use of test instruments can expose

employees to live parts of electric circuits, paragraph (c)(1) would require testing work on electric circuits or equipment to be performed by qualified persons.

To prevent injuries to employees resulting from exposed conductors or other defects in the test equipment, paragraph (c)(2) would require the visual inspection of such equipment before use. Of course, employees would not be permitted to use this equipment until it has been repaired.

Using test equipment on circuits with voltages or currents higher than the rating of the equipment or in improper environments can cause the equipment's failure. Since employees can be injured as a result of this failure, paragraph (c)(3) would require test equipment to be used within its rating and to be suitable for the environment in which they are to be used.

Paragraph (d) of § 1910.334 would require suitable protective measures to be taken to protect against the hazards of using flammable and ignitable materials occasionally in ordinary locations (those which are not covered by existing § 1910.307). While storage, manufacture, and other on-going presence of flammables are covered under the installation requirements for hazardous locations contained in Subpart S, temporary uses are not covered. The proposal would prohibit energizing electric equipment which might ignite the flammable or ignitable materials, unless suitable protective measures are taken. Protective measures could include ventilation and clearing accumulations of combustible dusts, as appropriate.

(5) § 1910.335. The requirements of this section address accidents involving the failure to use protective equipment. Paragraph (a) of proposed § 1910.335 addresses the proper use of protective equipment. Requirements would include those on inspection, protection, and situations demanding the use of personal protective equipment. These proposed regulations are intended to ensure that the equipment will actually provide insulation of and safety to the employee.

OSHA's existing regulations⁴ on the design of insulating protective equipment are contained in Subpart I of 29 CFR Part 1910, which references various American National Standards Institute (ANSI) standards.

Rubber protective equipment for electrical workers shall conform to the

requirements established in the American National Standards Institute Standards as specified in the following list:

Item	Standard
Rubber insulating gloves	J6.6—1967
Rubber matting for use around electric apparatus	J6.7—1935 (R 1962)
Rubber insulating blankets	J6.4—1970
Rubber insulating hoods	J6.2—1950 (R 1962)
Rubber insulating line hose	J6.1—1950 (R 1962)
Rubber insulating sleeves	J6.5—1962

NFPA 70E refers to more recent (but not the most recent) editions⁵ of the same ANSI standards. However, in this rulemaking effort, OSHA is not proposing to make changes to Subpart I. OSHA has decided that it would be more appropriate to revise its regulations on the construction of insulating protective equipment as a part of another rulemaking effort. The revision of § 1910.137 is currently under development.

Since most new protective equipment meets the more recent ANSI standards, this action seems to make OSHA's standards appear to be inconsistent with current industry practices. However, as set forth in OSHA Instruction No. CPL 2.45A, under circumstances in which an OSHA standard incorporates an earlier edition of a national consensus standard that has since been revised by the standards writing organization, OSHA policy is generally not to cite employers who use equipment made in accordance with later editions of those standards.

Paragraph (a) of § 1910.335 also addresses the use of other types of protective equipment not specifically covered in Subpart I, such as fuse handling devices, nonconductive rope, and protective shields and barriers.

Paragraph (b) applies to alerting techniques. To inform employees about electrical hazards to which they are exposed, safety signs and symbols would be required. (Requirements for safety signs, symbols, and tags are

contained in existing § 1910.145. The proposed requirement for safety signs, symbols, and tags does not increase the burden imposed by this existing standard.) This paragraph would also require the use of barricades to limit access to areas containing exposed, energized electric parts. If signs and barricades alone will not adequately protect employees, other means, such as an attendant, must be used to provide the necessary protection.

(6) § 1910.399. OSHA is proposing to apply the definitions in existing § 1910.399 to the entire Subpart S and to remove the paragraph designations from the section. Also, the proposed standard would add a definition for the term "may".

An explanation of the use of the word "may" would also be added to the definitions. To conform to correct grammar and to existing usage in Subpart S, the words "may" and "shall" have been used as follows:

A. If a discretionary right, privilege, or power is conferred, the word "may" has been used. (For example: the employer may restrict access to equipment; i.e., it is permissible for the employer to do this.) Such rules are permissive in nature and are usually used as exceptions to requirements.

B. If a right, privilege, or power is abridged, or if an obligation to abstain from acting is imposed, the word "may" has been used with a restrictive "no," "not," or "only." (For example: (1) No unqualified person may enter restricted areas; (2) unqualified persons may not enter restricted areas; or (3) only qualified persons may enter restricted areas. For all three cases, persons who are not qualified are prohibited from restricted areas.) These requirements are mandatory.

C. If an obligation to act is imposed, the word "shall" has been used. (For example: employers shall restrict access to areas containing live parts. This rule is mandatory upon the employer to act.)

The use of these terms in the proposal is consistent with their use in the existing Subpart S.

(7) Miscellaneous. Various general industry standards have continued to reference the 1971 NEC, even though the latest revision of Subpart S makes such references unnecessary. Therefore, a number of miscellaneous amendments have also been proposed to substitute references to Subpart S for the current references to the NEC (§§ 1910.68(b)(4) and (c)(5)(iv)(c), 1910.94(a)(2)(iii), 1910.103(b)(3)(iii)(e), 1910.110 Table H-28, and 1910.178(c)(2)). Other changes

⁴ Blankets—ANSI/ASTM D1048—1977, Specifications for Rubber Insulating Blankets, Hoods—ANSI/ASTM D1049—1977, Specifications for Rubber Insulating Covers, Line Hoses—ANSI/ASTM D1050—1977, Specifications for Rubber Insulating Line Hoses, Sleeves—ANSI/ASTM D1051—1977, Specifications for Rubber Insulating Sleeves, Gloves—ANSI/ASTM D120—1977, Specifications for Rubber Insulating Gloves, Mats—ANSI/ASTM D178—1977, Specifications for Rubber Insulating Matting, ANSI—American National Standards Institute, ASTM—American Society for Testing and Materials.

⁵ § 1910.137 Electrical protective devices.

have been proposed to consolidate electrical safety-related work practices in Subpart S and, where possible, eliminate them from other subparts of Part 1910 (§§ 1910.26(c)(3)(viii), 1910.67(b)(4), 1910.180(j), 1910.181(j)(5), 1910.265(c)(12), and 1910.266(c)(xxii). In five other places in Part 1910 (§§ 1910.106(h)(7)(iii)(a), 1910.179(g)(1)(i), 1910.252(a)(6)(iv)(c)(2), and 1910.261(g)(1)(iv) and (k)(16)), the regulations contain inaccurate references to the electrical standards. OSHA has proposed to revise these provisions so that they refer to Subpart S.

