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SAFETY INFORMATION PROFILE

Overview of Electrical and Mechanical Lockout Devices

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PREFACE

The information in this profile was prepared in accordance with the provisions of NIOSH Contract #210-78-0130-0000 and is only one of twenty-seven Industry Profiles prepared under the contract. The reader should understand that this study is not intended to be an in-depth analysis, but rather, a limited overview of the industry. Each individual profile was prepared by a Profile Manager utilizing approximately 45 hours of professional time. Each profile is a reflection of the available literature, and other information obtained from industry, government, and labor contacts. Information Profiles are primarily intended for use in determining future study needs, priorities and directions. From this preliminary study may come various in-depth studies such as criteria documents, technology assessments, epidemiological studies, etc.

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EXECUTIVE SUMMARY

This profile, Overview of Electrical Mechanical Lockout Devices, has identified three devices suitable for lockout of electrical or mechanical systems. These are identified as padlocks, hasp type multi-padlock adaptors and pin type adaptor. Equipment such as electric disconnect switches and valves with self-contained locking capacity was not investigated.

A review of lockout requirement was made. There are three types of situations where lockouts or isolation systems are involved for hazard reduction. The first is locking out to prevent movement or motion. This most commonly involves electrically powered equipment, but does include hydraulic, pneumatic, steam and other power sources. Secondly, lockouts are used to prevent hazardous atmospheric generation, most commonly encountered confined space work, including gases, temperature and pressure. Third, lockouts are used to preclude exposure to electrical currents.

The technology is available to identify most potentially hazardous circumstances and to provide lockout (isolation) protection programs to negate the hazards. Such protection programs require proper original evaluation, design, installation and implementation including, education of personnel and work practice enforcement. Older facilities, without benefit of proper design and equipment, require improvised modifications which may influence effectiveness.

Lockout schemes as now found in standards, codes and company safety rules or regulations include (1) tagging out requirements, (2) tagging or locking out requirements, and (3) locking out with supplemental tagging. The National Electrical Code has a very limited number of lockout requirements. However, there are additional references where lockout capacity or requirements to make equipment inoperative are found.

There were no statistics identified relevant to lockout programs. Nor were any related studies identified.

Industry has tended to accept the principle of lockout and most industrial groups have incorporated lockout into their safety programs. Enforcement of individual lockout programs may be deficient.

There are existing standards where lockout is a part of the total isolation plan. The National Electrical Code standards for working in confined spaces and the OSHA General Industry Standards all have direct and/or implied requirements.

Because of the extensive potential application of lockout (isolation programs) requirements, there is an equally broad potential of interested industry associations and labor organizations.

Only 13 companies were identified as distributing lockout devices. Of these, only three responded to profile inquiry correspondence. Manufacturers of electrical equipment, with self-contained lockout capacity were not contacted.

OVERVIEW OF ELECTRICAL MECHANICAL LOCKOUT DEVICES

A. Standard Industrial Classifications Included

Because of the broad scope of lockout utilization, no industrial segment can be excluded from consideration.

Lockout requirements are primarily relevant to the protection of employees in occupational classifications including, craftsmen/kindred workers, operatives, laborers, farmers and farm managers. Occasionally, managers, professional and technical people and others can benefit.

B. Process Descriptions

(1) Overview

Historically electrical and mechanical lockout devices have been utilized to prevent injury to employees from: (a) mechanical movement or motion of equipment powered normally by electrical means, (b) electrical shock protection where people are required to work on exposed electrical circuitry, and (c) to prevent exposure to corrosive and/or toxic fluids, exposure to high and low temperature, exposure to gases and solid materials, as well as, the potential for exposure to excessive pressures. These exposures or potentials are found in many industrial activities including maintenance operations at almost all types of facilities and locations. Lockout procedures have extensive application in the chemical process industry, in manufacturing processes, in electrical power generation and distribution systems, in boilers and steam generating plants and in ship building and repair industries.

(2) Potential Applications

(a) Machinery Applications

Machinery operations of all types typically require equipment to be shut down before maintenance or adjustment work is performed. This requirement has been a factor in industrial safety programs for many years. There are code requirements for lockout procedure. However, explicit requirements are limited to a few types of equipment such as overhead cranes and various mechanical presses. There are statements in

various standards and regulations requiring the "provision to lockout" equipment or circuits, without the necessary requirement that lockout be accomplished. However, many company safety orders, or procedural requirements do require locking out of electrical and other types of hazard potential. (See Appendix A).

A zero mechanical state (ZMS) (27) recognizes the need to neutralize all energy sources including:

- .Hydraulic fluids under pressure
- .Compressed air
- .Energy stored in springs
- .Potential energy from suspended parts
- .Any other source that might cause unexpected mechanical movement.(26)

(b) Electrical Work

It is common practice to de-energize circuits when working on electrical circuits or open exposed wiring to prevent electrical shock. The National Electrical Code(4) does not normally require locking out of the circuits for circuits under 600 volts. However, requirements for providing lockable isolating switches are found in several sections. Lockout requirements for circuits above 600 volt potential are more stringent.

The most common electrical clearance procedure is a system of electrical isolation to prevent movement or motion of machinery or materials which may endanger personnel. This electrical scheme does not involve electricians nor electrical hazards.(25) As industrial machinery becomes more complex, it is inevitable that more complex procedures are required to shut down machines and assure that they will remain in a state offering maximum protection for those who perform maintenance, setup and service work.(26)

(c) Confined Space Entry

Confined space entry hazards are found in many industrial settings. Commonly, confined space entry brings to mind entering tanks or mixing equipment via manhole access to perform cleaning, maintenance or installation work. The broader prospective of confined space entry must include work in ships holds, truck and rail cars, bulk material storage bins or silos, small space areas in manufacturing, and any other space with: (1) limited personnel ingress or egress, (2) limited air circulation or, (3) space normally occupied or potentially occupied by process materials.

(3) Elements of Electrical/Mechanical Lockout Procedures

The Accident Prevention Manual for Industrial Operations(20) lists the following lockout procedures which they consider to be generally acceptable: (1) Alert the operator. (2) Before starting work on engine or motor line shaft or other power transmission equipment or power driven machinery, make sure it cannot be set in motion without your permission. (3) Place your

own padlock on the control switch lever or valve even though someone else has locked the control. (You will not be protected unless you put your own padlock on it). (4) If no padlock is available, place a "man at work sign" at the control block mechanism. Make sure both the sign and blocking are fastened securely so they cannot be easily removed. (5) When through working at the end of your shift, remove your own padlock or your own sign and blocking. Do not permit someone else to remove it for you. Make sure you are not exposing another person to danger by removing your padlock or sign. (6) If you lose the key to your padlock report the loss immediately to your Supervisor and get a new padlock.

The discontinued Manufacturing Chemists Association Safety Guide SG-8 entitled "Recommended Safe Practices and Procedures for Electrical Switch Lockout Procedure",(17) summarizes the following points which should be considered in electrical switch lockout:

(a) "Recognize the hazards faced by multi-man crews and individual workmen performing maintenance work on rotating or agitated chemical processing equipment.

(b) Prepare a standard procedure acceptable to both operating and maintenance departments. Provide for original lockout by operating personnel.

(c) Provide a separate lock and tag for each maintenance craft or crew. Always honor each of the several locks.

(d) Simplify the write-up and steps to be followed.

(e) Do not put the standard into effect unless and until top management has accepted it in spirit and in wording."

Pelko's article entitled, "A Realistic Approach to Electrical Safety Clearance Procedures",(25) identifies and elaborates on the follcwing:

.Accountability

.Need for permit is determined

.Clearance permit is requested

.Permit requested is routed through operating department

.Permit request is referred to plant electrical department

.Electrician executes clearance operations

.Electrical supervisor inspects and approves clearance and issues permit.

.Permit holder accepts permit

.Work is complete. Permit holder releases permit

.Operating department approves permit for clearance

.Electrical supervisor arranges for restoration of clearance

.Electrian restores equipment to operating mode

.Electrical supervisor closes permit

(4) Elements of A Confined Space Scheme

The Manufacturing Chemists Association Safety Guide SG-10 entitled, "Entering Tanks and Other Enclosed Spaces",(18) identifies three items of procedure to reduce the hazards of tank entry. These include: (1) Establish a definite system of preplanning for tank entry and work instruction program. (2) Prepare the vessel for entry by physically isolating it. Remove contaminants and test to insure absence of contaminants. (3) Use a formal permit system requiring written authorization for entry to be issued only after the supervisor in charge is satisfied personally with tank preparation, precautions to be taken, personal protective equipment to be used and procedures to be followed.

Under the description of isolation the MCA (18) indicates that the tank enclosure should be completely isolated from all other systems and equipment, all lines connected to the tank should be visibly disconnected and blanked off. Physical disconnection should be by removal of valves, spool pieces or expansion joints with blank flanges placed in the lines. Exceptions to the normal blanking procedures, such as bleeder valves in open position, should be approved only by qualified supervision and only when clearly justified and not as a matter of expediency when alternative measures could be taken to protect the workers. It is further pointed out that experience has shown that valves although closed, may leak dangerous liquid or gas. This fact requires the disconnection, capping

or blanking of all service, process vent, or overflow lines on a given unit to prevent entrance of a materials by leakage through (or accidental opening of) a valve. Steam connections to the jacket; water, brine and air lines; drains in overflow lines that extend into a sewer from which steam or fume can be conducted back into enclosure should be included in the isolation procedures. Blanks should be of sufficient thickness or strength and material composition to successfully retain the pressure which may be imposed, without distortion or failure.

Also included in the isolation requirements, (18) is a section identified as "lockout" cross-referencing the Manufacturing Chemists Association Safety Guide SG 8 entitled, "Electrical Switch Lockout Procedure".(17) Line disconnect switches supplying power to any mechanical apparatus in the tank such as mixers, or conveyors should be tagged and locked in the off position. It is not adequate to lock a push button station as it still may be possible to energize the circuit. The key should be kept by the man in the tank. Multiple crews require utilization of multiple locks. It is further advised that in some circumstances it may be necessary to have an electrician pull the line fuses, or to implement other positive steps to guard against accident energization. These steps may include disconnecting a line shaft, belt or chain drive, or installing mechanical latches. As in all isolation situations of lockout/tagout procedures, a test to determine the adequacy of isolation should be performed.

The American National Standards Institute has adopted a confined work space standard entitled, "Working in Confined Spaces" Z117.1-1977.(24) The content of this standard was not extensively reviewed during this information profile development effort.

It should be noted that some code requirements allow or require that double stop valves and a free flow drain between valves be provided as a form of pipeline isolation (blanking, lockout). For example, the California Administrative Code, Boiler and Fired Pressure Vessel Safety Orders(10) and the Utah Boiler and Pressure Vessels Rules and Regulations(8) require two valves; however, locking is not obligatory. It is preferred that the one be an outside screw and yoke type valve and that the centrally located drain (valved) be visible to the operator of the system. The TVA Hazard Control Manual, Draft Standard for Confined Space Entry allows either the installation of a blank flange between the confined space and all possible sources of harmful materials or isolation valves closed and tagged with the appropriate warning tag.(11) The Department of Army, Corps of Engineers requires that the lines leading into or out of enclosed spaces shall be physically disconnected and capped or blanked to prevent flow or drainage into the space. Closing of valves is not a satisfactory substitute.(12) According to the Industrial Safety Handbook,(13) isolation of vessels in the United Kingdom by closing of valves is generally not sufficient nor completely satisfactory. The acceptable method of isolation of inlet and outlet pipes is to disconnect them or use bolted blanks. It further cautions that valves can be sealed for liquors and still not be gas tight, leading to hazardous conditions

where volatile liquids or liquids containing dissolved gases are present. It is also cautioned that the isolation be supplemented by a posted notice of "Danger Men Working".

The National Fire Protection Association, Installation and Operation of Pulverized Fuel Systems, 1978 Standard No. 85F has several valving requirements for differing configurations, including a requirement, "a dust type valve or equivalent shall be installed as close to the furnace as possible in each burner pipe supplying a pressure furnace. A second dust type valve or valves shall be installed to isolate all burner lines from the pulverizer or exhauster. Both valves shall be closed prior to entering the pulverizer or exhauster."(16)

(5) Equipment Availability

The availability of the electrical and mechanical lockout devices is extensive in as much as electrical boxes and switches typically provide the capacity for locking out the switch. The National Electrical Manufacturers Association (NEMA) has the requirement in some of their standards.(28) Typically new equipment has locking capacity. Older equipment may require simple modification to accept padlocks.(17,20,26) Conventional circuit breakers, panel board circuit breakers, although drilled for tagging purposes and for ganging are not suitable for accepting conventional padlock lockout devices. No device or adapter was discovered

which provides for padlocking standard panel box circuit breaker handles. Equipment to meet the requirement may be available through electrical suppliers. This shortcoming is also true for the pipe and valve industry. Valves are available with locking features and typically wheeled valves can be secured or locked with chain and/or padlock, however, it is usually a makeshift arrangement. Lockable valves are available when specified.

In searching for people supplying specialized lockout or locking devices Best's Safety Directory was utilized. Letters were sent to 13 of the companies listing lockout safety devices. Appendix B shows the copy of the letter and the mailing list. From this single mailing there were three responses, one of which had no apparent lockout application, the other two providing information on hasp type extenders, allowing multiple padlocks. One supplier also provides an adapter to allow locking of pin type receptacles found particularly on valves. No attempt to identify all of the different locking provisions for electrical disconnect or isolating switches in this profile development was made.

C. Potential Hazards

Because of the wide range of the application or potential application of lockout schemes, the range of injuries can be from: A no injury/product loss or damage incidence, where it is a matter of chance that no one is injured or killed; to minor types of injuries, cuts, scrapes, contusions resulting from actuation of equipment; to the more major types of injuries including mutilations, amputations, electrical shocks, poisonings; and ultimately to catastrophic events involving single or multiple deaths. Perhaps the confined space or entry types of operations are more likely to result in catastrophic accidents.

The most common cause of accident in the chemical industry is the mechanical motion or movement of equipment improperly locked or tagged out. The second general accident cause is the flow of liquid (gas) and the third most frequent accident cause is direct electrical exposure, working on energized electrical circuits.(21)

D. Hazard Controls

The General techniques and procedures for lockouts and isolation of equipment are found throughout the literature and are summarized in the National Safety Council's Accident Prevention Manual for Industrial Operations.(20) There are several documents that give specific details such as National Safety Council Safety Data Sheet #237 "Methods of Locking Electrical Switches".(19) More specialized procedures are found in the Manufacturing Chemists Associations "Entering Tanks and Other Enclosed Spaces"(18) and in "Working in Confined Spaces", ANSI Z117.1, 1977.(24)

There are numerous references in safety literature about the need or desirability for requiring isolating or locking out machinery or equipment systems, although the standards don't commonly recognize in detail all of the relevant circumstances. The conclusion is that most company, organization or agency safety directives or plans have adopted and accepted lockout/tagout practices as a valid technique for preventing accidents, injuries and fatalities. However, in the codes and standards identified, lockouts/tagouts requirements appear in limited manner. The nuclear energy industry regulations and information has not been researched, but it is felt that there are numerous references and lockout requirements for people protection in nuclear field.

It appears that most of the advertised lockout equipment is oriented towards the electrical isolation. Lockout devices for others are not represented, resulting in the need for improvision in techniques. However,

pipe blanks, caps, locking type valves, etc. are a normal piping supply item, not provided or promoted as a safety item. (See Appendix C)

Confined space entry, where required regularly, should have properly designed and engineered provisions for piping isolation, mechanical blocking and other forms of lockout. Typically this safety consideration is absent in all but the most advanced organizations.

E. Accident and Illness Statistics

No source was located where statistical information has been developed regarding accidents or injuries resulting from lack or improper application of lockouts. The Case History of Accidents in the Chemical Industry(21) covering the period 1951 through 1974 was reviewed. There are 2108 total case write-ups, of which the index identifies 23 instances under "lock and tag." These 23 cases were reveiwed and summarized, identifying three items of information: (1) general labor classification, (2) the type of incidence and (3) the lockout/tagout procedural aspects. The tabulated information is found in Table 1. This summary does not recognize that many of the other 2108 cases may have been precluded by a lockout or tagout procedure. Again, it should be pointed out that no other tabulation or statistical information was determined where lockouts, tagouts or safety clearance procedures were part of the information developed.