One other proposed revision would remove existing paragraph (b)(1) from § 1910.304. Since this provision relates only to construction work, its inclusion in the General Industry Standard is unnecessary. The same requirement is appropriately contained in § 1926.404(b)(1) of Subpart K of Part 1926, the Construction Safety and Health Standards.

IV. Regulatory Impact Assessment

The Preliminary Regulatory Impact and Flexibility Analysis for the proposed standard on electrical safety-related work practices for general industry was prepared in accordance with the requirements of Executive Order 12291 and the Regulatory Flexibility Act of 1980 (5 U.S.C. 601 et seq.). Since the proposed standard is not likely: (1) To have an annual effect on the economy of \$100 million; (2) to result in a major increase in costs or prices for consumers, industries, government agencies or geographic regions; or (3) to have significant adverse effects on competition, employment, investment,

productivity, innovation, or the ability of United States-based enterprises to compete with foreign-based enterprises, the proposal does not constitute a major rule under the cost criteria of Executive Order 12291. However, because of the wide ranging impact of the proposal, OSHA is treating this standard as if it were a major rule.

A. Affected Industries

The standard would apply in some respect to every major SIC economic division with the exception of agriculture, construction, and public administration. In 1984, these affected industries accounted for about 4.5 million firms and a total of 69 million employees.

B. Benefits

The analysis of the benefits of the proposed standard covered the four years from 1984 through 1987 and was performed relative to a baseline reflective of the levels of electrical safety training and electrical safety-related work practices currently found in general industry. OSHA estimates that under current practices, 243 deaths and 7,721 injuries will occur in 1987.

To estimate the potential benefits of the proposed standard or its probable effectiveness in preventing electrical contact injuries (e.g., shock, electrocution), an analysis of differential risk was first performed. The analysis revealed that, in 1987, an estimated 1753 nonfatal and 101 fatal injuries could be avoided if the standard were implemented. The injuries which could be avoided during the first through fourth years are as follows:

Year	No. of nonfatal/fatal injuries avoided
1984.....	1,660/96
1985.....	1,691/97
1986.....	1,721/99
1987.....	1,753/101

C. Technical Feasibility and Costs

OSHA has determined that the proposal would be technologically feasible, as all of the provisions can be met by using currently available equipment, facilities, tests, inspections and work practices.

Current practices are used for the cost analysis baseline. In estimating the industrywide costs of complying with the proposed standard, it was assumed that workplaces would incur costs relating to:

- Providing appropriate training to employees, and
- Meeting the requirement of the lockout and tagging provision.

The annual cost of the proposed standard is estimated at \$90.8 million (in 1985 dollars).

The allocation of training costs for OSHA's proposed electrical safety work practices standard is based on the categorization of occupations according to the actual or potential risk of injury associated with working on or near exposed live electrical circuitry. Occupations were grouped into high, elevated, and low risk categories based on the level of worker exposure to electrical hazards and the incidence rate of electrical injuries per occupation (see Table 4).

TABLE 4.—OCCUPATIONS REQUIRING TRAINING

Category	Annual electrical injury incidence rate ¹	Occupation	Population to be trained ²
High Risk—1 hour Training.....	.933	Electrical Assemblers.....	337,506
	.933	Electrical Machinery Assemblers.....	114,406
	.821	Powerline Troubleshooters.....	166
	.821	Electricians.....	187,118
	.821	Line Installers/Cable Splicers.....	552
	.426	Stationary Engr. & Station Oper.....	43,861
	.101	AirCond/Heating/Refrig Mechanic.....	254,227
	.101	Electrical Instrument Repairers.....	8,442
	.101	Electric Motor Repairers.....	24,883
	.101	Industrial Machine Repairers.....	308,857
	.101	Instrument Repairers.....	36,391
	.101	Maintenance Repairers.....	658,039
	.050	Computer Service Technicians.....	69,419
	.050	Electronic Wires.....	44,437
	.050	Radio/TV Service Technicians.....	51,516
	.050	Electronic Technician.....	376,900

TABLE 4.—OCCUPATIONS REQUIRING TRAINING—Continued

Category	Annual electrical injury incidence rate ¹	Occupation	Population to be trained ²
Elevated Risk—½ hour Training	.101	Appliance Installers	75,036
	.101	Office Machine Repairers	68,205
	.046	Blue Collar Supervisors	1,067,645
	.046	Petroleum Derrick Operators	19,708
	.046	Crane/Derrick/Hoist Operators	82,641
Low Risk—¼ hour Training	.101	Welders and Flame Cutters	433,721
	.101	Knitting Machine Repairers	8,713
	.101	Loom Fixers	14,604
	.053	Roustabouts	123,328
	.053	Truck Drivers	54,464
	.046	Riggers	17,459
	.010	Electrical Engineers	299,701
Total			4,781,945

¹ Final Report, Regulatory Assessment of the Impact of the Proposed Electrical Safety-Related Work Practices Standard, JACA Corporation, Fort Washington, PA, January 1984, Contract #J-9-F-2-0068, p. 4-10.

² U.S. Department of Labor, Bureau of Labor Statistics, *National OES Survey-Based Matrix, Industry-Occupation Employment, 1983 and projected 1995 Alternatives* (Washington, DC, U.S. GPO, 1983).

Populations to be trained were taken from the BLS *National OES Survey-Based Matrix, Industry-Occupation Employment, 1983 and Projected 1995 Alternatives*. Incidence rates for all occupations affected by the standard were determined by the following formula:

$$\left(\frac{\text{Number of SDS Claims}}{\text{Employment population}} \right) \times 1000$$

Dept. of Labor Fatality/Catastrophe and Underwriters Laboratories (UL) electrical injury reports were also utilized to determine, qualitatively, occupations with high electrical hazard exposures. For example, of 208 serious electrical injury and death reports, Electricians accounted for 47 and Powerline Troubleshooters accounted for 38; these occupations were identified as high risk. Line Installers/Cable Splicers accounted for 18 injuries and deaths and Crane Operators accounted for 26; these were placed in the elevated risk category. In the low risk category, Welders and Flame Cutters accounted for 12 injuries and deaths, and Truck Drivers accounted for 15. The UL and Fatality/Catastrophe data sets were generally consistent with the SDS-generated injury incidence rates; occupations with a high incidence rate of electrical injury accounted for a relatively large proportion of the Fatality/Catastrophe and UL reports, and occupations with a low SDS incidence rate generally account for few injuries.

The high risk category includes occupations which require routine work on or near live parts of electric equipment. Injury incidence rates for

these occupations ranged between 0.933 (Electrical Assemblers and Electrical Machinery Assemblers) and 0.426 (Power Station Operators and Stationary Engineers). However, some occupations in the high risk category had lower incidence rates ranging from 0.050 (Electrical Technicians and Electronic Wirers) to 0.101 (Electric Motor Repairers, Electrical Instrument Repairers, etc.). Although these occupational groups had relatively low injury incidence rates, they were placed in the high risk category because of their high exposure to electrical hazards.

The elevated risk category includes occupations in which work on or near live parts is not routine but frequent work on live circuitry is expected. This category includes such occupations as Appliance Installers/Repairers and Crane/Derrick/Hoist Operators, with incidence rates of 0.101 and 0.046, respectively.

The low risk occupations do some work on live circuitry but accidental contact is minimal compared with the other occupations. This category includes Welders/Flame Cutters, Knitting Machine Repairers, Loom Fixers, Roustabouts, Truck Drivers, Riggers, and Electrical Engineers. Incidence rates range from 0.101 for Welders to 0.010 for Electrical Engineers.

Based on this categorization scheme, one hour of annual training would be needed for the 2,516,720 employees in the high risk category, one-half hour of training for the 1,313,235 employees in elevated risk jobs, and one-quarter of an

hour of training for the 951,990 employees at low risk (Table 4).

The proposed standard may require the training of additional employees who face a risk of injury due to electric shock or other electrical hazards. These employees may be found in occupations other than those listed in the PRIA. The Agency requests information on any individuals or occupational groups which may not have been included in the PRIA. Any comments received will be reviewed and evaluated for incorporation into the final rule and into the Regulatory Impact Assessment that will accompany the final rule.

OSHA did not calculate the cost of procuring electrical protective equipment for compliance with the proposal. Employers are already required to have adequate supplies of rubber insulating equipment by § 1910.132. Therefore, OSHA has concluded that the proposal would not result in a significant purchase of additional protective equipment. The Agency requests information concerning this conclusion, and any comments received will be reviewed and evaluated for incorporation into the final rule and into the Regulatory Impact Assessment that will accompany the final rule. Specifically, OSHA is requesting commenters to answer the following questions:

(1) Do employers possess adequate supplies of the personal and other protective equipment required to comply with the proposed standard?

(2) If not, what items are lacking and at what cost could the requirements be met?

D. Economic Feasibility and Impacts

OSHA has also determined that the proposal would be economically feasible. The potential impacts of compliance on individual firms were evaluated by using financial models of firms in two industries. Industries selected represented a range of diversity with respect to the degree of electrical hazard present and the amount of effort required to comply with the proposed standard. The first-year model firm costs ranged from \$52 to \$124 for small firms, and from \$1,210 to \$2,945 for large firms. The analysis revealed that even if the entire cost of compliance were passed forward, the impact would be extremely small. With respect to the standard's potential impact on the profitability of firms, the analysis showed that even if the compliance costs were fully absorbed, profitability as measured by return on assets and profit margin would not be significantly reduced. None of the reductions would exceed 1.0 percent.

E. Regulatory Flexibility Certification

Pursuant to the Regulatory Flexibility Act of 1980 (5 U.S.C. 601 et seq.), OSHA has assessed the impact of the proposed standard and certifies that it would not have a significant impact on a substantial number of small entities. The majority of the firms subject to the proposed standard are small. Using a definition of a small firm as one that employs fewer than 20 workers, nearly 86 percent of the covered firms fall into the "small" category. The estimated cost of compliance with the proposed standard, however, would result in less than 1.0 percent decrease in profitability. OSHA has determined that, although many small firms would be affected by the proposal, the costs would be easily absorbed and there would be no significant or disproportionate impact on small entities.

F. Preliminary Regulatory Impact Analysis

The preceding discussion summarizes the key findings of the Preliminary Regulatory Impact Analysis (PRIA) of the proposed amendment to Subpart S, Part 1910, prepared by the Office of Regulatory Analysis of the Occupational Safety and Health Administration. The PRIA includes assessments of estimated compliance costs, estimated benefits, risks, small business impact, alternative regulatory and nonregulatory options and a profile of the industry. The PRIA is based on contract work performed for OSHA by JACA Corp. Their report, "Regulatory Assessment of the Impact of the Proposed Electrical Safety-

Related Work Practices Standard. Final Report", January 20, 1984, and OSHA's Preliminary Regulatory Impact Analysis are available to the public in Docket S-016. The public is invited to comment on these documents. All comments and other information supplied will be carefully reviewed and evaluated for incorporation into the Regulatory Impact Assessment that will accompany the final rule.

With respect to the PRIA, OSHA is requesting public comment on the following specific issues:

(1) OSHA has estimated that this proposed standard would prevent 85 percent of injuries and fatalities which are "potentially preventable." (See PRIA) "Potentially preventable" means that the causes of the accidents are addressed in this proposed standard. The 85 percent effectiveness rate assumes that, if all covered employers complied with the standard, 15 percent of "potentially preventable" accidents would still occur because of (human error). The 85 percent effectiveness rate depends, in this proposed standard, largely on the assumed effectiveness of employee training in preventing accidents. OSHA requests public comment on whether the 85 percent effectiveness rate is appropriate. If not, what would be the appropriate rate? How effective will the required training be in preventing accidents?

(2) In the PRIA, OSHA assumed 2 minutes of lost productive time for each instance of lockout. (See PRIA) OSHA requests public comment on whether this amount of lost time is appropriate. If not, what is the appropriate amount of time that would be lost?

V. Recordkeeping

This proposal references the requirements for safety signs and tags contained in existing § 1910.145. The paperwork requirements of § 1910.145 have been approved by the Office of Management and Budget under the Paperwork Reduction Act of 1980 and have been assigned OMB control number 1218-0132. Comments on these requirements as referenced in the proposed standard should be sent to: Desk Officer for OSHA, Room 3208, OMB, 726 Jackson Place NW., Washington, DC 20503.

VI. Public Participation

Interested persons are invited to submit written comments on the proposed standard and to file objections and request a public hearing.

Written data, views and arguments concerning the proposal must be postmarked on or before February 29, 1988, and submitted in quadruplicate to

the Docket Office, Docket No. S-016, Rm. N-3670; U.S. Department of Labor, 200 Constitution Avenue NW., Washington, DC 20210. Written submissions must clearly identify the provisions of the proposal which are addressed and the position taken with respect to each issue.