TABLE 1

Extracted Summary from Manufacturing Chemists Association

Case Histories of Accidents in the Chemical Industry.(21)

Lock and Tag

Total Incidents Indexed "Lock and Tag" 1951-1974 — 23

Labor Classification Injured - Exposed

Pipe fitters	2
Electricians	1
Operators - machine tender	13
Maintenance man (repairman)	3
Utility man	1
Unknown	2
Electrical Engineer	1
	23

Incident Type

Mechanical motion, movement of equipment	16
Flow of Liquid	6
Electrical	1
	23

Lock Out - Tag Out

No Procedure Identified	2
Procedure Violated (Practice Violated)	17
Procedure Deficient	3
Undefined	1
	23

Case Histories Numbers (See Attached)

Manufacturing Chemists Association - Case Histories of Accidents in the Chemical Industry

1951-1959

#58	Acid Valve	Pipefitters and Operators - not closed, tagged, locked (procedure violation)
	Pump	Not locked out
#152	Pump Alcohol	Pipefitters - pump start button, soft wired, not tagged, disconnect not locked out no tag (Procedural violation)
#161	Kiln Larry	Operator-maintenance adjustments - not locked out nor tagged (practice violation)
#221	Caustic	Maintenance - not locked out - accidental turn on of toggle switch
#398	Conveyor Drive	Unknown - lockout tagging rule violated
#434	Filter Wheel	Repairman - Tagging out rule violated
#531	Acid Line	Operator - tagout rule violated - plugged line

1960-1965

#811	Oleum	No injuries - lock and tag okay, (procedural violation)
#981	Ribbon Blender	Operator - No lockout or tagout procedure, Interconnected equipment
#1006	Pump	Machine Tender - No lockout or tagout practice communications
#1015	Feed Roll	Utility Man - Lockout and tagout procedure violation communications

1966-1969

#1271	Acid	Operator - Machine helper - lockout and tagout procedure violation contributed
#1468	Mechanical Pusher	Electrical Engineer - Lockout and tagout procedure violation
#1530	Roller Chain Sprocket	Employee - lockout and tagout procedure violation
#1543	Kettle agitator	Operator - lockout and tagout procedure violation
#1592	600 gal. mixer	Operator - lockout and tagout procedure violation communications

#1612	Pellet Machine	Operator - lockout and tagout procedure inadequate interlocks

1970-1974

#1813	Grinder	Maintenance Man - Lockout and tagout defective switch handle, checked and system operated
#1909	Pancake Dryer	Operator - Lockout and tagout procedure violation
#1943	Blender (9½ RPM)	Operator - Lockout and tagout procedure violation
#1946	Electrical Circuit	Electrician - Lockout and tagout system deficiencies
#2040	Screw Conveyor	Operator - Lockout and tagout procedure violation
#2061	Rotating Air Lock	Operator - Lockout and tagout procedure violated, defective system

F. Exposure Levels

No applicable information was located.

6. Related Studies

No studies were found relating to locking and tagging out procedures.

H. Industry Trends

Industry appears to have a long term commitment to internal locking out/tagging out procedures. However, the tabulation of instances in the section E indicates that there is a lack of enforcement of in-house procedures. Seventeen of the 23 reports referenced, identified a lockout/tagout procedural violation. Hence, the conclusion even though the procedure may be in the company/agency manuals or operating procedures, the enforcement and following of regulations may be deficient.

One of the large industrial sectors, electrical power generation and transmission, has possibly the greatest need for electrical systems isolation by lockout/tagout. It was indicated that the lockout/tagout practices are common throughout this industry with normally good application. However, an occasional policy or procedural violation results in accidents, incidents and fatalities. Of particular importance in this industry is the interrelationship between power generation and transmission responsibilities and the need to coordinate the isolation between these two branches. This relationship has been identified as an area that is sometimes troublesome.(22)

It should be noted that there are no specific Department of Labor, OSHA standards that address power generation or transmission at this time, except transmission line construction. Therefore, only the horizontal type standards are applicable to this industry. There are essentially no applicable operating and maintenance lockout requirements in the OSHA standards at this particular time.(22)

I. Existing Standards

(1) Federal Safety and Health Standards

The following Department of Labor, Occupational Safety and Health standards have been reviewed and it is believed that the excerpted portions are the only lockout references. One non-included reference is a tagging example and is not considered to be mandatory.

(a) 29 CFR 1910 - General Industry Standards.(1)

o Subpart I - Personal Protective Equipment

.132 - General Requirements

(a) Application

No specific reference to lockouts - however implied by "Protective equipment..."

"...protective shields and barriers"

"...through absorption, inhalation or physical contact"

o Subpart N - Materials Handling and Storage

.181 - Derricks

(f) Maintenance

(2) Maintenance Procedure

"...shall be taken..."

(c) The main or emergency switch shall be locked in the open position, if an electric hoist is used.

(d) Warning or out of order signs shall be placed on the derrick and hoist.

.179 - Overhead and Gantry Cranes

(e) Electric Equipment

(5) Switches

(i) The power supply to the runway conductors shall be controlled by a switch or circuit breaker located on a fixed structure, accessible from the floor, and arranged to be locked in the open position.

(ii) On cab-operated cranes a switch or circuit breaker of the enclosed type, with provision for locking in the open position, shall be provided in the leads from the runway conductors. A means of opening this switch or circuit breaker shall be located within each reach of the operator.

(iii) On floor-operated cranes, a switch or circuit breaker of the enclosed type, with provision for locking in the open position, shall be provided in the leads from the runway conductors. This disconnect shall be mounted on the bridge or footwalk near the runway collectors. One of the following types of floor-operated disconnects shall be provided:

(a) Nonconductive rope attached to the main disconnect switch.

(b) An undervoltage trip for the main circuit breaker operated by an emergency stop button in the pendant pushbutton station.

(c) A main line contactor operated by a switch or pushbutton in the pendant pushbutton station.

(iv) The hoisting motion of all electric travelling cranes shall be provided with an overtravel limit switch in the hoisting direction.

(v) All cranes using a lighting magnet circuit switch of the enclosed type with provision for locking in the open position. Means for discharging the inductive load of the magnet shall be provided.

o Subpart O - Machinery and Machine Guarding

.213 - Wood Working Machinery Requirements

(a)(10) It is recommended that each power driven wood-working machine be provided with a disconnect switch that can be locked in the off position.

(b)(5) On each machine operated by electric motors, positive means shall be provided for rendering such controls or devices inoperative while repairs or adjustments are being made to the machine they control.

.217 - Mechanical Power Presses

(b)(8) Electrical

(i) A main power disconnect switch capable of being locked only in the off position shall be provided with energy power press control system.

.218 - Forging Machines

(a)(3) Hammers and Presses

(iii) Means shall be provided for disconnecting the power to the machine and for locking out or rendering cycling controls inoperable.

(f) Forging Presses

(1) Mechanical forging presses

(i) The power to the press shall be locked out.

(ii) The flywheel shall be at rest.

(iii) The ram shall be blocked with a material the strength of which shall meet or exceed the specifications or dimensions shown in Table O-11.

(2) Hydraulic forging presses

(i) The hydraulic pumps and power apparatus shall be locked out.

(ii) The ram shall be blocked with a material the strength of which shall meet or exceed the specifications or dimensions shown in Table O-11.

(h) Upsetters

(2) Lockouts. Upsetters shall be provided with a means for locking out the power at its entry point to the machine and rendering its cycling controls inoperable.

(5) Changing dies. When dies are being changed, maintenance performed, or any work done on machine, the power to the upsetter shall be locked out, and the flywheel shall be at rest.

(j) Other forge facility equipment

(1) Billet shears. A positive-type lockout device for disconnecting the power to the shear shall be provided.

o Subpart R - Special Industries

.263 - Bakery Equipment

(1) Ovens

(3) Safeguards of Mechanical Parts

(iii) Main shutoff valves, operable separately from any automatic valve, shall be provided to permit turning off the fuel or steam in case of an emergency.

(a) Main shutoff valves shall be locatet so that explosions, fires, etc. will not prevent access to these valves.

(b) Main shutoff valves shall be locked in the closed position when men must enter the oven or when the oven is not in service.

.265 - Sawmills

(c) Building Facilities and Isolated Equipment

(12) Electrical Wiring and Equipment

(v) Open Switches. Before working on electrical equipment, switches shall be open and shall be tagged, blocked, or locked out.

(13) Hydraulic Systems

Means shall be provided to block, chain or otherwise secure equipment normally supported by hydraulic pressure so as to provide for safe maintenance.

o Subpart S - Electrical

.309 - National Electrical Code

(a) (DOL required compliance - no lockout requirements identified)

(b) New - installations - utilization equipment, etc. Two lockout requirements and two optional requirements have been identified in the DOL adopted 1971 Electrical Code.(4) The 1978 code(5) has two additional required lockout provisions and requires lockout capacity under two exceptions to regulations. Reference details are shown on Table 2.

Paragraph 90-8 of the National Electrical Code Examination of Equipment for Safety implies that all/most equipment and materials be inspected by standardized examinations for safety, and the results published. This is interpreted to mean Underwriters Laboratory (UL) or equivalent approval or equipment be designed to National Electrical Manufacturing Association Standards (NEMA), etc. is required.

TABLE 2

NATIONAL ELECTRICAL CODE

LOCKOUT REQUIREMENTS COMPARISON

NFPA 70 1971		NFPA 70 1978
No lockout provision	Electric Heating	
	427-20(a) 427-21-3	"...be provided with a positive lockout in the off position."
No lockout provision	Article 430 Motor Circuits, Controllers Subpart H	
	430-102 Exception 1	Allowed, if lockout provisions are met.
	430-113 Exception	Lockout provision
	Article 600 Electrical Signs & Outline Lighting	
Lockout option	600-2 (a) 600-2 (a) exception	Lockout required
	Article 610 Cranes and Hoists	
"...arranged to be locked in the open position."	610-31	
	610-31	"...arranged to be locked in the open position..."
	610-32	"...arrange to be locked in the open position..."
	Article 620 Elevators & Dumbwaiters	
"...arranged to be locked in the open position."	620-51 (a) 620-51 (a)	"...arranged to be locked in the open position."

(b) 29 CFR 1926 - Construction Standards.(2)

o Subpart I - Tools - Hand and Power

.304 Disconnect Switches

"All fixed power driven wood working tools shall be provided with a disconnect switch that can either be locked or tagged in the off position."

o Subpart K - Electrical

.400 - General Requirements

(g) Lockout and Tagging of Circuits

(1) Equipment or circuits that are de-energized shall be rendered inoperative and have tags attached at all points where such equipment or circuits can be energized.

(2) Controls that are to be deactivated during the course of work on energized or de-energized equipment or circuits shall be tagged.

(3) Tags shall be placed to identify plainly the equipment or ciruits being worked on.

o Subpart N - Cranes, Derricks, Hoists, Elevators and Converyors

.555 - Conveyors

(a) General Requirements

(7) Conveyors shall be locked out or otherwise rendered inoperable, and tagged out with "DO NOT OPERATE" tag during repairs and when operation is hazardous to employees performing maintenance work.

o Subpart V - Power Transmission and Distribution

.950 - Deenergizing lines and equipment

(1) When deenergizing lines and equipment operated in excess of 600 volts, and the means of disconnecting from electric energy is not visibly open or visibly locked out, the provisions of subdivisions (i) through (vii) of this subparagraph shall be complied with.

(2) When a crew working on a line or equipment can clearly see that the means of disconnecting from electric energy are visibly open or visibly locked-out, the provisions of subdivisions (i) and (ii) of this subparagraph shall apply.

(c) 29 CFR 1915 through 1918 - Maritime Standards.(3)

o No lockout references determined

(2) State Coverages

Some states have adapted more stringent or more clearly stated requirements in their Occupational Safety and Health Regulations than are found in the Federal Standards. Not all state regulations have been reviewed to determine additional coverage requirements.

Utah has specific coverage, Chapter B, paragraph 15.9 Lockouts and Tagging.(7) See Appendix D. These regulations apply and are directed primarily at prevention of motion or isolation of motive power, electrical, steam air and pressure lines. There is not specific reference to isolation of other hazards such as flammable liquids, toxic or corrosive materials such as may be required for confined space work.

The State of Utah Boiler and Pressure Vessel Rules and Regulations have requirements for boiler entry where closing, tagging and preferably padlocking is required. These regulations are issued by the Industrial Commission, however, and are not in the Utah OSHA Regulations. (3) See Appendix D.

The State of California has in their General Industry Safety Orders(23) specific regulations Title 8, Chapter 2312 requires sealing or closing and locking of valves from which a harmful material might accidentally flow back to the boiler or pressure vessel. Key retention is regulated. The related but different regulations, Subchapter 2 - Boiler and Fire Pressure Vessel Safety Orders - cross reference the General Industry Safety Orders and include the cross referenced requirements as an appendix.(10) The California Electrical Safety Orders(9) (high voltage) also require lockout capacity for switching of conductors, paragraph 2833, and other lockout requirements are identified in paragraph 2835. Circuit breakers are required to have a positive means to prevent unintended operation during inspection or maintenance. See Appendix D.

The profile development did not allow sufficient time to develop a comprehensive review of existing regulation, Federal, State, County, etc. The referenced state regulations are indicative of the type of regulations that may be found with a thorough search.

(3) Other Federal Agencies

Under the 29 CFR 1960 and Executive Order 11807 federal agencies must provide a safe and healthful workplace for the employees. Agencies can adopt existing 29 CFR regulations or develop their own.

In this regard the TVA is in the process of developing in-house standards. A draft standard No. 508 "Confined Space Entry", requires tagging out of (a) piping (steam, inert gases, chemicals), (b) drains or overflow lines and (c) operating controls. This draft standard (at the time of draft) does not require "locking out".(11) Other TVA "Draft" and "Interim" standards have lockout requirements equivalent to the counterpart OSHA or consensus standards.

The Department of the Army, Corps of Engineers "General Safety Requirements"(12) requires "positive means be taken to prevent the lines from being energized" in paragraph 15E "Overhead Lines". In addition, it is required that lines be visibly grounded. Paragraph 15G "Lockout and Tagging of Circuits" requires that "Equipment or circuits that are de-energized shall be rendered inoperative and have tags attached at all

points where such equipment or circuits can be energized." "Confined Space Entry" requires power disconnection, for any apparatus in or containing enclosed spaces, tagging and locking. Lines into or out of enclosed spaces - physically disconnected and capped or blanked to prevent flow or drainage into the space. The closing of valves is not a satisfactory substitute. "Safe Clearance Procedure" paragraph 28.A.03 requires provisions for lockout, tagging, disconnecting, and blanking or capping of controls, switches, valves, and lines or blocking or moving of parts to prevent unauthorized operation".(12) See Appendix D.

The two federal agency regulations cited are representative of types of requirements likely to be found in other federal agency regulations.

(4) Foreign Standards

Foreign standards were not available for study. The Industrial Safety Handbook(13) addresses the general need and requirements, with references to the legal requirements for a safe tank entry in the United Kingdom. Details for consideration and an "Entry Form", recognizing gas, liquid and electrical mechanical isolation is provided. A section, "Electrical Control Gear" - mentions in conjunction with proper regular testing and education, an example, "where to insure safety, switches should be locked in the off position and the keys retained by a responsible person... This precaution should be supplemented by a notice (tag)..."

Additional foreign reference articles from the NIOSH TIC search, not obtained, but indicating references to standards, is in Appendix E.

J. Names of Industries, Associations and Other Interested Parties

American National Standards Institute Inc.
1430 Broadway
New York, New York 10018

American Petroleum Institute
2101 L Street, N.W.
Washinton, D.C. 20037

American Petroleum Refiners Association
1110 Ring Building
1200 18th Street, N.W.
Washington, D.C. 20036

American Society for Testing and Materials
1916 Race Street
Philadelphia, PA 19103

Edison Electric Institure
90 Park Avenue
New York, New York 10016

National Safety Council

444 No. Michigan Avenue

Chicago, Illinois 60611

Institute of Electrical and Electronics Engineers Inc.

345 East 47th Street

New York, New York 10017

Instruments Society of America

400 Stanwix Street

Pittsburgh, PA 15222

International Brotherhood of Electrotechnical Commission

1 Rue de Varembe

1211 Geneva 20 Switzerland

or Through the American National Standards Institute

National Electrical Manufacturers Association

2101 L Street, N.W.

Washington, D.C. 20037

National Fire Protection Association

470 Atlantic Avenue

Boston, MA 00210

American Society of Heating, Refrigerating and Air Conditioning Engr.

345 East 47th Street

New York, New York 10017

American Society of Safety Engineers

850 Busse Highway

Parkridge, Illinois 60068

Canadian Industrial Safety Association

159 Bay Street

Suite 715

Toronto Ontario Canada

Compressed Air and Gas Institute

122 East 42nd Street

New York, New York 10017

Compressed Gas Association

500 5th Avenue

New York, New York 10036

Crane Manufacturers Association of America

1326 Freeport Road

Pittsburgh, PA 15238

Industrial Accident Prevention Association

Ontario

74 Victor Street Suite 1000

Toronto Ontario M5C 2A6 Canada

Industrial Accident Prevention Association

Quebec

50 Place Creemazie, Suite 812

Montreal 351, Quebec Canada

International Association of Electrical Inspectors

201 East Erie Street

Chicago, Illinois 60611

International Commission on Rules for the Approval of Electrical

Equipment

Utrechtseweg 3100

Arnhem, Netherlands

International Labor Office

Washington Branch Office

917 15th Street, N.W.