The data, views, and arguments that are submitted will be available for public inspection and copying in the Docket Office between the hours of 8:15 am and 4:45 pm. All timely written submissions received will be made a part of the record of this proceeding.

Under section 6(b)(3) of the Occupational Safety and Health Act, interested persons may file formal objections to the proposal, requesting an informal public hearing, in accordance with the following conditions:

1. The objections must include the name and address of the objector.
2. The objections must be postmarked on or before February 29, 1988, and submitted to the Docket Office, Docket S-016, Room N3670, OSHA, U.S. Department of Labor, 200 Constitution Avenue NW., Washington, DC 20210.
3. The objections must specify with particularity the provisions of the proposed rule to which objection is taken and must state the grounds therefor.
4. Each objection must be separately stated and numbered; and
5. The objections must be accompanied by a detailed summary of the evidence proposed to be presented at the requested hearing.

OSHA recognizes that there may be interested persons who, through their knowledge of safety or their experience in the operations involved, would wish to endorse or support certain provisions in the standard. OSHA welcomes such supportive comments, including any pertinent accident data or cost information which may be available, in order that the record of this rulemaking will present a balanced picture of the public response on the issues involved.

VII. State Standards

The 23 States and 2 Territories with their own OSHA-approved occupational safety and health plan must adopt a comparable standard within 6 months of the publication date of a final standard. These are: Alaska, Arizona, California,⁶ Connecticut,⁶ Hawaii, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Nevada, New Mexico, New York,⁶ North Carolina, Oregon, Puerto Rico, South Carolina, Tennessee, Utah,

⁶ Plan covers only State and local government employees.

Vermont, Virginia, Virgin Islands, Washington, Wyoming. Until such time as a State standard is promulgated, Federal OSHA will provide interim enforcement assistance, as appropriate.

VIII. List of Subjects in 29 CFR Part 1910

Electric power, Fire prevention, Flammable materials, Occupational safety and health, Safety, Signs and symbols, Tools.

IX. Authority

This document was prepared under the direction of John A. Pendergrass, Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, 200 Constitution Avenue NW., Washington, DC 20210.

Accordingly, pursuant to sections 4, 6, and 8 of the Occupational Safety and Health Act of 1970 (84 Stat. 1593, 1599, 29 U.S.C. 655, 657), Secretary of Labor's Order No. 9-83 (48 FR 35736), and 29 CFR Part 1911, it is proposed to amend 29 CFR Part 1910 as set forth below.

Signed at Washington, DC this 23rd day of November 1987.

John A. Pendergrass,

Assistant Secretary of Labor.

Part 1910 of Title 29 of the Code of Federal Regulations would be amended as follows:

PART 1910—[AMENDED]

Subpart D—[Amended]

1. The authority citation for Subpart D of Part 1910 would continue to read as follows:

Authority: Secs. 4, 6, 8, Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order No. 12-71 (36 FR 8754), 8-76 (41 FR 25059), or 9-83 (48 FR 35736), as applicable. Sections 1910.23, 1910.24, 1910.25, 1910.26, and 1910.28 also issued under 29 CFR Part 1911.

§ 1910.26 [Amended]

2. Paragraph (c)(3)(viii) of § 1910.26 would be removed.

Subpart F—[Amended]

3. The authority citation for Subpart F of Part 1910 would continue to read as follows:

Authority: Secs. 4, 6, 8, Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order No. 12-71 (36 FR 8754), 8-76 (41 FR 25059), or 9-83 (48 FR 35736), as applicable.

Sections 1910.66, 1910.67, 1910.68, and 1910.70 also issued under 29 CFR Part 1911.

4. Paragraph (b)(4) of § 1910.67 would be revised to read as follows:

§ 1910.67 Vehicle-mounted elevating and rotating work platforms.

(b) * * *

(4) For operations near overhead electric lines, see § 1910.333(c)(3).

5. Paragraphs (b)(4) and (c)(5)(iv)(c) of § 1910.68 would be revised to read as follows:

§ 1910.68 Manlifts.

(b) * * *

(4) Reference to other codes and subparts. The following codes, and subparts of this part, are applicable to this section. Safety Code for Mechanical Power Transmission Apparatus ANSI B15.1-1953 (R 1958) and Subpart O; Subpart S; Safety Code for Fixed Ladders, ANSI A14.3-1956 and Safety Requirements for Floor and Wall Openings, Railings and Toeboards, ANSI A12.1-1967 and Subpart D.

(c) * * *

(5) * * *

(iv) * * *

(c) Where flammable vapors or combustible dusts may be present, electrical installations shall be in accordance with the requirements of Subpart S of this part for such locations.

Subpart G—[Amended]

6. The authority citation for Subpart G of Part 1910 would continue to read as follows:

Authority: Secs. 4, 6, 8, Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order No. 12-71 (36 FR 8754), 8-76 (41 FR 25059), or 9-83 (48 FR 35736), as applicable.

Sections 1910.94 and 1910.99 also issued under 29 CFR Part 1911.

§ 1910.94 [Amended]

7. The words: "the National Electrical Code, NFPA 70-1971; ANSI C1-1971 (Rev. of C1-1968)" would be removed from paragraph (a)(2)(iii) of § 1910.94 and would be replaced with: "Subpart S of this part".

Subpart H—[Amended]

8. The authority citation for Subpart H of Part 1910 would be revised to read as follows:

Authority: Secs. 4, 6, 8, Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order No. 12-71 (36 FR 8754), 8-76 (41 FR 25059), or 9-83 (48 FR 35736), as applicable. Sections 1910.103, 1910.106, 1910.107, 1910.108, 1910.109, and 1910.110 also issued under 29 CFR Part 1911.

9. Paragraph (b)(3)(iii)(e) of § 1910.103 would be revised to read as follows:

§ 1910.103 Hydrogen.

(b) * * *

(3) * * *

(iii) * * *

(e) Electric equipment shall be in accordance with the requirements of Subpart S of this part for Class I, Division 2 locations.

10. Section 1910.106 would be amended to remove the acronym "NEC" from the boxheads in Tables H-18 and H-19, and paragraph (h)(7)(iii)(a) would be revised to read as follows:

§ 1910.106 Flammable and combustible liquids.

(h) * * *

(7) * * *

(iii) *Electrical.* (a) All electric wiring and equipment shall be installed in accordance with Subpart S of this part.

§ 1910.110 [Amended]

11. The words "National Electrical Code" would be removed from the boxhead in Table H-28 in § 1910.110.

Subpart N—[Amended]

12. The authority citation for Subpart N of Part 1910 would continue to read as follows:

Authority: Secs. 4, 6, 8, Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order No. 12-71 (36 FR 8754), 8-76 (41 FR 25059), or 9-83 (48 FR 35736), as applicable.

Sections 1910.177, 1910.178, 1910.179, 1910.183, 1910.184, 1910.189, and 1910.190 also issued under 29 CFR Part 1911.

13. Paragraph (c)(2) of § 1910.178 would be revised to read as follows:

§ 1910.178 Powered industrial trucks.

(c) * * *

(2) For specific areas of use, see Table N-1 which tabulates the information contained in this section. References are to the corresponding classification as used in Subpart S of this part.

14. Paragraph (g)(1)(i) of § 1910.179 would be revised to read as follows:

§ 1910.179 Overhead and gantry cranes.

(g) *Electric equipment*—(1) *General.* (i) Wiring and equipment shall comply with Subpart S of this part.

15. Paragraph (j) of § 1910.180 would be revised to read as follows:

§ 1910.180 Crawler, locomotive, and truck cranes.

(j) *Operations near overhead lines.* For operations near overhead electric lines, see § 1910.333(c)(3).

16. Entire paragraph (j)(5) of § 1910.181 would be revised to read as follows:

§ 1910.181 **Derricks.**

(j) * * *
(5) *Operations near overhead lines.* For operations near overhead electric lines, see § 1910.333(c)(3).

Subpart Q—[Amended]

17. The authority citation for Subpart Q of Part 1910 would be revised to read as follows:

Authority: Secs. 4, 6, 8, Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order No. 12-71 (36 FR 8754), 8-76 (41 FR 25059), or 9-83 (48 FR 35736), as applicable.

Section 1910.252 also issued under 29 CFR Part 1911.

18. Paragraph (a)(6)(iv)(d)(2) of § 1910.252 would be revised to read as follows:

§ 1910.252 **Welding, cutting, and brazing.**

(a) * * *
(6) * * *
(iv) * * *
(d) * * *

(2) Wiring and electric electric equipment in compressor or booster pump rooms or enclosures shall conform to the provisions of Subpart S of this Part for Class I, Division 2 locations.

Subpart R—[Amended]

19. The authority citation for Subpart R of Part 1910 would be revised to read as follows:

Authority: Secs. 4, 6, 8, Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order No. 12-71 (36 FR 8754), 8-76 (41 FR 25059), or 9-83 (48 FR 35736), as applicable.

Sections 1910.261, 1910.262, 1910.265, 1910.266, 1910.267, 1910.268, 1910.274, and 1910.275 also issued under 29 CFR Part 1911.

20. Paragraphs (g)(1)(iv) and (k)(16) of § 1910.261 would be revised to read as follows:

§ 1910.261 **Pulp, paper, and paperboard mills.**

(g) * * *
(1) * * *

(iv) Electric equipment shall be of the explosion-proof type, in accordance with the requirements of Subpart S of this part.

(k) * * *

(16) *Grounding.* All calender stacks and spreader bars shall be grounded as protection against shock induced by static electricity in accordance with Subpart S of this part.

§ 1910.265 **[Amended]**

21. Paragraph (c)(12) of § 1910.265 would be removed.

§ 1910.266 **[Amended]**

22. Paragraph (c)(6)(xxii) of § 1910.266 would be removed.

Subpart S—[Amended]

23. The authority citation for Subpart S of Part 1910 would be revised to read as follows:

Authority: Secs. 4, 6, 8, Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order No. 8-76 (41 FR 25059) or 9-83 (48 FR 35736), as applicable; 29 CFR Part 1911.

§ 1910.304 **[Amended]**

24. Entire paragraph (b)(1) of § 1910.304 would be removed.

25. Sections 1910.331 through 1910.335 would be added to Subpart S to read as follows:

Safety-Related Work Practices

§ 1910.331 **Scope.**

(a) *Covered work by both qualified and unqualified persons.* The provisions of §§ 1910.331 through 1910.335 cover electrical safety-related work practices for both qualified and unqualified persons working on, near, or with the following installations:

(1) *Premises wiring.* Installations of electric conductors and equipment within or on buildings or other structures, and on other premises such as yards, carnival, parking, and other lots, and industrial substations;

(2) *Wiring for connection to supply.* Installations of conductors that connect to the supply of electricity; and

(3) *Other wiring.* Installations of other outside conductors on the premises.

(4) *Optical fiber cable.* Installations of optical fiber cable where such installations are made along with electric conductors.

(b) *Other covered work by unqualified persons.* The provisions of §§ 1910.331 through 1910.335 also cover work performed by unqualified persons, on, near, or with the installations listed in paragraphs (c)(1) through (c)(4) of this section.

(c) *Excluded work by qualified persons.* The provisions of §§ 1910.331 through 1910.335 do not apply to work performed by qualified persons on or directly associated with the following installations:

(1) *Generation, transmission, and distribution installations.* Installations for the generation, control, transformation, transmission, and distribution of electric energy (including communication and metering) located in buildings used for such purposes or located outdoors.

Note.—Work associated with installations of utilization equipment used for other purposes (such as installations which are in office buildings, warehouses, garages, machine shops, recreational buildings, or other utilization systems and which are not an integral part of a generating plant, substation, or control center) is covered under paragraph (a) (1) of this section.

(2) *Communications installations.* Installations of communication equipment to the extent that the work is covered under § 1910.268.

(3) *Installations in vehicles.* Installations in ships, watercraft, railway rolling stock, aircraft, or automotive vehicles other than mobile homes and recreational vehicles.

(4) *Railway installations.* Installations of railways for generation, transformation, transmission, or distribution of power used exclusively for operation of rolling stock or installations of railways used exclusively for signaling and communication purposes.

§ 1910.332 **Training.**

(a) *Scope.* The training requirements contained in this section apply to employees in occupations listed in Table S-4. The training requirements in this section also apply to other employees who may reasonably be expected to face a risk of injury due to electric shock or other electrical hazards greater than or equal to the risk faced by employees in occupations listed in Table S-4.

(b) *Content of training.*—(1) *Practices addressed in this standard.* Employees shall be trained in and familiar with the safety-related work practices required by §§ 1910.331 through 1910.335 that pertain to their respective job assignments.

(2) *Additional requirements for unqualified persons.* Employees who are covered by paragraph (a) of this section but who are not qualified persons shall also be trained in and familiar with any electrically related safety practices not specifically addressed by §§ 1910.331 through 1910.335 but which are necessary for their safety.

(3) *Additional requirements for qualified persons.* Qualified persons, i.e., those permitted to work on or near exposed energized parts, shall at a minimum be trained in and familiar with:

(i) The skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment.