Washington, D. C. 20005

Laborers International Union of North America
AFL-CIO
905 16th Street, N.W.
Washington, D.C. 20006

Power Saw Manufacturers Association
734 15th Street, N.W.
Washington, D.C. 20005

Power Tool Institute
1803 So. Busse Road
Mt. Prospect, Illinois 60056

Royal Society for the Prevention of Accidents
6 Buckinham Palace
London SW1E 6HR England

Sheet Metal and Air Conditioning Contractors National Association
1611 No. Kent Street Suite 200
Arlington, Virginia 22209

National Board of Boiler Pressure Vessel Inspectors
1155 North I Street
Columbus, Ohio 43201

Manufacturing Chemists Association

1825 Connecticut Avenue N.W.

Washington, D.C. 20009

American Society of Mechanical Engineers

345 East 47th Street

New York City, New York 10017

Oil Chemical and Atomic Workers International Union

Box 2812

Denver, Colorado 80201

International Chemical Workers Union

1655 West Market Street

Akron, Ohio 44313

Laborers International Union of North America (Affiliated with AFL-CIO)

905 16th Street, N.W.

Washington, D.C. 20006

Underwriter's Laboratories, Inc.

207 E. Ohio Street

Chicago, Illinois 60611

American Foundrymen's Society

Golf and Wolf Roads

DesPlaines, Illinois 60016

The following are organizations represented on various code panels for the ANSI - C2 National Electrical Code:

AA	Aluminum Association
AAMI	Association for the Advancement of Medical Instrumentation
ACS	American College of Surgeons
AHA	American Hospital Association
AHAM	Association of Home Appliance Manufacturers
AIA	American Insurance Association
AISE	Association of Iron & Steel Engineers
AISI	American Iron & Steel Institute
AMP&TVP	Association of Motion Picture & Television Producers
API	American Petroleum Institute
ARI	Air-Conditioning & Refrigeration Institute
ASA	American Society of Anesthesiologists
AWWA	American Water Works Association
CBEMA	Computer and Business Equipment Manufacturers Association
CMAA	Crane Manufacturers Association of America, Inc.
EFMG	Electric Fuse Manufacturers Guild
EGSMA	Electrical Generating Systems Marketing Association
EIA	Electronic Industries Association
EL&PG	Electric Ligt & Power Group
FM	Factory Mutual Research Corporation
HEW	Department of Health, Education & Welfare
HMI	Hoist Manufacturers Institute
IAEI	International Association of Electrical Inspectors
IBEW	International Brotherhood of Electrical Workers
IEEE	Institute of Electrical & Electronic Engineers
IES	Illuminating Engineering Society
JCAH	Joint Commission on Accreditation of Hospitals
MCA	Manufacturing Chemists Association
MHI	Manufactured Housing Institute
NABM	National Association of Building Manufacturers
NAED	National Association of Electrical Distributors
NAHB	National Association of Home Builders
NBS	National Bureau of Standards
NCTA	National Cable Television Association
NECA	National Electrical Contractors Association
NEI	National Elevator Industry, Inc.
NEMA	National Electrical Manufacturers Association
NESA	National Electric Sign Association
NSC	National Safety Council
NSPI	National Swimming Pool Institute
PTI	Power Tool Institute
REA	Rural Electrification Administration
RVI	Recreational Vehicle Institute
SAE	Society of Automotive Engineers
SAMA	Scientific Apparatus Makers Association
SMP&TE	Society of Motion Pictures and Television Engineers
TG	Telephone Group
UL	Underwriters Laboratories Inc.
VA	Veterans Administration

K. Names and Addresses of Companies

Refer to Appendix B

L. Summary Analysis of Data

Devices utilized to lock out systems for safety purposes have been identified as (1) padlocks, (2) hasp-type, multi-padlock adapters and pin adapters for multi-padlock hasps. Equipment designed to have self-contained lockout capacity and not requiring a "device" was not investigated. Presumably, electrical switches and pipe valves are available with lockout capacity. Standard plumbing fittings, caps, blanks, etc. are not considered devices.

Lockout devices are a minor part of a control system. These systems attempt to control hazards of: (a) movement or motion of equipment, (b) electrical shock hazards, (c) exposure to substandard work atmospheres in confined spaces. Electrical lockouts would be part of a system or program such as an electrical clearance procedure in confined space entry procedures. These systems or programs may include safety techniques to reduce hazards such as disconnecting pipes and installing blanks fittings, not considered in the normal sense as a lockout, but rather a means of isolating a hazard from employees. The electrical isolating switch, locked out, performs this isolating function for two kinds of hazards, electrical shock or control of electrically powered motion or movement.

Companies and agencies have often adopted lockout/tagout procedures which have more stringent requirements than are found in the code requirements. From limited study data obtained, violations of these procedures indicate a lack of adequate internal enforcement of adopted rules.

There appears to have been a progression in the magnitude of requirements or applications from: (1) tagout requirements, to (2) lockout or tagout, to (3) specific lockout requirements with tagging to provide procedural control. The progression is apparently related to the time of original regulation or standard development. The change or tightening is slow to proceed and is related to the magnitude of anticipated severity or the frequency of less severe accidents.

Published relevant statistical information was not found. It is therefore concluded that individual company or industry groups may be conducting studies, resulting in adoption of their own lockout rules and providing input to consensus standard development.

The isolation system is dependent upon adequate design, engineering, code compliance, purchasing, installation, and maintenance of the system. Employee education and enforcement of applicable rules of the isolating system are requisites for its adequate operation. This is of particular importance in confined space isolation. Older systems require working with "as built" systems, which necessitates improvised modifications which may be cumbersome and/or inadequate. The electrical equipment available and the code requirements appear to be changing to meet industry needs as reflected by changing National Electrical Code and National Electrical Manufacturing Association standards.

M. Other Data

Appendix E contains NIOSH TIC references to articles, publications with references to lockout/tagout segments and/or regulations.

Appendix F contains a computer referenced article on a valve locking device, which may be relevant, but was not obtained or reviewed for this profile.

REFERENCES AND SOURCES

(1) Title 29 Code of Federal Regulations Part 1910, U.S. Department of Labor, Occupational Safety and Health Administration.

(2) Title 29 Code of Federal Regulations, Parts 1926, U.S. Department of Labor, Occupational Safety and Health Administration.

(3) Title 29 Code of Federal Regulations, Parts 1915, 1916, 1917, 1918, U.S. Department of Labor, Occupational Safety and Health Administration.

(4) Anon., National Electrical Code, NFPA No. 70, 1971 Edition, National Fire Protection Association, Boston, Massachusetts.

(5) Anon., National Electrical Code, NFPA No. 70, 1978 Edition, National Fire Protection Association, Boston, Massachusetts.

(6) Anon., Best's Safety Directory, 1975 Edition, A. M. Best Company, Park Avenue, Morristown, New Jersey, 07960.

(7) Anon., Utah Occupational Safety and Health Rules and Regulations, General Standards, Utah State Industrial Commission, Utah Occupational Safety and Health Division.

(8) Anon., Boiler and Pressure Vessel Rules and Regulations, Effective July 1, 1975, State of Utah Industrial Commission of Utah, Safety Division.

(9) Anon., High Voltage Electrical Safety Orders, State of California, California Administrative Code, Title 8 Industrial Relations, Chapter 4, Division of Industrial Safety.

(10) Anon., Boiler and Fired Pressure Vessel Safety Orders, State of California, California Administrative Code, Title 8 Industrial Relations, Chapter 4, Division of Industrial Safety.

(11) Anon., Hazard Control Manual, Tennessee Valley Authority, Draft Standard 508, Confined Space Entry; Interim Standard 516, Powered Woodworking and Metalworking Machines (stationery); Draft Standard 527, Overhead and Gantry Cranes; Draft Standard 528, Power Shovels and Crawler, Locomotive and Truck Cranes.

(12) Anon., General Safety Requirements, Department of Army, Corps of Engineers, U.S. Army.

(13) Handley, William M.B.E., Editor, Industrial Safety Handbook, Second Edition, McGraw-Hill Book Company (UK) Ltd.

(14) Anon., Uniform Mechanic Code, 1976 Edition, Published by the International Association of Plumbing and Mechanical Officials (IAPMO) and the International Conference of Building Officials (ICBO).

(15) Deleted - Reference number not used.

(16) Anon., Pulverized Fuel Systems, NFPA No. 85F, 1978 Edition, National Fire Protection Association, Boston, Massachusetts.

(17) Anon., Electrical Switch Lockout Procedure , SG-8, Adopted 1961, No longer issued, Manufacturing Chemists Association, 1925 Connecticut, N.W. Washington, D.C. 20009.

(18) Anon., Entering Tanks and Other Enclosed Spaces, SG-10, Manufacturing Chemists Association, 1961 , 1825 Connecticut, N.W., Washington, D.C. 20009.

(19) Anon., Methods of Locking Out Electric Switches, Data Sheet No. 237, Revision B 1971, National Safety Council, Chicago, Illinois.

(20) Anon., Accident Prevention Manual for Industrial Operations, 7th Edition, National Safety Council, Chicago, Illinois, pp 402-437, 1282-1284.

(21) Anon., Case Histories of Accidents in the Chemical Industry, Volume 1-4, Manufacturing Chemists Association, 1825 Connecticut Avenue, N.W., Washington, D.C. 20009.

(22) Personal communication with Jerry Lefler, Safety Department, Utah Power and Light Company, Salt Lake City, Utah, December 13, 1978.

(23) Anon., General Industrial Safety Orders, State of California, California Admininstrative Code, Title 8 Industrial Relations, Chapter 4, Division of Industrial Safety.

(24) Anon., Working in Confined Spaces, 1977. ANSI Z19.1, American National Standards Association.

(25) Palko, E. D., Editor, A Realistic Approach to Electrical Safety Clearance Procedures, Plant Engineering, Vol. 31, No. 4, February 17, 1977, pp. 106-111.

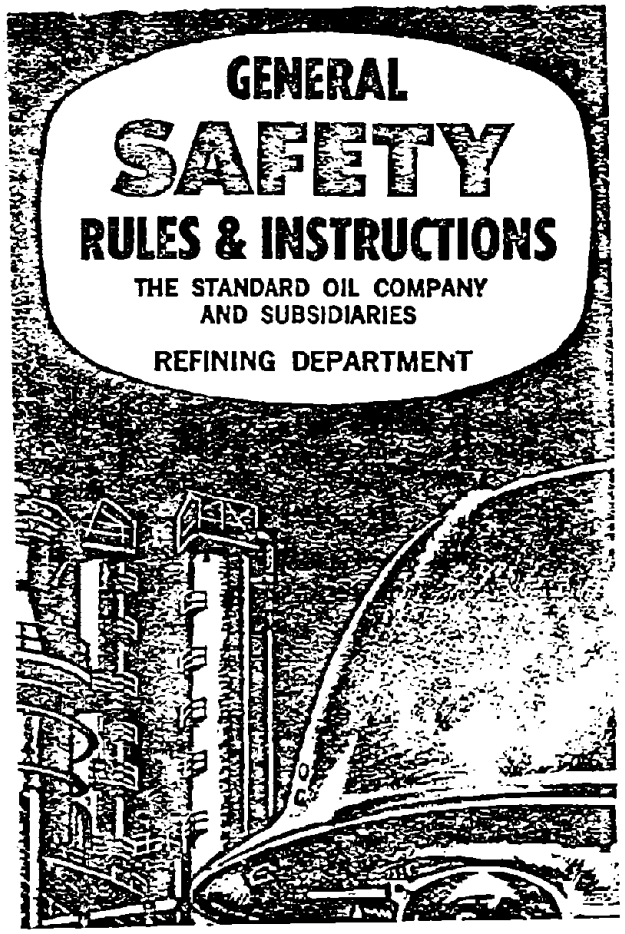
(26) Anon., Establish An Effective Lockout Procedure, Modern Casting, Vol. 67, December 1977.

Editor's Note: This article was prepared from material published by Employers Insurance of Wausar entitled, "Machinery Lockout and the Broader Concept, Zero Mechanical State."

(27) Anon., American National Standards Institute - (Unavailable - unlisted) ANSI Z241.1, 1975. Note: Refer to footnote reference #26, "Standard available from American Foundrymen's Society".

(28) Personal Communication with Mr. Lucas, National Electrical Manufacturing Association, 2101 L St., NW, Washington, D. C. on December 6, 1978.

APPENDIX

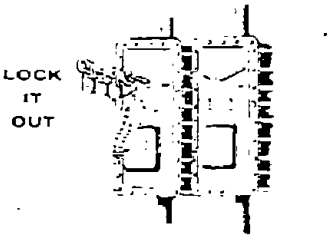


15. LOCKING OUT POWER SOURCES TO EQUIPMENT UNDER REPAIR

NO WORK IS TO BE DONE ON ANY EQUIPMENT, MACHINERY, POWER TOOLS, ETC. UNTIL POSITIVE MEASURES HAVE BEEN TAKEN TO INSURE THAT THE POWER SOURCE IS SHUT OFF AND CANNOT BE TURNED ON WHILE THE WORK IS IN PROGRESS.

In the following procedures, the protective devices used to prevent accidental starting are to be removed only by authorized persons, preferably those who put the devices in place. No one should remove a protective device until all employees have completed their work and are in a safe position.

ELECTRICAL OR ELECTRICALLY DRIVEN EQUIPMENT shall have the switch or breaker to that equipment positively locked out. (Locking out just the push button station is not adequate.) Always test before



the work is started to be sure the switch or breaker has actually shut off power. If for any reason the switch cannot be locked out, do not start the work—check with your supervisor.

STEAM, AIR, OR GAS POWERED EQUIPMENT shall have the closed power valve secured against accidental opening by a lock or locked chain, and by firmly attaching a "DO NOT OPEN" tag to the wheel or plug. The tag must be readily visible from the operating position. The supply line must be blanked if the closed control valve leaks.

In those few cases when machinery cannot be shut down before oiling, cleaning, adjust-

APPENDIX B

December 8, 1978

Gentlemen:

D. B. Associates, Inc. is currently developing safety information profiles under a National Institute for Occupational Safety and Health (NIOSH) contract #210-78-0130.

One profile, entitled "Electrical and Mechanical Lockout Devices" requires a review of available equipment, suppliers and product descriptions. A review of Bests Safety Directory has indicated that your company does distribute products or a product that should be included in our profile development.

We invite you to provide to D. B. Associates, sales, promotional or catalog information on any products that may be considered under the general heading of "electrical or mechanical lockout devices" (electrical, gas, steam, liquid, pressure, mechanical forces, etc.).

Information on other devices, such as discontinued items, will also be appreciated.

Any information that you can provide or that can be referenced, in the form of studies, reports or statistical information will contribute to the completion of the profile and will also be greatly appreciated.

This supplied information will be summarized in the profile and the catalog and/or sales information will be forwarded to NIOSH for their future use.

Your prompt attention to this request is appreciated. All relevant information should be mailed to:

D. B. Associates, Inc.
Attn: Gordon A. Allcott #21
1864 So. State Street #200
Salt Lake City, Utah 84115

Sincerely yours,

G. A. Allcott
Group Leader, Safety

GAA/tf

APPENDIX B

Engineering Development Co., Inc.
Box 183
Warsaw, IN 46580

Industrial Products Co.
21 Cabaot Blvd.
Langhorn, PA 19047

Rockford Safety Equipment Co.
4620 Hydraulic Road
Rockford, IL 61109

Searjeant Safety Products
Div. Hansford Mfg. Corp.
3123 Winton Road, So.
Rochester, NY 14623

Tapeswitch Corp. of America
320 Broad Hollow Road
Farmingdale, NY 11735

Cutler-Hammer Inc.
4201 N. 27th Street
Milwaukee, WI 53216

Hazard Controls Inc.
Yale and Woodland Avenues
Cherry Hill, NJ 08034

Walter Heath Co., Inc.
P. O. Box 361
Red Bank, NJ 07701

Hoffman Engineering Co.
9th and Tyler Streets
Anoka, MN 55303

Osborn Mfg. Corp.
Box 271
Warsaw, IN 46580

Hanna Fluid Power Products, Rexnord Inc.
1765 N. Elston Avenue
Chicago, IL 60622

Parker Hannifin Corp.
17325 Euclid Avenue
Cleveland, OH 44112

Ross Operating Valve Co.
120 E. Goldengate Avenue
Detroit, MI 48203

APPENDIX C

THE POSITIVE SAFETY MANUFACTURING COMPANY • PUNCH PRESS SAFETY DEVICES

(216) 951-2130 • 34990 MELINZ PARKWAY
EASTLAKE, OHIO 44094

December 18, 1978

Attention: Mr. Gordon A. Allcott #21
D. B. Associates, Incorporated
1864 So. State Street #200
Salt Lake City, Utah 84115

Subject: Searjeant Lock Outs Literature

Dear Mr. Allcott:

Thank you for your inquiry regarding our Searjeant Safety Products.