(ii) The skills and techniques necessary to determine the nominal voltage of exposed live parts, and

(iii) The clearance distances specified in § 1910.333(c) and the corresponding voltages to which the qualified person will be exposed.

Note 1: For the purposes of §§ 1910.331 through 1910.335, a person must have this training in order to be considered a qualified person.

Note 2: Qualified persons who work on energized equipment involving either direct contact or contact by means of tools or materials must also have the training needed to meet § 1910.333(c)(2).

(c) *Type of training.* The training required by this section shall be of the classroom or on-the-job type. The degree of training provided shall be determined by the risk to the employee.

TABLE S-4.—TYPICAL OCCUPATIONAL CATEGORIES OF EMPLOYEES FACING A HIGHER THAN NORMAL RISK OF ELECTRICAL ACCIDENTS

Occupation
Electricians.
Mechanics and repairers.
Electrical and electronic technicians.
Electrical and electronic equipment assemblers.
Stationary engineers.
Material handling equipment operators.
Electrical and electronic engineers.
Blue collar supervisors.
Welders.
Riggers and roustabouts.

§ 1910.333 Selection and use of work practices.

(a) *General.* Safety-related work practices shall be employed to prevent electric shock or other injuries resulting from either direct or indirect electrical contacts, when work is performed near or on equipment or circuits which are or may be energized. The specific safety-related work practices shall be consistent with the nature and extent of the associated electrical hazards.

(1) *Deenergized parts.* Live parts to which an employee may be exposed shall be deenergized before the employee works on or near them, unless the employer can demonstrate that deenergizing introduces additional or increased hazards or is infeasible due to equipment design or operational limitations.

Note 1: Examples of increased or additional hazards include interruption of life support equipment, shutdown of hazardous location ventilation equipment, or removal of illumination for an area.

Note 2: Work on or near deenergized parts is covered by paragraph (b) of this section.

(2) *Energized parts.* If the exposed live parts are not deenergized (i.e., for reasons of increased or additional hazards or infeasibility), then other safety-related work practices shall be used to protect employees who may be exposed to the electrical hazards involved. Such work practices shall protect employees against contact with energized circuit parts directly with any part of their body or indirectly through some other conductive object. The work practices that are used shall be suitable for the conditions under which the work is to be performed and for the voltage level of the exposed electric conductors or circuit parts. Specific work practice requirements are detailed in paragraph (c) of this section.

(b) *Working on or near exposed deenergized parts—(1) Application.* This paragraph applies to work on exposed deenergized parts or near enough to them to expose the employee to any electrical hazard they present. Conductors and parts of electric equipment that have been deenergized but have not been locked out or tagged in accordance with paragraph (b) of this section shall be treated as energized parts, and paragraph (c) of this section applies to work on or near them.

(2) *Lockout and tagging.* While any employee is exposed to contact with parts of fixed electric equipment or circuits which have been deenergized, the circuits energizing the parts shall be locked out or tagged or both in accordance with the requirements of this paragraph. The requirements shall be followed in the order in which they are presented (i.e., paragraph (b) (2) (i) first, then paragraph (b) (2) (ii), etc.).

Note: As used in this section, fixed equipment refers to equipment fastened in place or connected by permanent wiring methods.

(i) *Deenergizing equipment.* (A) Safe procedures for deenergizing circuits and equipment shall be determined before circuits or equipment are deenergized.

(B) The circuits and equipment to be worked on shall be disconnected from all electric energy sources. Control circuit devices, such as push buttons, selector switches, and interlocks, may not be used as the sole means for deenergizing circuits or equipment. Interlocks for electric equipment may not be used as a substitute for lockout and tagging procedures.

(C) Stored electric energy which might endanger personnel shall be released. Capacitors shall be discharged and high capacitance elements shall be short-circuited and grounded, if the stored electric energy might endanger personnel.

Note: If the capacitors or associated equipment are handled in meeting this requirement, they shall be treated as energized.

(ii) *Application of locks and tags.* (A) A lock and a tag shall be placed on each disconnecting means used to deenergize circuits and equipment on which work is to be performed, except as provided in paragraphs (b) (2) (ii) (C) and (b) (2) (ii) (D) of this section. The lock shall be attached so as to prevent persons from operating the disconnecting means unless they resort to undue force or the use of tools.

(B) Each tag shall contain a statement prohibiting unauthorized operation of the disconnecting means and removal of the tag.

(C) If a lock cannot be applied, or if the employer can demonstrate that tagging procedures will provide safety equivalent to that of a lock, a tag may be used without a lock. In such cases, the following additional requirements shall be met:

(1) The tags shall be of a distinctive, employer-standardized design that clearly prohibits unauthorized energizing of the circuits and removal of the tag.

(2) A tag may not be used without an additional safety measure such as the removal of an isolating circuit element, blocking of a controlling switch, or opening of an extra disconnecting device.

(3) All persons who have access to controlling devices shall be trained in and familiar with the employer's tagging procedures.

(D) A lock may be placed without a tag only under the following conditions:

(1) Only one circuit or piece of equipment is deenergized, and

(2) The lockout period does not extend beyond the work shift, and

(3) Affected employees are familiar with this procedure.

(iii) *Verification of deenergized condition.* The requirements of this paragraph shall be met before any circuits or equipment can be considered and worked as deenergized.

(A) A qualified person shall operate the equipment operating controls or otherwise verify that the equipment cannot be restarted.

(B) 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. The test shall also determine if any energized condition exists as a result of inadvertently induced voltage or unrelated voltage backfeed even though specific parts of the circuit have been deenergized and presumed to be safe. If the circuit to be tested is over 600 volts, nominal, the test equipment shall be checked for proper operation immediately before and immediately after this test.

(iv) *Reenergizing equipment.* These requirements shall be met, in the order given, before circuits or equipment are re-energized, even temporarily.

(A) 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.

(B) All affected employees shall be notified to stay clear of circuits and equipment.

(C) Locks and tags shall be removed.

(D) There shall be a visual determination that all employees are clear of the circuits and equipment.

(3) *Interlocks.* Only qualified persons following the requirements of paragraph (c) of this section may defeat electrical interlocks, and then only temporarily while work is being performed on the equipment. The interlock system shall be returned to its operable condition when this work is completed.

(c) *Working on or near exposed energized parts.*—(1) *Application.* This paragraph applies to work performed on exposed live parts (involving either direct contact or contact by means of tools or materials) or near enough to them for employees to be exposed to any hazard they present.

(2) *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. Such persons shall be capable of working safely on energized circuits and shall be familiar with the proper use of special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools.