Enclosed is one copy of the Searjeant Hand Tool Bulletin #120. The attached Bulletin is descriptive of our Searjeant Lock Outs.

Lock Outs are designed to prevent the accidental start up of equipment by one person or crew, while another person or crew is still working on that equipment.

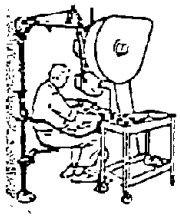
I sincerely hope that the attached bulletin provides the desired information, but should you have any questions or comments, please advise. Also, I hope that we will have the pleasure of serving you.

Very truly yours,

THE POSITIVE SAFETY MFG. COMPANY

J. K. Loeser
Vice President

JKL:cab
Enclosure



Member, National Safety Council

Phone 219 / 267-3813

ED-CO®
Lockouts - Safety Tools - Battery Lifters

ENGINEERING DEVELOPMENT CO., INC.
P.O. Box 1036
Warsaw, Indiana 46580
Phone: 219/267-3813

December 12, 1978

D. B. Associates, Inc.
Attn: Gordon A. Allcott #21
1864 South State Street #200
Salt Lake City, Utah 84115

Dear Sir:

In response to your letter of December 8th, we are enclosing catalogs and other materials which we hope will be of help in developing your safety information profile.

For many years I felt that lockouts should, as nearly as possible, be as strong and as safe as the padlocks used with them.

The enclosed spring steel lockout sample with the patented interlocking hasp will allow you to examine first hand it's strength and safety.

We formerly manufactured lockouts made of cast aluminum but discontinued them because they were definitely not safe.

I hope the enclosed information will be of help and if there is anything else we can do, please let us know.

Sincerely,

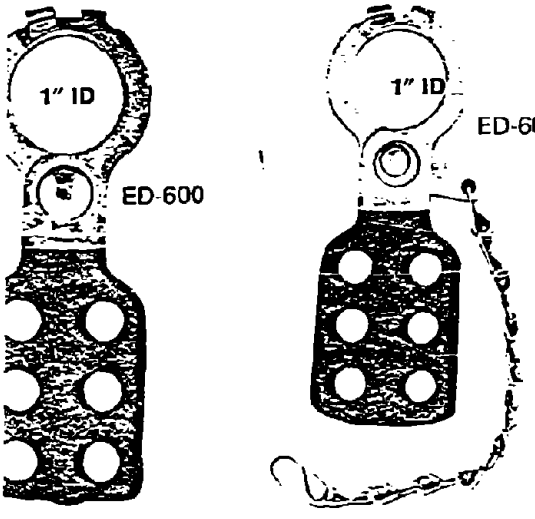
Albert K. Reque
President

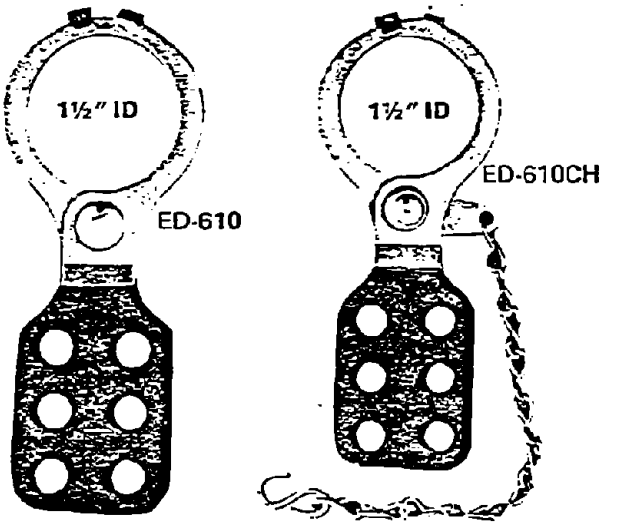
AKR/cjb
Encls.

ED-CO. Assures a Safer Lockout Program

ED-CO has made the first real improvement in lockouts since they were invented in 1915 by a railroad brakeman. Lockouts still do the same job, but until now they have all had a common fault. They could be pried open with a screwdriver or pliers with the padlocks still in place. And aluminum lockouts can be broken off by a strong pair of hands.

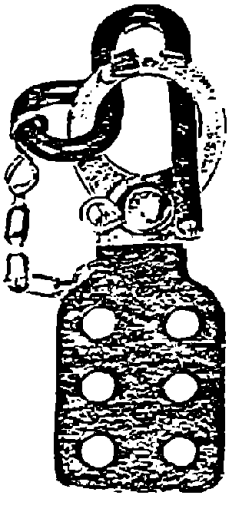
Hardened steel hasp with patented interlocking tabs can't be pried open, filed or sawed any easier than your padlocks. This safe lockout defeats attempts to circumvent OSHA requirements. Red vinyl coating. Off the shelf in either 1" or 1½" I.D. hasps. Packed 12 lockouts per box. F.O.B. Warsaw.



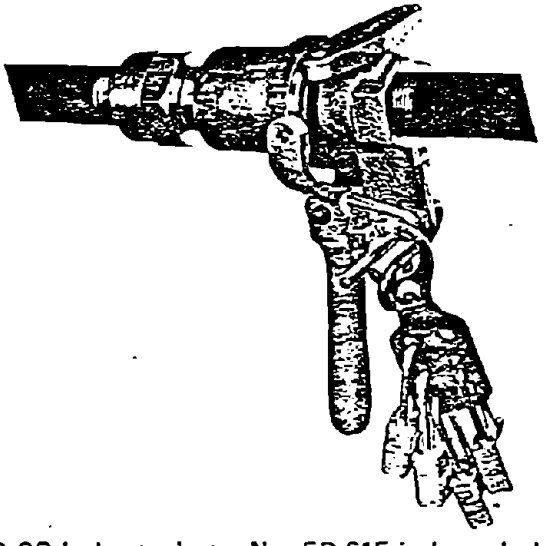


LOCKOUT ADAPTER

Permits use of ED-CO lockouts on steam, air or fluid lines. Made of ¼" zinc plated steel.



ED-615 Adapter Only
ED-615CH Adapter w/ED-600 lockout attached.



ED-CO lockout adapter No. ED-615 is shown locked to a Hunt valve with an ED-600 ED-CO lockout and ED-725 ED-CO padlocks with 2½" hasps.

APPENDIX D-1

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
UNITED STATES ARMY

GENERAL SAFETY
REQUIREMENTS

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402
Stock No. 008-022-00108-9

mechanical ventilation or respiratory protective equipment shall be provided.

07.B.13. No entry shall be permitted to manholes or unvented vaults unless forced ventilation is provided or the atmosphere is found to be safe by testing for oxygen deficiency and the presence of explosive gases or fumes. No man shall enter such a place unless wearing a life line tended by a man safely outside and having no other duties. A signal system shall be established.

07.B.14. When sufficient ventilation cannot be obtained without blocking the means of access, employees in the confined space shall be protected by air line respirators.

07.B.15. Exposure of employees to inhalation, ingestion, skin absorption, or contact with any material or substance at a concentration above those specified in the "Threshold Limit Values of Airborne Contaminates" of the American Conference of Governmental Industrial Hygienists, latest edition, shall be avoided.

07.B.16. Instruments shall be provided to test the atmosphere quantitatively for carbon monoxide, nitrogen dioxide, flammable or toxic gasses, dusts, mists, and fumes that occur in the tunnel or shaft. Tests shall be conducted as frequently as necessary to assure that the required quality and quantity of air is maintained. A record of all tests shall be maintained and kept available.

07.C. PROTECTIVE HEADGEAR

07.C.01. Protective headgear shall meet the requirements for class A or class B headgear as defined by ANSI Z89.2.

07.C.02. Protective headgear worn in proximity to electric lines, apparatus, and equipment shall be class B (ANSI Z89.2).

07.C.03. All points of entry to a hard hat area shall have a hard hat caution sign.

07.C.04. Hard hat areas shall be general areas such as construction, alteration, demolition, dredging, quarry, building, or similar related field activities rather than specific portions of a building or project.

07.C.05. All construction workers and supervisors and inspector personnel on construction work, floating plant, survey parties and stream discharge measuring parties, lock operating personnel, and all employees engaged in maintenance operations shall wear protective headgear while on the work site. Visitors at work sites shall be furnished and

sion. Splices shall have insulation equal to that of the cable.

15.D.13. Portable electric lighting used in moist and/or hazardous locations such as drums, tanks, vessels, and grease pits shall be operated at a maximum of 12 volts.

15.E. OVERHEAD LINES

15.E.01. Overhead transmission and distribution lines shall be carried on towers and poles which provide safe clearances over roadways and structures.

15.E.02. All electric power or distribution lines shall be placed underground in areas where there is extensive use of equipment having the capability of encroachment on the clear distances specified in 15.E.08.

15.E.03. Clearances shall be adequate for the movement of vehicles and for the operation of construction equipment.

15.E.04. Protection of outdoor trolleys and portable cables rated above 600 volts for supplying power to moveable construction equipment such as gantry cranes, mobile cranes, shovels, etc., shall conform to National Electric Safety Code requirements.

15.E.05. When it is necessary to transport machinery or equipment under overhead lines in a manner that encroaches on specified clearances, the job shall be scheduled so the lines can be de-energized.

15.E.06. Plant shall not be sited or placed within 20 feet (6.10 m) of overhead transmission or distribution lines.

15.E.07. Operations adjacent to overhead lines shall not be initiated until the governing utilities authorities have been notified and the operations coordinated therewith.

15.E.08. Operations adjacent to overhead lines are prohibited unless one of the following conditions is satisfied:

a. Power has been shut off and positive means taken to prevent the lines from being energized.

b. Equipment or any part thereof does not have the capability of coming within the following minimum clearance from energized overhead lines, and equipment has been positioned and blocked to assure no part thereof including cables can come within the following minimum clearances:

Power lines nominal system kv	Minimum required clearance
50 or under	10 feet (3.05 m)
69	12 feet (3.66 m)
115; 161	15 feet (4.57 m)
230; 285	20 feet (6.10 m)
345	25 feet (7.62 m)
500	35 feet (10.67 m)

A notice of the minimum required clearance shall be posted at the operator's position. Electric line derrick trucks and aerial lifts shall not be required to comply with this requirement. (ENG Form 3363).

15.E.09. Cage-type boom guards, insulating links, or proximity warning devices may be used on cranes, but the use of such devices shall not alter the requirements of any other regulation of this part even if such device is required by law or regulation. The insulating link shall be capable of withstanding a one-minute dry low frequency dielectric test of 50,000 volts, a.c. Boom guard and warning devices shall meet Air Force Technical Order, T.O. 36C-1-4.

15.E.10. In transit with no load and boom lowered, the equipment clearance shall be a minimum of 4 feet (1.2 m) for voltages less than 50 kv, and 10 feet (3.05 m) for voltages over 50 kv, up to and including 345 kv, and 16 feet (4.88 m) for voltages above 345 kv.

15.E.11. Any overhead wire shall be considered to be energized unless and until the person owning such line or operating officials of the electrical utility supplying the line assures that it is not an energized line and it has been visibly grounded.

15.E.12. Prior to work near transmitter towers where an electrical charge can be induced in the equipment or materials being handled, the transmitter shall be de-energized or test shall be made to determine if electrical charge is induced on the crane. The following precautions shall be taken when necessary to dissipate induced voltages:

a. The equipment shall be provided with an electrical ground directly to the upper rotating structure supporting the boom; and

b. Ground jumper cables shall be attached to materials being handled by boom equipment when electrical charge is induced while working near energized transmitters. Crews shall be provided with nonconductive poles having large alligator clips or other

similar protection to attach the ground cable to the load. Approved insulating-gloves will be used.

15.E.13. Combustible and flammable materials shall be removed from the immediate area prior to operations.

15.F. BATTERY CHARGING

15.F.01. Battery charging installations shall be located in areas designated for that purpose.

15.F.02. Batteries of the nonseal type shall be located in enclosures with outside vents, or in well ventilated rooms, so arranged as to prevent the escape of fumes, gases, or electrolyte spray into other areas.

15.F.03. Ventilation shall be provided to ensure diffusion of the gases from the battery to prevent the accumulation of an explosive mixture.

15.F.04. Racks and trays shall be substantial and treated to be resistant to the electrolyte.

15.F.05. Floors shall be of acid resistant construction or be protected from acid accumulations.

15.F.06. Facilities for quick drenching of the eyes and body shall be provided for emergency use in the immediate vicinity of the work area.

15.F.07. Facilities shall be provided for flushing and neutralizing spilled electrolyte, for fire protection, for protecting charging apparatus from mechanical damage, and for adequate ventilation for dispersal of fumes from batteries.

15.F.08. When charging batteries, the vent caps shall be kept in place to avoid electrolyte spray. Care shall be taken to assure vent caps are functioning.

15.G. LOCKOUT AND TAGGING OF CIRCUITS

15.G.01. Equipment or circuits that are de-energized shall be rendered inoperative and have tags attached at all points where such equipment or circuits can be energized.

15.G.02. A safe clearance procedure shall be established. See Section XXVIII.

15.H. HAZARDOUS LOCATIONS

15.H.01. All components and utilization equipment used in a hazardous location shall be chosen from among those listed by a nationally recognized testing laboratory, such as Underwriters'

SECTION XXVII

WORK IN CONFINED OR INCLOSED SPACES

27.A. GENERAL

27.A.01. Prior to entry into confined or inclosed spaces, a positive procedure to eliminate or control the hazards shall be established.

27.A.02. Procedure shall be in accordance with the Manufacturing Chemists Association, Safety Guide SG-10, Entering Tanks and Other Inclosed Spaces, or with Department of the Navy publication "Fuel Storage Tank Cleaning at the Shore Establishment" (NAVDOCKS P-342) or with the American Petroleum Institute's Recommended Practice, RP 2015, cleaning Petroleum Storage Tanks, as supplemented.

27.A.03. Inclosed spaces shall include storage tanks, tank cars, holds of vessels, process vessels with limited access, deep tanks, pits, vaults, shaft, or other confined spaces with one side open to the air and ventilation or exhaust ducts sewers, underground utility tunnels, or pipe lines with limited ventilation.

27.A.04. Hazards considered shall include toxic material and vapors, flammable materials and vapors, asphyxiating, corrosive, or radioactive material, and lack of oxygen.

27.A.05. Inclosed spaces shall be tested for contaminants and periodic check tests shall be made to assure an acceptable atmospheric condition.

27.A.06. Adequate mechanical exhaust ventilation shall be provided.

27.A.07. Protective clothing and respiratory protection shall not be used as a substitute for cleaning and ventilating of spaces.

27.A.08. No one shall enter an inclosed space containing a flammable atmosphere or one which, because of oxygen deficiency or contamination, may be immediately harmful to life in case of failure of the respiratory equipment.

27.A.09. Persons working in confined or inclosed spaces shall have a safety harness and life line with an attendant if the atmosphere has oxygen deficiency or contamination sufficient to require respiratory protection. The attendant shall be assigned no other duties. A signal system shall be established.

27.A.10. Disconnects in the power to any apparatus in or containing inclosed spaces shall be tagged and locked open whenever men are in the inclosed space.

27.A.11. All lines leading into or out of inclosed spaces shall be physically disconnected and capped or blanked to prevent flow or drainage into the space. The closing of valves will not be a satisfactory substitute.

27.A.12. Local exhaust ventilation shall be provided to eliminate contaminants generated by welding and other operations within inclosed spaces.

27.A.13. Only explosion-proof lighting shall be used in confined or inclosed spaces unless the atmosphere has been proven to be nonflammable.

27.A.14. The nozzle of air, inert gas, and steam lines or hoses, when used in the cleaning or ventilation of tanks and vessels that contain hazardous concentrations of flammable gases or vapors, shall be bonded to the tank or vessel shell. Bonding devices shall not be attached or detached in hazardous concentrations of flammable gases or vapors.

SECTION XXVIII

SAFE CLEARANCE PROCEDURE

28.A. GENERAL

28.A.01. A safe clearance procedure shall be established prior to work on or near electrical equipment or lines, mechanical equipment, pressure systems, and vessels and lines or equipment containing dangerous or hazardous material which can be energized, pressurized, activated, or released remotely or inadvertently.

28.A.02. A safe clearance is an operating procedure by which a person, acting individually or as a representative of a crew, may have a designated system or equipment removed from and held out of service until released by him.

28.A.03. Procedure shall include provisions for lockout, tagging, disconnecting, and blanking or capping of controls, switches, valves, and lines, or blocking of moving parts to prevent unauthorized operation.

28.A.04. A safe clearance procedure shall be required on all systems and equipment if unauthorized removal or return to service could result in injury, damage, loss of content, loss of protection, or loss of system operating capability.

APPENDIX D-2

HIGH VOLTAGE ELECTRICAL SAFETY ORDERS

State of California

California Administrative Code

TITLE 8. Industrial Relations

Chapter 3.2 California Occupational Safety and Health Regulations (CAL/OSHA)

Chapter 3.3 Occupational Safety and Health Appeals Board

Chapter 3.5 Occupational Safety and Health Standards Board

Chapter 4 Division of Industrial Safety (Industrial Safety Orders)

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Service Factor. The service factor of an electric machine is a multiplier which, applied to the rated output, indicates a permissible loading which may be carried continuously under the conditions for that service factor.

Service Point. The point of connection between the facilities of the serving agency and those of the consumer.

Shielded Cable. A shielded cable is a cable in which the insulated conductor(s) is enclosed in a conducting envelope(s), so constructed that substantially every point on the surface of the insulation is at ground potential or at some predetermined potential with respect to ground.

Stored-Energy Operation. Operation by means of energy stored in the mechanism, sufficient to complete a specified operation.

Stress Cone. (See Cable Terminations.)

Submersible. Submersible, as an adjective, describes a device which is so constructed that it will operate satisfactorily when completely or partially submerged in a liquid under specified conditions.

Suitable. Capable of performing with safety the particular function specified in these Orders.

Supervised. Under continuous or intermittent surveillance by a local or remote operator or automatic data processing system.

Switch (Hook) Stick. A device with an insulated handle and a hook or other means for performing stick operation of a switching device.

Switching Device. A device designed to close and/or open an electric circuit.

Switching Devices.

(A) Circuit Breaker. A device designed to open and close a circuit by non-automatic means, and to open the circuit automatically on a predetermined overload of current, without injury to itself when properly applied within its rating.

(B) Cutout. An assembly of a fuse support with either a fuseholder, fuse carrier, or disconnecting blade. The fuseholder or fuse carrrier may include a conducting element (fuse link), or may act as a disconnecting blade by the inclusion of a non-fusible member.

(C) Disconnecting Means. A device, or group of devices, or other means whereby the conductors of a circuit can be disconnected from their source of supply.

(D) Disconnecting (or Isolating) Switch (Disconnector, Isolator). A switch intended for isolating an electric circuit from the source of power. It has no interrupting rating and is intended to be operated only after the circuit has been opened by some other means.

(E) Interrupter Switch. A switch, capable of making, carrying, and interrupting specified currents.

(F) Oil Cutout (Oil-Filled Cutout). A cutout in which all or part of the fuse support and its fuse link or disconnecting blades are mounted in oil with complete immersion of the contacts and the fusible portion of the conducting element (fuse link), so that arc interruption by severing of the fuse link or by opening of the contacts will occur under oil.

Article 69. Switches

2833. Interrupter Switches.

(a) Rating.

(1) Continuous Current Rating. The continuous current rating of interrupter switches shall equal or exceed the maximum continuous current at the point of installation.

(2) Interrupting Rating. The current interrupting rating of interrupter switches shall equal or exceed the maximum current which the switch will be required to interrupt.

(3) Momentary Rating. The momentary rating of interrupter switches shall equal or exceed the asymmetrical short circuit current available at the switch location. The asymmetrical short circuit current shall include contributions from all connected sources of energy, such as other lines, generators, large motors, etc.

(4) Fault Closing Rating. Interrupter switches shall have a fault closing rating equal to or greater than the asymmetrical short circuit current which can occur at the switch location, unless suitable interlocks or operating procedures preclude the possibility of closing into a fault.

(5) Voltage Rating. The maximum voltage rating of interrupter switches shall equal or exceed the maximum circuit voltage.

(b) Enclosure. Interrupter switches installed indoors shall have a metal enclosure, or shall be installed in a room of at least 2-hour fire-resistive construction, or in a transformer vault.

(c) Readily and Safely Accessible. Interrupter switches shall be so installed that the center of the grip of the operating handle of the switch, when in its uppermost position, will be not more than 6½ feet above the floor or working platform.

(d) Switch Enclosures. Switch enclosures shall not be used as raceways for conductors feeding through, or tapping off, to other switches, unless adequate space is provided for this purpose.

(e) Switching of Conductors. The switching mechanism shall be arranged to be operated from a location where the operator is not exposed to energized parts and shall be arranged to open all ungrounded conductors of the circuit simultaneously with one operation. Switches shall be arranged to be locked in the open position. Metal-enclosed switches shall be operable from outside the enclosure.

(f) Installation Requirements. All switch blades shall be de-energized when the switch is in the open position.

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Article 69. Switches

Exception: The blades of switches used to connect a load to more than one source of supply may be energized when in the open position if (1) suitable barriers or enclosures are installed over the switches to prevent accidental contact with the energized switch blades; and (2) a conspicuous permanent sign is placed on the outside of the barrier or enclosure warning that the switch blades may be energized in any position.

(g) Fuses. Fuses installed with interrupter switches shall comply with the requirements of Article 72.

(h) Interrupter Switches. Interrupter switches, except those installed on poles or structures, shall be so located that they may be operated or maintained from a readily and safely accessible place.

(i) Identification. Interrupter switches shall have a permanent and legible nameplate including the following information: manufacturer's type or designation, continuous current rating, interrupting current rating, momentary current rating, fault closing rating, and maximum voltage rating.

(j) Stored Energy for Opening. The stored energy operator may be left in the uncharged position after the switch has been closed if a single movement of the operating handle charges the operator and opens the switch.

2834. Fused Interrupter Switches. Fused interrupter switches shall be so installed that all supply terminals shall be at the top of the switch enclosure.

Exception: Supply terminals are not required to be at the top of the switch enclosure if barriers are installed to prevent persons from accidentally contacting energized parts or dropping tools or fuses into energized parts.

2835. Disconnecting (Isolating) Switches. (a) General. Disconnecting switches may be single-pole or multiple-pole.

(b) Isolating Means. A suitable air break switching device shall be installed to isolate each oil switch from all sources of supply unless automatic disconnecting switchgear equipment of the metal-clad draw-out type is used.

Exception: In highly corrosive or flammable atmospheres, suitable isolating means other than air break shall be used, or the isolating means shall be installed in an enclosure approved for use in such locations of the particular hazard involved.

(c) Accessible to Qualified Persons Only. Disconnecting switches installed in locations where only qualified persons are permitted access shall be installed in suitable enclosures, or shall be elevated above the floor not less than clearances shown in Section 2935.

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Article 69. Switches

(d) Accessible to Other Than Qualified Persons. Disconnecting switches installed in any location where other than qualified persons have access shall be installed in suitable enclosures.

The door or cover of the enclosure shall be kept closed, except when opened for operation or inspection. If installed so that the bottom of the enclosure is less than 8 feet above the floor, the door or cover shall be kept locked.

When disconnecting switches are operable from outside the enclosure by a remote control mechanism, the operating handle or lever shall be kept locked when in either the open or closed position.

(e) Isolating Switches. Isolating switches shall be provided with suitable means for safe normal operation. This operating means may be an insulated hookstick, an insulated external operating handle, or remote control mechanism. Disconnecting switches shall provide a visible gap in the circuit adequate for the operating voltage.

Provision shall be made to observe the position of the blades of disconnecting switches. If viewing windows are provided, they shall be shatterproof, of adequate size, and suitably located to permit viewing of all contacts. Metal-enclosed switches other than those designed for hookstick operation shall be arranged to be locked in the open position. Multiple switches in the same enclosure shall be equipped with a connection diagram.

(f) Rating. Disconnecting switches shall have current and voltage ratings not less than the full-load current and operating voltage of the circuit. The momentary rating of disconnecting switches shall equal or exceed the asymmetrical short circuit current available at the switch location. The asymmetrical short circuit current shall include contributions from all connected sources of energy, such as other lines, generators, large motors, etc.

(g) Identification. The disconnecting switches shall have a permanent and legible nameplate including the following information: continuous current rating, maximum voltage rating, momentary current rating.

(h) Warning Signs. Unless so interlocked that they cannot be opened under load, disconnecting switches shall be provided with permanent warning signs having letters at least 2 inches high and reading as follows: "Warning—Disconnecting Switch—Do Not Open Under Load." When a group of disconnecting switches is installed in one room or enclosure, a single sign may be sufficent.

(i) Barriers. Suitable barriers shall be installed on both sides of each pole of disconnecting switches mounted indoors.

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Article 70. Circuit Breakers

2837. Ratings. (a) The continuous current rating of a circuit breaker shall equal or exceed the maximum continuous current at the point of installation.

(b) The interrupting rating of a circuit breaker shall equal or exceed the maximum fault current the circuit breaker will be required to interrupt, including contributions from all connected sources of energy.

(c) The closing rating of a circuit breaker shall equal or exceed the maximum asymmetrical fault current into which the circuit breaker can be closed.

(d) The momentary rating of a circuit breaker shall equal or exceed the maximum asymmetrical fault current at the point of installation.

(e) The rated maximum voltage of a circuit breaker shall equal or exceed the maximum circuit voltage.

2838. Grounding. Metallic enclosures for circuit breakers shall be grounded as required by Article 55.

2839. General. Circuit breakers shall comply with AN Standard C37.04—1964, and may be single pole or multi-pole. They shall:

(a) Have an accessible mechanical or other approved means for manual tripping, independent of control power.

(b) Be release free (trip free).

(c) Have positive means to prevent unintended operation during inspection or maintenance.

(d) When operated manually while energized, open and close the main contacts independent of the speed of the manual operation.

(e) Be equipped with a mechanical position indicator to show the open or closed position of the main contacts.

2840. Identification. (a) Circuit breakers shall have a permanent and legible nameplate including the following information: manufacturer's name or trademark, manufacturer's type or identification number, continuous current rating, interrupting rating in MVA or amperes, and maximum voltage rating.

(b) Modifications of a circuit breaker affecting its rating(s) shall be accompanied by an appropriate change in the identification data on the nameplate.

2841. Isolation. (a) Means shall be provided to isolate each circuit breaker or circuit breaker installation from all sources of potential.

(b) The isolating means shall provide a visible gap in the electrical circuit adequate for the operating voltage.

(c) Isolating or disconnecting switches (with no interrupting rating) shall be mechanically interlocked with the circuit breaker or shall be provided with prominently displayed caution signs in accordance with Article 69 to prevent switching load current.

(d) The isolating means may be individually or group operated.

APPENDIX D-3

GENERAL INDUSTRY
SAFETY ORDERS

APPENDIX D-3

(Register 77, No. 14—4-2-77)

INTRODUCTION

3200. Purpose. To fulfill the expressed social public policy of the State of California set forth in Article XX, Section 21 of the Constitution, to make full provision for securing safety in places of employment, these General Industry Safety Orders are promulgated for the guidance of employers and employees alike. Compliance with these orders may not in itself prevent occupational injuries or diseases, but will, it is believed, provide a safe environment which is a fundamental prerequisite in controlling injuries. Every employer should provide his supervisory staff with a copy of these orders and assure himself that each supervisor is familiar with those sections pertaining to the operations under his supervision.

NOTE: Authority cited for §§ 3200 to 4207, inclusive: Sections 6312 and 6500, Labor Code. Additional authority cited: Section 6502 and Section 142.3, Labor Code. Issuing agency: Division of Industrial Safety.

History: 1. New §§ 3200 to 4191, inclusive (except as otherwise noted) filed, and §§ 4201 to 4207, inclusive, refiled, 12-19-49 (Register 18, No. 8).

2. These orders supersede the orders heretofore separately published in Title 8, Chapter 1, Subchapter 4 entitled Dust, Fumes, Vapors and Gases Safety Orders, Engine Safety Orders, Gantry-Truck Safety Orders, General Safety Orders, Laundry Safety Orders, Mechanical Power Transmission Safety Orders, Steam Shovel and Locomotive Crane Safety Orders, Safety Orders for Women in Industry and Woodworking Safety Orders.

3201. Title. These safety orders shall be known as General Industry Safety Orders.

3202. Application. (a) These orders establish minimum standards and apply to all employments and places of employment in California as defined by Labor Code Section 6303; provided, however, that when the Occupational Safety and Health Standards Board has adopted or adopts safety orders applying to certain industries, occupations or employments exclusively, in which like conditions and hazards exist, those orders shall take precedence wherever they are inconsistent with the General Industry Safety Orders hereinafter set forth.

(b) After the date on which these Orders become effective, all installations shall conform to these Orders.

Exception: (1) Existing installations which are in compliance with safety orders, or variations therefrom, in effect prior to the effective date of these safety orders, unless the hazard presented by the installation or equipment is, in the judgment of the Chief of the Division, of such severity as to warrant control by the application of the applicable sections of these orders.

(2) Facsimiles, replicas, reproductions, or simulations when used for exhibition purposes when such compliance would be detrimental to their use for such purposes unless the hazard presented by the installation is, in the judgment of the Chief of the Division, of such severity as to warrant control by the application of the applicable sections of these Orders.

Introduction

(c) Regulations herein affecting building standards, apply to any building, or building alteration, or building modification for which construction is commenced after the effective date of the regulations. Date of commencement of construction, for the purpose of this section, shall be:

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3309. Drainage and Ventilation. (a) Trenches, tunnels and pits inside buildings shall have proper drainage and ventilation, or other means of protecting employees who work in these areas shall be provided as required in Group 16 of these orders.

(b) Sewage tanks and sewage sumps inside buildings shall be tightly covered and ventilated with a suitable vent to the outside atmosphere so located as not to endanger the safety of employees.

3310. Discharge Location. (a) The discharge opening from traps, drains, and blowoffs shall be located so as not to endanger the safety of employees.

(b) Internal combustion engine exhaust pipe outlets shall be so located that the exhaust vapors or gases will not be drawn into the air inlets of air compressors or air conditioning systems.

(c) Exhaust condensed steam shall not reduce the visibility around machinery or on walkways, roads, and runways to the extent that hazards to employees are created by such reduction in visibility.

(d) Relief or vent discharges of tanks or other closed vessels in which there are toxic or flammable vapors or gases, fumes, dusts or other harmful substances shall be located so as not to endanger the safety of employees. When it is impractical to divert dangerous concentrations of toxic or flammable vapors or gases, fumes, dusts or other harmful substances from such working areas, employees performing work of a transient nature in these areas shall be provided with, and shall wear, approved respiratory and personal protective equipment.

3311. Flarebacks. (a) To provide greater safety in lighting and relighting fixed fired equipment, the employer shall designate one or more employees who shall be trained in the safe lighting and relighting of the equipment. It shall be the responsibility of the employer to limit lighting and relighting of the equipment to employees so designated. It shall be the responsibility of the employees to follow the instructions given them. Copies of the instructions shall be prominently displayed at a location near the equipment.

(b) In addition to the above fire boxes or combustion chambers shall be purged or allowed sufficient time to vent themselves before a source of ignition is introduced into them.

(c) Provision shall be made, for the furnishing of extension lighting rods, where their use is indicated. Valves and other controls shall be so located as to avoid placing the employee in an unsafe position if a flareback occurs.

3312. Entering Combustion Chambers, Flues, Boilers or Unfired Steam Pressure Vessels. (a) Before employees are allowed to enter, through a manhole, the shell or drum of a steam boiler or an unfired steam pressure vessel for maintenance or repair, where such a boiler or pressure vessel is one of a battery of two or more boilers or vessels or is connected to another source of steam, the valves connecting to the steam header or other source of steam shall be closed and effectively blinded or two valves shall be installed with a bleeder between them and the valves shall be closed and bleeder open. Blow down valves and other valves on lines through which harmful material might accidentally flow back to the boiler or vessel shall be either sealed or closed and locked and the key retained by the employee or his supervisor while the employee is in the boiler or vessel. When lines are effectively blinded the valves need not be locked or sealed.

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(b) Employees shall not enter or be required to enter the fire boxes, flues or combustion chambers of fired apparatus until:

(1) The pilot light, fuel and steam lines to burners entering the fire box or combustion chamber have been blinded, disconnected or effectively closed by the use of two block valves with an open bleeder between them.

(2) All probability of ignition of any solid combustibles in the fire box or combustion chamber has been removed.