(3) *Overhead lines.* If work is to be performed near overhead lines, the lines shall be deenergized and grounded, or other protective measures shall be provided before work is started. If the lines are to be deenergized, arrangements shall be made with the person or organization that operates or

controls the electric circuits involved to deenergize and ground them. If protective measures are provided such as guarding, isolating, or insulating, these precautions shall prevent employees from contacting such lines directly with any part of their body or indirectly through conductive materials, tools, or equipment.

(i) *Unqualified persons.* (A) When an unqualified person is working in an elevated position near overhead lines, the location shall be such that the person and the longest conductive object he or she may contact cannot come closer to any unguarded, energized overhead line than the following distances:

(1) For voltages to ground 50kV or below—10 ft. (305 cm);

(2) For voltages to ground over 50kV—10 ft. (305 cm) plus 4 in. (10 cm) for every 10kV over 50kV.

(B) When an unqualified person is working on the ground in the vicinity of overhead lines, the person may not bring any conductive object closer to unguarded, energized overhead lines than the distances given in paragraph (c)(3)(i)(A) of this section.

Note: For voltages normally encountered with overhead power lines, objects which do not have an insulating rating for the voltage involved are considered to be conductive.

(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 S-5 unless:

(A) The person is insulated from the energized part (gloves or gloves with sleeves rated for the voltage involved are considered to be insulation of the person from the energized part on which work is performed), or

(B) The energized part is insulated from any other conductive object at a different potential and from the person, or

(C) The person is insulated from all conductive objects at a potential different from the energized part.

TABLE S-5.—ALTERNATING CURRENT—APPROACH DISTANCES

Voltage range (phase to phase)	Minimum approach distance
300V and less.....	(¹)
Over 300V, not over 750V.	1 ft. 0 in. (30.5 cm).

TABLE S-5.—ALTERNATING CURRENT—APPROACH DISTANCES—Continued

Voltage range (phase to phase)	Minimum approach distance
Over 750V, not over 2kV.	1 ft. 6 in. (46 cm).
Over 2kV, not over 15kV.	2 ft. 0 in. (61 cm).
Over 15kV, not over 37kV.	3 ft. 0 in. (91 cm).
Over 37kV, not over 87.5kV.	3 ft. 6 in. (107 cm).
Over 87.5kV, not over 121kV.	4 ft. 0 in. (122 cm).
Over 121kV, not over 140kV.	4 ft. 6 in. (137 cm).

¹ Avoid contact.

(iii) *Vehicular and mechanical equipment.* (A) Any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines shall be operated so that a clearance of 10 ft. (305 cm) is maintained. If the voltage is higher than 50kV, the clearance shall be increased 4 in. (10 cm) for every 10kV over that voltage. However, under any of the following conditions, the clearance may be reduced:

(1) If the vehicle is in transit with its structure lowered, the clearance may be reduced to 4 ft. (122 cm).

(2) If insulating barriers are installed to prevent contact with the lines, and if the barriers are rated for the voltage of the line being guarded and are not a part of or an attachment to the vehicle or its raised structure, the clearance may be reduced to a distance within the designed working dimensions of the insulating barrier.

(3) If the equipment is 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 S-5.

(B) Employees standing on the ground may not contact the vehicle or mechanical equipment or any of its attachments, unless:

(1) The employee is using protective equipment rated for the voltage; or

(2) The equipment is located so that no part of its structure can come closer to the line than permitted in paragraph (c)(3)(iii) of this section.

(C) If any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines is intentionally grounded, employees working on the ground near the point of grounding may not stand at the grounding location whenever there is a possibility of overhead line contact.

Additional precautions, such as the use of barricades or insulation, shall be taken to protect employees from hazardous ground potentials, depending on earth resistivity and fault currents, which can develop within the first few feet outward from the grounding point.

(4) *Illumination.* (i) Employees may not enter spaces containing exposed energized parts, unless illumination is provided to enable the employees to perform the work safely.

(ii) Where lack of illumination or an obstruction precludes observation of the work to be performed, employees may not perform tasks near exposed energized parts. Employees may not reach blindly into areas which may contain energized parts.

(5) *Confined or enclosed work spaces.* When working in confined or enclosed spaces (such as manholes or vaults) that contain exposed energized parts, employees shall take precautions (such as the use of protective shields, protective barriers, or insulating materials) to avoid inadvertent contact with these parts. Doors, hinged panels and the like shall be secured to prevent their swinging into an employee and causing the employee to contact exposed energized parts.

(6) *Conductive materials and equipment.* Conductive materials and equipment that are in contact with any part of an employee's body shall be handled in a manner that will prevent them from contacting exposed energized conductors or circuit parts. If employees handle long dimensional conductive objects (such as ducts and pipes) in areas with exposed live parts, the employer shall institute work practices which will minimize the hazard.

(7) *Portable ladders.* Portable metal ladders and ladders with longitudinal metallic reinforcement may not be used wherever the employee might contact exposed energized parts.

(8) *Conductive apparel.* Conductive articles of jewelry and clothing (such as watch bands, bracelets, rings, key chains, necklaces, metalized aprons, cloth with conductive thread, or metal headgear) may not be worn if they might contact exposed energized parts. The contact hazard may be eliminated if such articles are rendered nonconductive by covering, wrapping, or other insulating means.

(9) *Housekeeping duties.* Where live parts present an electrical contact hazard, employees may not perform housekeeping duties at such close distances to the parts that there is a possibility of contact, unless adequate safeguards (such as insulating equipment or barriers) are provided. Electrically conductive cleaning

materials (including conductive solids such as steel wool, metalized cloth, and silicon carbide as well as conductive liquid solutions) may not be used in proximity of energized parts unless procedures are followed which will prevent electrical contact.

§ 1910.334 Use of equipment.

(a) *Portable electric equipment.* This paragraph applies to the use of cord- and plug-connected equipment, including flexible cord sets (extension cords).

(1) *Handling.* Portable equipment shall be handled in a manner which will not cause damage. Flexible electric cords connected to equipment may not be used for raising or lowering the equipment. Flexible cords may not be fastened with staples or otherwise hung in such a fashion as to damage the outer jacket or insulation.

(2) *Visual inspection.* (i) Portable cord- and plug-connected equipment and flexible cord sets (extension cords) shall be visually inspected before use on any shift for external defects (such as loose parts, deformed and missing pins, or damage to outer jacket or insulation) and for evidence of possible internal damage (such as pinched or crushed outer jacket). Cord- and plug-connected equipment and flexible cord sets (extension cords) which remain connected once they are put in place and are not exposed to damage need not be visually inspected until they are relocated.

(ii) If there is a defect or evidence of damage that might expose an employee to injury, no employee may use the defective or damaged item until necessary repairs and tests have been made.

(iii) When an attachment plug is to be connected to a receptacle (including any on a cord set), the relationship of the plug and receptacle contacts shall first be checked to ensure that they are of mating configurations.

(3) *Grounding-type equipment.* (i) A flexible cord used with grounding-type equipment shall contain an equipment grounding conductor.

(ii) Attachment plugs and receptacles may not be connected or altered in a manner which would prevent proper continuity of the equipment grounding conductor at the point where plugs are attached to receptacles. Additionally, these devices may not be altered to allow the grounding pole of a plug to be inserted into slots intended for connection to the current-carrying conductors.

(iii) Adapters which interrupt the continuity of the equipment grounding connection may not be used.

(4) *Conductive work locations.*

Portable electric equipment and flexible cords used in highly conductive work locations (such as those inundated with water or other conductive liquids), or in job locations where employees are likely to contact water or conductive liquids, shall be approved for those locations.

(5) *Connecting attachment plugs.* (i) Employees' hands may not be wet when plugging and unplugging flexible cords and cord- and plug-connected equipment.

(ii) Locking-type connectors shall be properly secured after connection.

(b) *Electric power and lighting circuits.*—(1) *Routine opening and closing of circuits.* Load rated switches, circuit breakers, or other devices specifically designed as disconnecting means shall be used for the routine opening, reversing, or closing of circuits under load conditions. Nonloadbreak cable connectors, fuses, terminal lugs, and cable splice connections may not be used for such purposes.

(2) *Reclosing circuits after protective device operation.* After a circuit is deenergized by a circuit protective device, the circuit may not be manually reenergized until it has been determined that the equipment and circuit can be safely energized. The repetitive manual reclosing of circuit breakers or reenergizing circuits through replaced fuses is prohibited.

(3) *Overcurrent protection modification.* Overcurrent protection of circuits and conductors may not be modified, even on a temporary basis, beyond that allowed by § 1910.304(e).

(c) *Test instruments and equipment.*—(1) *Use.* Only qualified persons may perform testing work on electric circuits or equipment.

(2) *Visual inspection.* Test instruments and equipment and all associated test leads, cables, power cords, probes, and connectors shall be visually inspected for external defects and damage before the equipment is used. If there is evidence of defects or damage that might expose an employee to injury, the defective or damaged item shall be removed from service until any necessary repairs and tests have been made.

(3) *Rating of equipment.* Test instruments and equipment and their accessories shall be rated for the circuits and equipment to which they will be connected and shall be designed for the environment in which they will be used.

(d) *Occasional use of flammable or ignitable materials.* When flammable or ignitable materials are occasionally

used, or when work practices may result in hazardous accumulations of suspended or layered combustible dust in locations not classified as hazardous under § 1910.307, electric equipment capable of releasing sufficient electric or thermal energy to ignite these materials or dust accumulations may not be energized unless measures are taken to prevent hazardous conditions from developing.

§ 1910.335 Safeguards for personnel protection.

(a) *Use of protective equipment*—(1) Personal protective equipment. (i) Employees working in areas where there are potential electrical hazards shall be provided with electrical protective equipment that is appropriate for the specific parts of the body to be protected and for the work to be performed.

Note.—Personal protective equipment requirements are contained in Subpart I of this part.

(ii) Protective equipment shall be maintained in a safe, reliable condition and shall be periodically inspected or tested.

(iii) If the insulating capability of protective equipment may be subject to damage during use, the insulating material shall be protected. (For example, an outer covering of leather is sometimes used for the protection of rubber insulating material.)

(iv) Employees shall wear nonconductive head protection wherever there is a danger of head injury from electric shock or burns due to contact with exposed energized parts.

(v) Employees shall wear protective equipment for the eyes or face wherever there is danger of injury to the eyes or

face from electric arcs or flashes or from flying objects resulting from electrical explosion.

(2) *General protective equipment and tools.* (i) When working near exposed energized conductors or circuit parts, employees shall use insulated tools or handling equipment if the tools or handling equipment might make contact with such conductors or parts. If the insulating capability of insulated tools or handling equipment is subject to damage, the insulating material shall be protected.

(A) Fuse handling equipment, insulated for the circuit voltage, shall be used to remove or install fuses when the fuse terminals are energized.

(B) Ropes and handlines used near exposed energized parts shall be nonconductive.

(ii) Protective shields, protective barriers, or insulating materials shall be used to protect employees from shock, burns, or other electrically related injuries while they are working near exposed energized parts which might be accidentally contacted or where dangerous electric heating or arcing might occur. When normally enclosed live parts are exposed for maintenance or repair, they shall be guarded to protect unqualified persons from contact with the live parts.

(b) *Alerting techniques.* The following alerting techniques shall be used to warn and protect employees from hazards which could cause injury due to electric shock, burns, or failure of electric equipment parts:

(1) *Safety signs and tags.* Safety signs, safety symbols, or accident prevention tags shall be used where necessary to warn employees about electrical hazards which may endanger them, as required by § 1910.145.

(2) *Barricades.* Barricades shall be used in conjunction with safety signs where it is necessary to prevent or limit employee access to work areas exposing employees to uninsulated energized conductors or circuit parts. Conductive barricades may not be used where they might cause an electrical contact hazard.

(3) *Attendants.* If signs and barricades do not provide sufficient warning and protection from electrical hazards, an attendant shall be stationed to warn and protect employees.

26. The numbered paragraph designations (1) through (137) would be removed from the definitions in paragraph (a) of § 1910.399.

27. Reserved paragraphs (b), (c), and (d), of § 1910.399 would be removed, and both the paragraph (a) designation and the heading "Definitions applicable to §§ 1910.302 through 1910.330" would be removed from paragraph (a) of § 1910.399.

28. A definition of "may" between the definitions of "location" and "medium voltage cable" in § 1910.399 would be added to read as follows:

§ 1910.399 Definitions applicable to this subpart.

* * * * *

May. If a discretionary right, privilege, or power is conferred, the word "may" is used. If a right, privilege, or power is abridged or if an obligation to abstain from acting is imposed, the word "may" is used with restrictive "no," "not," or "only." (E.g., no employer may * * *; an employer may not * * *; only qualified persons may * * *.)

* * * * *

[FR Doc. 87-27285 Filed 11-27-87; 8:45 am]

BILLING CODE 4510-26-M