3313. Use of Solvents for Washing. (a) The substances listed below shall not be used to wash floors, walls, ceilings, machines, equipment, furniture or parts thereof except:

(1) In an adequately ventilated location;

(2) In vapor degreasers designed for use with a specific material or in similar units designed for such application;

(3) In vented, totally enclosed systems;

(4) Outdoors, in quantities of one gallon or less.

List of substances:

benzol	ether
carbon disulfide	pentachloroethane
carbon tetrachloride	tetrachloroethane
chloroform	tetrachloroethylene
	trichloroethylene

(b) Where the substances listed below are used for washing as permitted in (a), hand protection as prescribed in Article 10 shall be provided for exposed employees except where such use is infrequent and of short duration:

benzol	chloroform
carbon tetrachloride	trichloroethylene
	tetrachloroethylene

3314. Cleaning, Repairing, Servicing and Adjusting Prime Movers, Machinery and Equipment. (a) Machinery or equipment capable of movement shall be stopped and the power source de-energized or disengaged, and, if necessary, the moveable parts shall be mechanically blocked or locked to prevent inadvertent movement during cleaning, servicing or adjusting operations unless the machinery or equipment must be capable of movement during this period in order to perform the specific task. If so, the employer shall minimize the hazard of movement by providing and requiring the use of extension tools (e.g., extended swabs, brushes, scrapers) or other methods or means to protect employees from injury due to such movement. Employees shall be made familiar with the safe use and maintenance of such tools by thorough training.

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(b) Every prime mover or power driven machine equipped with lockable controls or readily adaptable to lockable controls shall be locked out or positively sealed in the "off" position during repair work and setting-up operations. Machines or prime movers not equipped with lockable controls or readily adaptable to lockable controls shall be considered in compliance with this order when positive means are taken, such as de-energizing or disconnecting the equipment from its source of power, or other action which will prevent the prime mover or machine from inadvertent movement. In all cases, accident prevention signs and/or tags shall be placed on the controls of the machines and prime movers during repair work.

Note: For the purpose of this order, "locked out" means the use of devices, positive methods and procedures, which effectively prevent unexpected or inadvertent movement of the machine or materials.

(c) The employer shall provide a sufficient number of accident prevention signs or tags and padlocks, seals or other similarly effective means which may be required by any reasonably foreseeable repair emergency. Signs, tags, padlocks, or seals shall have means by which they can be readily secured to the controls.

(d) During repair prime movers, machines, or equipment shall be effectively blocked or otherwise secured to prevent inadvertent movement if such movement can cause injury to employees.

(e) On repetitive process machines, such as numerical control machines, which require power or current continuance to maintain indexing and where repair, adjustment, testing, or setting up operations cannot be accomplished with the prime mover or energy source disconnected, such operations may be performed under the following conditions:

(1) The operating station where the machine may be activated must at all times be under the control of a qualified operator or craftsman.

(2) All participants must be in clear view of the operator or in positive communication with each other.

(3) All participants must be beyond the reach of machine elements which may move rapidly and present a hazard to them.

(4) Where machine configuration or size requires that the operator leave his control station to install tools, and where machine elements which may move rapidly, if activated, exist, such elements must be separately locked out by positive means.

(5) During repair procedures where mechanical components are being adjusted or replaced, the machine shall be de-energized or disconnected from its power source.

Note: "Participant" shall mean any other person(s) engaged in the repair, adjustment, testing, or setting up operation in addition to the qualified operator or craftsman having control of the machine operating station.

History: 1. Amendment filed 10-25-74; effective thirtieth day thereafter (Register 74, No. 43).

2. Repealer and new subsections (a), (b) and (c) and amendment of subsection (d) filed 5-12-77; effective thirtieth day thereafter (Register 77, No. 20).

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3516.[8] **Try Cock Manipulation.** Provisions shall be made whereby each of the try cocks can be manipulated by the employee while standing on the floor or platform on which the boiler is mounted.

3517.[9] **Steam Gage and Water Gage Glass Location.** The steam gage and water gage glasses shall be so located on the boiler that they can be clearly seen by the operator.

History: 1. New Appendix 1 (Sections 3228, 3274, 3311, 3312, 3310, 3514, 3515, 3516 and 3517) filed 12-14-76; effective thirtieth day thereafter (Register 76, No. 51).

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[8] Reprint of General Industry Safety Order, Section 3516, Try Cock Manipulation (Register 72, No. 23).

[9] Reprint of General Industry Safety Order, Section 3517, Steam Gage and Water Gage Class Location (Register 72, No. 23).

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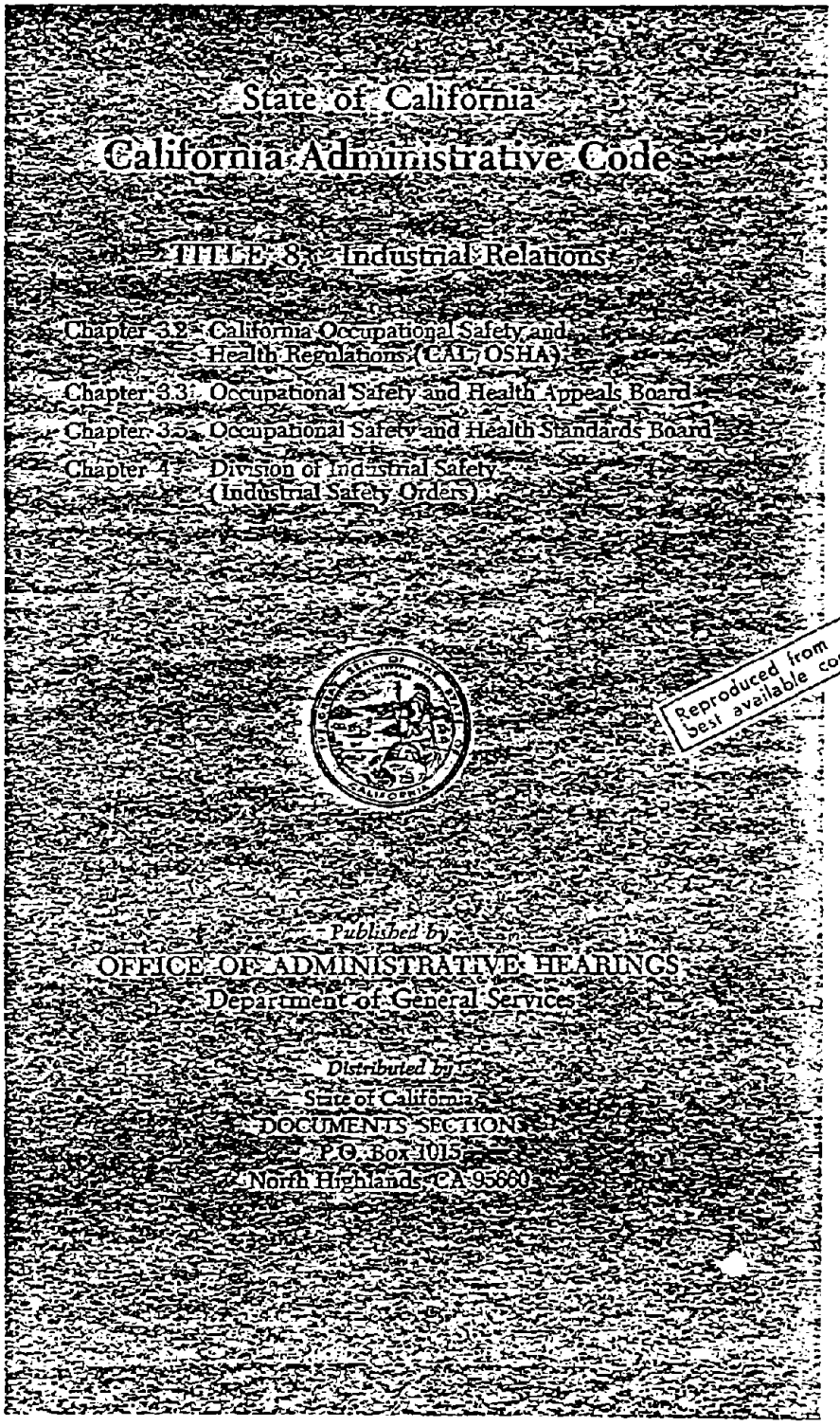
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APPENDIX D-4

(Register 78, No. 51—12-18-78)

SUBCHAPTER 2. BOILER AND FIRED PRESSURE VESSEL SAFETY ORDERS

Originally Printed 4-20-45, as Boiler Safety Orders
(Repealer and new Subchapter 2 filed 8-18-55)

Article

Detailed Analysis

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Section

Article 2. Definitions

Section

Article 3. Design and Construction

Section

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at least 2 means of feeding when required by paragraph PG-59(d)(2)(g) of the Code. A water supply system may be considered as a means of feeding water to the boiler where the water pressure in the system is not less than 6 percent above the pressure at which the safety valve is set to open. Feed piping, valves, and appurtenances shall be installed as required by the Code.

History: 1. Amendment filed 11-2-66; effective thirtieth day thereafter (Register 66, No. 38). Approved by State Building Standards Commission.

766. Water and Pressure Gages. All power boilers and high-temperature water boilers subject to these Orders shall be equipped with water gages and pressure gages as required by the Code.

History: 1. Amendment filed 11-2-66; effective thirtieth day thereafter (Register 66, No. 38). Approved by State Building Standards Commission.

767. Reinstallation of Secondhand Power Boilers. When a power boiler changes both ownership and location, the purchaser shall report the state serial number and the new proposed location to the division.

768. Access for Inspection and Cleaning. (a) Where it is impracticable to remove the hood of any vertical fire-tube boiler for inspection purposes, an access opening of the following dimensions shall be provided in the hood:

(1) For boilers not exceeding thirty-six inches (36") diameter, not less than six inches by eight inches (6" x 8") or equivalent area with a minimum dimension of six inches (6") in any direction.

(2) For boilers over thirty-six inches (36") diameter, not less than twelve inches by sixteen inches (12" x 16") or equivalent area with a minimum dimension of eleven inches (11") in any direction and a minimum diameter of fifteen inches (15") for circular openings.

(b) Access for inspection and cleaning shall be provided in all boiler settings. The minimum dimension of access openings shall be 12 inches by 16 inches, unless the size and/or design of the boiler setting is such that inspection and cleaning can be adequately accomplished through smaller openings.

(c) When 2 or more steam, high-temperature water, or hot water heating boilers having manhole openings are installed in battery or connected to a common main or header, each boiler having a manhole opening shall be fitted with 2 stop valves between the boiler and the common main or header. An ample free blow drain shall be provided between the stop valves and the discharge from the drain shall be visible to the operator while manipulating the drain valve.

History: 1. Amendment filed 11-2-66; effective thirtieth day thereafter (Register 66, No. 38). Approved by State Building Standards Commission.

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(c) Nothing in sections (a) and (b) above shall prohibit any qualified safety engineer employed by the Division from requiring any boiler to be prepared for inspection when in his opinion such inspection is necessary to determine the safety of the boiler.

History: 1. Amendment filed 11-2-66; effective thirtieth day thereafter (Register 66, No. 38). Approved by State Building Standards Commission.

772. Preparation of Boilers for Inspection. (a) The owner or user of a boiler or boilers herein required to be inspected shall, after 14 days' notice from the division, prepare the boiler for internal inspection.

If the owner or user finds the date set for inspection not to his convenience, he shall immediately advise the division, or qualified inspector, and ask for a postponement and state the reasons therefor, in which case the inspection date may be postponed for a period not to exceed thirty (30) days from the date first set for inspection.

(b) To prepare a boiler for internal inspection the water shall be drawn off and the boiler thoroughly washed. Manhole and handhold covers and washout plugs in the boiler feed lines and water column connections necessary for adequate inspection shall be removed and the furnace and combustion chamber thoroughly cooled and cleaned. Enough of the brickwork, refractory, or insulating material shall be removed to permit the qualified inspector to determine the condition of the boiler, furnace, or other parts and to enable the qualified inspector to obtain such data as is required at each annual inspection. The steam gage shall be removed for testing. At the discretion of the Division, data obtained by nondestructive examination may be used in lieu of visual inspection.

(c) The owner or user shall prepare the boiler for hydrostatic test when required by the qualified inspector. If the boiler to be hydrostatically tested is connected with other boilers that are under steam pressure, such connections shall be blanked off unless provided with double stop valves with a free blow drain between the valves.

(d) Before a resale inspection or other inspection of a secondhand boiler is made, the interior of the shell or drum may be required to be descaled and cleaned, such tubes shall be removed as the qualified inspector deems necessary to enable him to ascertain their condition, the lagging and brickwork shall be removed, and the exterior of the shell or drum shall be cleaned. No paint shall be applied before the inspection is made.

History: 1. Amendment filed 11-2-66; effective thirtieth day thereafter (Register 66, No. 38). Approved by State Building Standards Commission.

773. Identification of Boilers. (a) Qualified inspectors making the first field inspection of boilers required by these Orders to have a permit to operate, shall stamp on the boiler a state serial number (unless a state serial number has previously been stamped thereon) which shall become a permanent means of identification. This assigned number shall be made either by steel die figures not less than $\frac{5}{16}$-inch in height, or outlined by means of center punch dots, with figures not

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while in operation to determine that the heater is operating safely within the set operating conditions and provided that each of the following are complied with:

(1) The heater is equipped with automatic safety shutdown devices for each of the following conditions:

(A) Excessive tube skin or steam temperature
(B) Excessive steam pressure
(C) Flame failure
(D) Inadequate combustion air

(2) Within intervals not to exceed every 60 days of operation of the heater, the following inspection checks shall be performed by a person familiar with the equipment and who has been properly instructed in making such checks:

(A) Each safety shutdown device shall be tested for proper operation.

(B) All external piping and wiring shall be visually checked for obvious defects.

(C) All indicating gages shall be checked for proper calibration.

Equipment defects found in (A), (B), or (C) above shall be corrected before continuing the boiler in service.

(3) At the time of the annual inspection of the heater and its accessory equipment, all automatic operating controls and automatic safety shutdown devices which are not failsafe shall be serviced as necessary to assure their continued reliability to include:

(A) Replace vacuum tubes and check sensing devices in the flame-failure system and replace if not operating properly.

(B) Test all coils, diaphragms, and other operating parts of all safety shutdown and operating control valves.

Such servicing shall be done by a person familiar with such controls and devices and who has been properly instructed in their servicing.

(4) A record shall be kept of the inspection and maintenance operations required by (2) and (3) above and this record shall be available to the certified inspector at the time of the annual inspection.

NOTE: Authority cited: Sections 6312, 6500 and 6502, Labor Code.

History: 1. Amendment filed 12-17-65; effective thirtieth day thereafter (Register 65, No. 24).
2. Amendment filed 11-2-66; effective thirtieth day thereafter (Register 66, No. 38). Approved by State Building Standards Commission.
3. Amendment of subsection (b)(2) filed 12-31-74; effective thirtieth day thereafter (Register 75, No. 1).

782. **Safe Practices.** (a) The following Safety Orders from Title 8, California Administrative Code are hereby made a part of these orders:

(1) General Industry Safety Order 3228(i): Number of Exits, Boiler, Furnace and Incinerator Rooms. See Appendix 1.

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(2) General Industry Safety Order 3274: Valves and Controls. See Appendix 1.

(3) General Industry Safety Order 3311: Flarebacks. See Appendix 1.

(4) General Industry Safety Order 3312: Entering Combustion Chambers, Flues, Boilers or Unfired Steam Pressure Vessels. See Appendix 1.

(5) General Industry Safety Order 3310: Discharge Location. See Appendix 1.

(6) General Industry Safety Order 3514: Tubular Gage Guard. See Appendix 1.

(7) General Industry Safety Order 3515: Try Cock Discharge Receptacle. See Appendix 1.

(8) General Industry Safety Order 3516: Try Cock Manipulation. See Appendix 1.

(9) General Industry Safety Order 3517: Steam Gage and Water Gage Glass Location. See Appendix 1.

(b) All fired boilers, not included in Sections 763 and 771, equipped with controls to permit the burners to be ignited automatically shall be equipped with a full safety pilot or other device that will provide equivalent safety. Such safety pilot or other device shall be of a type that will de-energize the electrical circuit and/or cause the main burner fuel valve to close within the following burner input and time limits.

400,000 BTU/HR and under	90 seconds
400,001 to 2,500,000 BTU/HR	9 seconds
Over 2,500,000 BTU/HR	5 seconds

(c) All dampers used in smokestacks of boilers which use natural draft shall have suitable openings to vent the furnace.

(d) When portable electric lights are used inside any boiler or pressure vessel they shall be equipped with a vaportight globe, substantial guard, rugged nonconducting lamp holder and handle, and shall have type S cord or equivalent sufficiently long to reach to a plug-in or junction box outside the vessel.

History: 1. Repealer and new subsection (b) filed 8-12-76; effective thirtieth day thereafter (Register 76, No. 33). For prior history, see Register 74, No. 42.
2. Amendment of subsection (a) filed 12-14-76; effective thirtieth day thereafter (Register 76, No. 51).

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APPENDIX 1

3228. (i)[1] Boiler, Furnace and Incinerator Rooms. Any room containing a boiler, furnace, incinerator, or other fuel-fired equipment must be provided with two means of egress when both of the following conditions exist:

(1) The area of the room exceeds 500 square feet, or

(2) The largest single piece of fuel-fired equipment exceeds 1,000,000 B.t.u. per hour input capacity.

Exception: Rooms housing high-pressure boilers (greater than 15 lbs. psi) where either of the conditions listed in (1) or (2) exist shall be provided with 2 exits.

If two means of egress must be provided, one may be a fixed ladder. The means of egress must be separated by a horizontal distance not less than half the greatest horizontal dimension of the room. All openings shall be protected with a self-closing fire assembly having a minimum one-hour fire-protection rating. Where oil-fired boilers are used, a 6-inch noncombustible sill (dike) shall be provided. There shall be no interior openings between any occupancy where flammable or explosive concentrations may be expected to accumulate.

3274.[2] Valves and Controls. (a) Where pipe valves require daily manipulation and are so located that they cannot be reached or operated from the floor, a permanent platform or other safe means of operation shall be provided.

(b) Valves or other controls shall not be so located that their manipulation exposes the employee to hazards of dangerous moving parts of prime movers, machines, or transmission equipment. (Title 24, T8-3274)

3311.[3] Flarebacks. (a) To provide greater safety in lighting and relighting fixed fired equipment, the employer shall designate one or more employees who shall be trained in the safe lighting and relighting of the equipment. It shall be the responsibility of the employer to limit lighting and relighting of the equipment to employees so designated. It shall be the responsibility of the employees to follow the instructions given them. Copies of the instructions shall be prominently displayed at a location near the equipment.

(b) In addition to the above fire boxes or combustion chambers shall be purged or allowed sufficient time to vent themselves before a source of ignition is introduced into them.

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[1] Reprint of General Industry Safety Order, Section 3228 (i), Exits, Boiler, Furnace and Incinerator Rooms, of the California Administrative Code, Title 8, Subchapter 7 (Register 72, No. 23).

[2] Reprint of General Industry Safety Order, Section 3274, Valves and Controls, of the California Administrative Code, Title 8, Subchapter 7 (Register 76, No. 29).

[3] Reprint of General Industry Safety Order, Section 3311, Flarebacks, of the California Administrative Code, Title 8, Subchapter 7 (Register 72, No. 23).

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(c) Provision shall be made, for the furnishing of extension lighting rods, where their use is indicated. Valves and other controls shall be so located as to avoid placing the employee in an unsafe position if a flareback occurs.

3312.[4] **Entering Combustion Chambers, Flues, Boilers or Unfired Steam Pressure Vessels.** (a) Before employees are allowed to enter, through a manhole, the shell or drum of a steam boiler or an unfired steam pressure vessel for maintenance or repair, where such a boiler or pressure vessel is one of a battery of two or more boilers or vessels or is connected to another source of steam, the valves connecting to the steam header or other source of steam shall be closed and effectively blinded or two valves shall be installed with a bleeder between them and the valves shall be closed and bleeder open. Blow down valves and other valves on lines through which harmful material might accidentally flow back to the boiler or vessel shall be either sealed or closed and locked and the key retained by the employee or his supervisor while the employee is in the boiler or vessel. When lines are effectively blinded the valves need not be locked or sealed.

(b) Employees shall not enter or be required to enter the fire boxes, flues or combustion chambers of fired apparatus until:

(1) The pilot light, fuel and steam lines to burners entering the fire box or combustion chamber have been blinded, disconnected or effectively closed by the use of two block valves with an open bleeder between them.

(2) All probability of ignition of any solid combustibles in the fire box or combustion chamber has been removed.

3310.[5] **Discharge Location.** (a) The discharge opening from traps, drains, and blowoffs shall be located so as not to endanger the safety of employees.

3514.[6] **Tubular Gage Guard.** (a) Tubular water gages on portable steam boilers shall be protected with a substantial guard affording protection at least equivalent to that obtained by an enclosure of one-half (½) inch wire mesh of No. 18 U.S.S. gage.

(b) (NI) Every portable steam boiler shall be equipped with liquid level gages of the reflex type.

3515.[7] **Try Cock Discharge Receptacle.** Where discharge presents hazards to employees, try cocks shall discharge into a funnel, dripper, or other similar receptacle, which in turn shall be piped to a safe place of discharge.

[4] Reprint of General Industry Safety Order, Section 3312, Entering Combustion Chambers, Flues, Boilers or Unfired Steam Pressure Vessels, of the California Administrative Code, Title 8, Subchapter 7 (Register 72, No. 23).

[5] Reprint of General Industry Safety Order, Section 3310(a), Discharge Location (Register 72, No. 23).

[6] Reprint of General Industry Safety Order, Section 3514, Tubular Gage Guard (Register 72, No. 23).

[7] Reprint of General Industry Safety Order, Section 3515, Try Cock Discharge Receptacle (Register 72, No. 23).

APPENDIX D-5

THE STATE OF UTAH

BOILER AND PRESSURE VESSEL RULES AND REGULATIONS

EFFECTIVE
JULY 1, 1975

ISSUED BY

THE INDUSTRIAL COMMISSION OF UTAH
SAFETY DIVISION

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(b) EXTERNAL INSPECTION means an inspection made when a boiler or pressure vessel is in operation, if possible.

8. COMMISSION, NATIONAL BOARD means the commission issued by the National Board to a holder of a Certificate of Competency who desires to make shop inspections or field inspections in accordance with the National Board By-laws and whose employer submits the inspector's application to the National Board for such commission.

9. COMMISSION means the Industrial Commission, State of Utah.

10. COMMISSIONER means the Commissioner in charge of the Safety Division.

11. CONDEMNED BOILER OR PRESSURE VESSEL means a boiler or pressure vessel that has been inspected and declared unsafe, or disqualified by legal requirements by the Chief or Deputy Inspector who has applied a stamping or marking designating its condemnation.

12. DIVISION means the Boiler and Pressure Vessel Safety Division of the Industrial Commission of Utah.

13. EXISTING INSTALLATION means and includes any boiler or pressure vessel constructed, installed, and placed in operation or contracted for before July 1, 1945.

14. INSPECTION CERTIFICATE means a certification issued by the Inspector for the operation of a boiler or pressure vessels.

15. INSPECTOR means the Chief Inspector, or any Deputy Inspector, or Special Inspector.

(a) CHIEF INSPECTOR means the Chief Boiler and Pressure Vessel Inspector for the State of Utah.

(b) DEPUTY INSPECTOR means any inspector appointed by the Commissioner.

(c) SPECIAL INSPECTOR means an inspector holding a Utah Certificate of Competency, and who is regularly employed by an insurance company authorized to insure against loss from explosion of boilers or pressure vessels in this state and owner or user as defined in Part II, Para. II.

16. REPAIR means work necessary to return a boiler or pressure vessel to a safe and satisfactory operating condition.

(a) MAJOR REPAIR means a repair upon which the strength of a boiler or pressure vessel will depend.

(b) ALTERATION means a change in a boiler or pressure vessel that substantially alters the original design requiring consideration of the effect of the change on the original design. It is not intended that the addition of nozzles smaller than an unreinforced opening size be considered an alteration.

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PART II - ADMINISTRATION

1. MINIMUM CONSTRUCTION STANDARDS FOR BOILERS AND PRESSURE VESSELS

(a) All boilers and pressure vessels used in industrial or manufacturing establishments, business establishments, sawmills, construction jobs and every place where workmen or the public may be exposed to the risks thereof shall be designed, constructed, inspected, stamped and installed in accordance with the applicable ASME Boiler and Pressure Vessel Code and the latest Addenda thereto, in effect, and these Rules and Regulations.

(b) It is preferable that all boilers and pressure vessels be registered with the National Board. If boilers and pressure vessels are not registered with the National Board, then it shall be the manufacturer's responsibility to send one legible copy of the manufacturer's data report to the Industrial Commission of Utah, prior to installation in this State.

(c) Pressure Piping - Piping external to power boilers from the boiler to the first stop valve of a single boiler, and to the second stop valve in a battery of two or more boilers is subject to the requirements of ASME Power Boiler Code, Section I, and the design, fabrication, installation and testing of the valves and piping shall be in conformity with the applicable paragraphs of ASME Code.

(d) State of Utah Special - If a boiler or pressure vessel is of special design or one that cannot bear ASME stamping, details of the proposed construction, including shop drawings, shall be submitted to the Chief Inspector and approval as "State of Utah Special" for construction and installation must be obtained from the Commission before construction is started.

(e) Before secondhand equipment is installed, application for permission to install shall be filed by the owner or user with the Chief Inspector and approval obtained. Such equipment entering the State of Utah shall be subject to the requirements of (a) and (b) above.

(f) Electric boilers, subject to the requirements of the Safety Act and these Rules and Regulations, shall bear the Underwriters' Laboratories label on the completed unit or assembly by the manufacturer. This label shall be in addition to the code symbol stamping requirements of the ASME and the National Board.

2. FREQUENCY OF INSPECTIONS OF BOILERS AND PRESSURE VESSELS

(a) Power boilers shall receive a certificate inspection annually which shall be an internal inspection. Such boilers shall also be inspected externally annually, while under operating conditions.

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an indicator to show whether the valve is open or closed and is designed to withstand the required hydrostatic pressure test of the boiler.

When a stop valve is so located that water can accumulate, ample drains shall be provided. The drainage shall be piped to a safe location and shall not be discharged on the top of the boiler or its setting.

When boilers provided with manholes are connected to a common steam main, the steam connection from each boiler shall be fitted with two stop valves having an ample free-blow drain between them. The discharge of the drain shall be visible to the operator while manipulating the valves and shall be piped clear of the boiler setting. The stop valves shall consist preferably of one automatic nonreturn valve (set next to the boiler) and a second valve of the outside-screw-and-yoke type.

11. BLOWOFF CONNECTION

The construction of the setting around each blowoff pipe shall permit free expansion and contraction. Careful attention shall be given to the problem of sealing these setting openings without restricting the movement of the blowoff piping.

All blowoff piping, when exposed to furnace heat, shall be protected by firebrick or other heat-resisting material, so constructed that the piping may be inspected readily.

Each boiler shall have a blowoff pipe, fitted with a valve or cock, in direct connection with the lowest water space. Cocks shall be of the gland or guard type and suitable for the pressure allowed. The use of globe valves shall not be permitted. When the maximum allowable working pressure exceeds 100 psig, each blowoff pipe shall be provided with two valves or a valve and cock.

Blowoff piping shall comply with the requirements of the ASME Code, Section I, from the boiler to the valve or valves, and shall be run full size without use of reducers or bushings. The piping shall not be galvanized.

All fittings between the boiler and blowoff valve shall be of steel. In case of renewal of blowoff pipe or fittings, they shall be installed in accordance with the rules and regulations for new installations of the ASME Code.

12. REPAIRS AND RENEWALS OF BOILER FITTINGS AND APPLIANCES.

Whenever repairs are made to fittings or appliances or it becomes necessary to replace them, such repairs or replacements shall comply with the latest requirements of the ASME Code, and the National Board Inspection Code.

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PART IV - GENERAL REQUIREMENTS

1. INSPECTION OF BOILERS AND PRESSURE VESSELS

All boilers and pressure vessels, not exempt by the Act, shall be inspected internally and externally, as provided by these Rules and Regulations, by an inspector. The owner or user shall prepare each boiler or pressure vessel for such inspection and for appropriate pressure tests, whenever necessary. Following is a recommended general guide in preparing equipment for an internal inspection:

(a) BOILERS

(1) Cool the boiler, furnace and setting sufficiently to prevent damage to any part.

(2) Drain and wash thoroughly internal parts to be inspected.

(3) Remove manhole and handhole plates, and wash out, drain and inspection plugs.

(4) Remove a sufficient number of grates of internally fired boilers, as requested by the inspector.

(5) Remove brickwork, refractory and insulation, as required by the inspector, to determine condition of boiler, headers, tubes, furnace, structural supports, and other parts.

(6) Prevent leakage of water, steam or vapors into boiler interiors that would endanger personnel.

(7) Before opening the manhole or handhole covers and entering any parts of the steam-generating unit connected to a common header with other boilers, the nonreturn and steam stop valves must be closed, tagged, and preferably padlocked, and drain valves or cocks between the two valves opened. The feed and check valves must be closed, tagged, and preferably padlocked, and drain valves or cocks located between the two valves opened. After draining the boiler, the blowoff valves shall be closed and padlocked. Blowoff lines, where practicable, shall be disconnected between pressure parts and valves. All drains and vent lines shall be opened.

(8) Prepare the pressure gage for testing.

(b) PRESSURE VESSELS

(1) Remove manhole and handhole plates, cleaning and inspection plugs.

(2) Clean internal surfaces and adequately ventilate all interior spaces.

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(3) Isolate the unit to the extent that internal temperature, pressure and environment are not injurious to personnel and are under strict control during complete inspection.

(4) Remove linings or coverings as required by the inspector, to determine true physical condition of the vessel and its components

(5) Make protective and regulating controls readily accessible for inspection.

(6) Prepar the pressure gages for testing.

2. BOILERS AND PRESSURE VESSELS IMPROPERLY PREPARED FOR INSPECTION

If a boiler or pressure vessel has not been properly prepared for an internal inspection, or if the owner or user fails to comply with the requirements for a hydrostatic test as set forth in these Rules and Regulations, the inspector may decline to make the inspection or test and the inspection certificate shall be withheld until the owner or user complies with the requirements.

3. REMOVAL OF COVERING TO PERMIT INSPECTION

If the boiler or pressure vessel is jacketed so that the seams of shells, drums, or domes cannot be seen, sufficient jacketing, setting wall, or other form of casing or housing shall be removed to permit reasonable inspection of the seams and so that the size of the rivets, pitch of the rivets, and other data necessary to determine the safety of the boiler or pressure vessel may be obtained, provided such information cannot be determined by other means.

4. LAP-SEAM CRACK

The shell of a pressure vessel, in which a lap-seam crack is discovered along a longitudinal riveted joint, shall be immediately discontinued from use. If the equipment is not more than 15 years of age, a complete new course of the original thickness may be installed at the discretion of the inspector and after approval by the Chief Inspector. Patching is prohibited. (by "lap-seam crack" is meant the typical crack frequently found in lap seams, extending parallel to the longitudinal joint and located either between or adjacent to rivet holes).

5. HYDROSTATIC PRESSURE TESTS

A hydrostatic pressure test, when applied to boiler or pressure vessels, shall not exceed 1 1/2 times the maximum allowable working pressure. The pressure shall be under proper control so that in no case shall the required test pressure be exceeded by more than 2 percent.

During a hydrostatic test involving pressures in excess of the lowest safety valve setting, the safety valve or valves shall be removed or each

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UTAH OCCUPATIONAL SAFETY AND HEALTH

RULES AND REGULATIONS

GENERAL STANDARDS

UTAH STATE INDUSTRIAL COMMISSION

EFFECTIVE DATE JANUARY 1, 1974

REVISION No. 1 - FEBRUARY 2, 1976

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place so the necessary help can be obtained in case of emergency. This list shall include:

(1) Responsible supervision (superintendent or equivalent)
(2) Doctor
(3) Hospital
(4) Ambulance
(5) Fire Department
(6) Sheriff or Police

15.9 Lockouts and Tagging.

15.9.1 Where there is danger of machinery being started or electrical circuits being energized while repairs or maintenance work is being done, the electrical circuits shall be locked open and/or tagged and the employee in charge (the one who places the lock) shall keep the key until the job is completed or he is relieved from the job, such as by shift change or other assignment. It if it expected that the job may be assigned to other workmen, he may remove his lock provided the supervisor or other workman apply their lock and tag immediately. Where there is danger of machinery being started or of steam or air creating a hazard to workmen while repairs on maintenance work is being done, the employee in charge shall disconnect the lines or lock and tag the main valve closed or blank the line on all steam driven machinery, pressurized lines or lines connected to such equipment if they could create a hazard to workmen.

15.9.2 After tagging and lockout procedures have been applied, machinery, lines, and equipment shall be checked to insure that they cannot be operated.

15.9.3 If locks and tags cannot be applied, conspicuous tags made of nonconducting material and plainly lettered, "MEN WORKING" followed by the other appropriate wording, such as "Do not close this switch" shall be used.

15.9.4 When in doubt as to procedure, the workman shall consult his supervisor concerning safe procedure.

15.10 Safety-Type hooks shall be used wherever possible.

15.11 Emergency Showers, Bubblers, and Eye Washers.

15.11.1 Readily accessible, well marked, rapid action safety showers and eye wash facilities must be available in areas where strong acid, caustic or highly oxidizing or irritating chemicals are being handled. (This is not applicable where first aid practices specifically preclude flushing with running water).

15.11.2 Showers should have deluge type heads, easily accessible, plainly marked and controlled by quick opening valves of the type that stay open. The valve handle should be equipped with a pull chain, rope, etc., so the blinded employee will be able to more easily locate the valve control. In addition, it is recommended that the floor platform be so constructed to actuate the quick opening valve. The shower should be capable of supplying large quantities of water under moderately high pressure. Blankets should be located so as to be reasonably accessible to the shower area.

15.11.3 Eye wash fountain or a ready source of running tap water, such as drinking fountain or hose with a gentle flow of water should be immediately available for eye irrigation. All safety equipment should be inspected and tested at regular intervals, preferably daily and especially during freezing

APPENDIX E

NIOSHTIC FOREIGN REFERENCES

With Lockout and Regulation Notations

APPENDIX E

NIOSHTIC FOREIGN REFERENCES

44911 M3
CONTROL: NIOSH-C003742
ACCESS: CIS 819-1969
SOURCE:
TITLE: RECOMMENDATIONS FOR THE CORRECT APPLICATION OF LAWS AND REGULATIONS RELATING TO CRANES AND HOISTS (OTHER THAN PASSENGER AND GOODS LIFTS)
REFER1: CAHIERS DE NOTES DOCUMENTAIRES - SECURITE ET HYGIENE DU TRAVAIL, NO. 54, NOTE NO. 625-54-69, PAGES 19-43
REFER2:
PUBDATE: 69/03/00

CONCH HOISTING-EQUIPMENT, MACHINE-GUARDING, SAFETY-DEVICES, PROTECTIVE-EQUIPMENT, ELECTRICAL-HAZARDS, CONSTRUCTION-INDUSTRY
65 RECOMMENDATIONS PUT FORWARD BY A JOINT SUB-COMMITTEE FORMED BY FRENCH BUILDERS' ASSOCIATIONS TO ESTABLISH A COMMON INTERPRETATION OF REGULATIONS GOVERNING CRANES AND HOISTS. THE FOLLOWING ASPECTS ARE DEALT WITH: INSTALLATION OF EQUIPMENT AND TRACKS; GUARD RAILS AND TOEBOARDS; ELECTRICAL SUPPLY (CONTACTORS AND CIRCUIT-BREAKERS); EARTHING; DESIGN OF OPERATORS' CABINS AND ACCESS TO SAME; GUARDING OF MOVING PARTS (GEARS, ROLLERS AND GUIDE PULLEYS); SAFETY HOOKS FOR CRANES; BRAKING DISTANCES; LOWERING OF LOADS; PULLEY BLOCKS; ACCESS FOR INSPECTION AND MAINTENANCE; TESTING; PROTECTION OF MOTORS; LOCKING OF CONTROL GEAR. AN APPENDIX CONTAINS TABLES AND ILLUSTRATIONS EXPLAINING THE APPLICATION OF STATUTORY ELECTRICAL SAFETY MEASURES. (FRENCH)

48983 M3
CONTROL: NIOSH-00047344
ACCESS: CIS 74-1831
SOURCE:
AUTHOR: HOMBERGER, E.
TITLE: CONSTRUCTION PRINCIPLES FOR SWITCHING STATIONS TO ENSURE OPTIMAL SAFETY OF PERSONNEL
REFER1: BULLETIN DES SCHWEIZERISCHEN ELEKTROTECHNISCHEN VEREINS - BULLETIN DE L'ASSOCIATION SUISSE DES ELECTRICIENS, VOL. 64, NO. 4, PAGES 245-251
REFER2:
PUBDATE: 73/02/17

CONCH BUSKA, ELECTRICAL-HAZARDS, ACCIDENT-PREVENTION, ELECTRICAL-EQUIPMENT, SAFETY-ENGINEERING, SAFETY-EQUIPMENT, SAFETY-DEVICES, HUMAN-FACTORS, ELECTRICAL-GROUNDING, DESIGN
AS SAFETY DEVICES TO PROTECT AGAINST ELECTRIC CONTACT DURING THE OPERATION OF, AND WORK IN, HIGH-VOLTAGE SWITCHING STATIONS ARE REVIEWED, INCLUDING: TRANSPARENT SCREENS MADE OF HARDENED GLASS, LOCKING OF TRIPPED CIRCUIT-BREAKERS, ERGONOMIC DESIGN OF EQUIPMENT AND CONTROLS, EARTHING, ENCLOSURE OF EQUIPMENT. THE EFFECT OF THE SCHEMATIC ARRANGEMENT OF A SYSTEM ON OCCUPATIONAL SAFETY IS INDICATED AND THE HAZARDS PRESENT IN VERY HIGH-VOLTAGE AND LOW-VOLTAGE EQUIPMENT ARE DISCUSSED. A SUMMARY OF THE MAIN SAFETY RULES IS GIVEN. (FRENCH)

APPENDIX E

NIOSHTIC FOREIGN REFERENCES

SOURCE:
TITLE: DIRECTIVES RELATING TO PACKING MACHINES
REFER1: CENTRAL OFFICE FOR ACCIDENT PREVENTION, FEDERATION OF INDUSTRIAL MUTUAL ACCIDENT INSURANCE ASSOCIATION, BONN, ZH 1/413, CARL HEYMANNS VERLAG KG, COLOGNE, 11 PAGES
REFER2:
PUBDATE: 69/00/00

00NCH STANDARDS, REGULATIONS, MACHINERY, SAFETY-DEVICES, ACCIDENT-PREVENTION
65 FOLLOWING INTRODUCTORY PARAGRAPHS INDICATING THE SCOPE OF THESE DIRECTIVES AND DEFINING BASIC TERMS, SECTIONS ARE DEVOTED TO CONSTRUCTION AND EQUIPMENT (NIP-POINTS, ROTATING PARTS, EMERGENCY SWITCHES, LOCKING DEVICES, WARNING DEVICES AND SWITCHES, FEEDING UNDER PRESSURE AND WITH HAZARDOUS GOODS) AND OPERATION. (GERMAN)

2522 M3
CONTROL: NIOSH-00016195
ACCESS: CIS 1507-1970
SOURCE:
TITLE: THE ELECTRICAL EQUIPMENT OF MACHINE TOOLS FOR GENERAL USE
REFER1: ELECTROTECHNICAL ASSOCIATION, PARIS, STANDARD NO. NF C 79-100, 33 PAGES, 51 REFERENCES
REFER2:
PUBDATE: 69/09/00

00NCH MACHINE-TOOLS, ELECTRICAL-HAZARDS, SAFETY-DEVICES, SAFETY-PRECAUTIONS, ELECTRIC-CURRENT
65 THIS STANDARD WAS ISSUED TO TAKE ACCOUNT OF PUBLICATION 204-1 OF 1965 OF THE INTERNATIONAL ELECTROTECHNICAL COMMISSION. IT ARE DESIGNED THE ELECTRICAL EQUIPMENT OF MACHINE TOOLS FOR GENERAL USE, INTENDED FOR CONNECTION TO SYSTEMS OF A NOMINAL VOLTAGE BETWEEN CONDUCTORS NOT EXCEEDING 600 VOLTS FOR BOTH DIRECT AND ALTERNATING CURRENT. SECTIONS ARE DEVOTED TO: MARKING AND INSTRUCTIONS FOR INSTALLATION, MAINTENANCE AND OPERATION; GENERAL SPECIFICATIONS RELATING TO ELECTRICAL SUPPLY, CONNECTIONS, CIRCUIT-BREAKERS; SAFETY MEASURES RELATING TO CIRCUIT-BREAKERS, OVERLOADING AND UNDERVOLTAGE; CONTROL CIRCUITS (SUPPLY, SAFETY LOCKING DEVICES, STOPPING); ENCLOSURES AND COMPARTMENTS FOR THE PROTECTION OF CIRCUITS AGAINST EXTERNAL ENVIRONMENTAL FACTORS; CONTROLS AND OPERATING GEAR (PROTECTION AND ACCESSIBILITY); CONDUCTORS AND CABLES (MAXIMUM CURRENT, VOLTAGE DROP, INSULATION); A REVIEW OF STANDARDS APPLICABLE TO ELECTRIC MOTORS; INDIVIDUAL LIGHTING; EARTHING; TESTING; A LIST OF RELEVANT STANDARDS. A QUESTIONNAIRE INTENDED TO SERVE AS A BASIS FOR THE SELECTION OF EQUIPMENT IS APPENDED. (FRENCH)

APPENDIX E

NIOSHTIC FOREIGN REFERENCES

5057.1 M3
CONTROL: NIOSH-0.0050544
ACCESS: CIS 75-1259
SOURCE:
AUTHOR: HENSELE, W.
TITLE: GET IN WITHOUT DANGER - SAFE ENTRY INTO COMPOUND MIXING INSTALLATIONS
REFER1: SICHERHEITSINGENIEUR, VOL. 5, NO. 10, PAGES 462-466
REFER2:
PUBDATE: 74/10/00

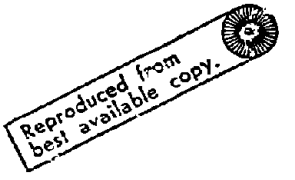
CONCH SAFETY-MEASURES, ACCIDENT-PREVENTION, MIXING-EQUIPMENT
65 A REVIEW OF THE PRECAUTIONS NECESSARY WHEN CLEANING AND SERVICING COMPOUND ANIMAL FEED MIXERS AND SIMILAR INSTALLATIONS: INSTRUCTION AND QUALIFICATIONS OF MAINTENANCE STAFF; REMOVAL OF FUSES; LOCKING OF CONTROLS; A SINGLE KEY FOR THE MAIN SWITCH AND THE MIXER LID SECURED BY A COMMON SAFETY LOCK. CIRCUIT DIAGRAMS. (GERMAN)

2022 M3
CONTROL: NIOSH-0001447
ACCESS: CIS 319-1969
SOURCE:
AUTHOR: JOFFRE, H., AND H. VIALETTES
TITLE: CAUSES OF ACCIDENTS CONNECTED WITH PARTICLE ACCELERATORS AND PROTECTION AGAINST RADIATION
REFER1: RADIOPROTECTION, VOL. 3, NO. 2, PAGES 81-96, 20 REFERENCES
REFER2:
PUBDATE: 68/00/00

CONCH IONIZING-RADIATION, ACCIDENT-INVESTIGATION, CONTROL-MEASURES, ACCIDENT-PREVENTION, PHYSIOLOGICAL-EFFECTS
65 ANALYSIS OF SEVERAL TYPICAL ACCIDENTS POINTING TO: INADEQUATE INSTRUCTION OF OR MISTAKES BY PERSONNEL, MALFUNCTIONING OF ACCELERATORS, OR FAILURE OF SAFETY DEVICES. STUDY OF ACCIDENTS PROVIDED INFORMATION ON THE BIOLOGICAL EFFECTS OF RADIATION AND ON THE BEHAVIOR OF RADIATION IN MATTER, AND PROVIDED BASIC DATA FOR WARNING SYSTEMS. MEASURES ARE INDICATED FOR SURROUNDING AGAINST FORGETFULNESS OR NEGLIGENCE AND AGAINST SAFETY DEVICES BEING PUT OUT OF ACTION, AND FOR PREVENTING FAILURE OR MALFUNCTIONING OF CONTROL APPARATUS OR UNINTENDED RADIATION. SPECIFIC SAFETY MEASURES AND RADIATION PROTECTION APPLICABLE TO PARTICLE ACCELERATORS INCLUDE: RADIATION MONITORING PANELS, SAFETY LOCKING DEVICES, OPTICAL AND ACOUSTIC SIGNALS, AND SPECIAL SAFETY DEVICES ON GENERATORS. (FRENCH)

APPENDIX E

NIOSHTIC FOREIGN REFERENCES



5833 M3
CONTROL: NIOSH-00014431
ACCESS: CIS 317-1970
SOURCE:
AUTHOR: LINDBERG, K.
TITLE: PREVENTION OF THE UNINTENTIONAL STARTING OF MACHINES
REFER1: ENKAISE TAPATURMIA - FOREBYGG OLYCKSFALL, NO. 4-5, PAGES 10-17
REFER2:
PUBDATE: 69/00/00

CONCH ACCIDENTS, ACCIDENT-PREVENTION, SAFETY-MEASURES, SAFETY-DEVICES, CONTROL-MEASURES, EQUIPMENT
65 A REVIEW OF THE CAUSES OF THE UNINTENTIONAL AND UNAUTHORIZED STARTING OR SWITCHING ON OF MACHINES OR INSTALLATIONS DURING MAINTENANCE, REPAIR, ADJUSTMENT AND SIMILAR WORK FOLLOWED BY DESCRIPTIONS AND ILLUSTRATIONS OF NUMEROUS SAFETY DEVICES AND SYSTEMS (WARNING SIGNS, PADLOCKS, SAFETY CUTOUTS, LOCKS, ETC.) DESIGNED TO ELIMINATE THIS TYPE OF HAZARD. (FINNISH)

SOURCE:
TITLE: ACCIDENT OCCURRENCE IN THE CHEMICAL INDUSTRY
REFER1: SCHWEIZERISCHE UNFALLVERSICHERUNGSANSTALT, LUZERN, SWITZERLAND, 45 PAGES
REFER2:
PUBDATE: 73/10/00
CONCH CHEMICAL PROCESSING INDUSTRY, CHEMICAL MANUFACTURING INDUSTRY, EPIDEMIOLOGY, MORBIDITY, ACCIDENT INVESTIGATIONS, SAFETY MEASURES, EXPLOSION PREVENTION, EXPLOSIVE ATMOSPHERES, SAFETY DEVICES, SAFETY EQUIPMENT, SAFETY REGULATIONS
65 AFTER ENUMERATING THE VARIOUS SECTORS OF THE CHEMICAL INDUSTRY (BASIC CHEMICALS, REFINED CHEMICAL PRODUCTS, PHARMACEUTICAL AND COSMETIC PRODUCTS, SOAPS, WASHING POWDERS AND DETERGENTS, INDUSTRIAL GASES, ETC.) THIS REPORT GIVES, IN TABULAR FORM, A BREAKDOWN OF OCCUPATIONAL ACCIDENTS BY SECTOR, MATERIAL CAUSE AND TYPE OF INJURY, FOR THE PERIOD 1964-65. THE COST OF ACCIDENTS SET OUT IN THE TABLES REFERS TO THE PERIOD 1958-67. PART OF THE REPORT IS DEVOTED TO VARIOUS ASPECTS OF ACCIDENT PREVENTION (PREVENTION OF EXPLOSIVE MIXTURES FORMING, SAFETY LOCKING DEVICES FOR MACHINERY, GUARDRAILS, SAFE METHODS FOR STORING AND STACKING). MORE DETAILED TABLES OF BREAKDOWN OF ACCIDENTS, A LIST OF ORDINANCES OF THE SWISS FEDERAL COUNCIL AND THE RULES OF THE SWISS ACCIDENT INSURANCE INSTITUTE FOR THE PREVENTION OF OCCUPATIONAL ACCIDENTS AND DISEASES ARE APPENDED. (GERMAN)

APPENDIX E

NIOSHTIC FOREIGN REFERENCES

42266 M3
CONTROL: NIOSH-00036582
ACCESS: CIS 222?-1?70
SOURCE:
AUTHOR: IGOSIN, B. A., AND L. P. GRUSNIKOVA
TITLE: CONSTRUCTIONAL SAFETY REQUIREMENTS FOR COTTON - PROCESSING MACHINES
REFER1: NAUCNIE RAEOTY INSTITUTOV OHRANY TRUDA VCSPS, NO. 62, PAGES 45-56
REFER2:
PUBDATE: 70/00/00

CONCH TEXTILES-INDUSTRY, SAFETY-PRECAUTIONS, SAFETY-DEVICES, ILLUMINATION
65 THE REQUIREMENTS SET OUT IN THIS ARTICLE ARE BASED ON AN ANALYSIS OF ACCIDENT CAUSES AND A STUDY OF UNSATISFACTORY DESIGN FEATURES IN NEW MACHINES OR MACHINES ALREADY IN USE. IT IS A THREE-PART DRAFT FOR REGULATIONS COVERING THE USE OF MACHINES, GENERAL SPECIFICATIONS AND SPECIFICATIONS FOR PARTICULAR TYPES OF MACHINE. THE GENERAL SPECIFICATIONS RELATE TO THE CONSTRUCTION AND ARRANGEMENT OF THE DRIVE AND CONTROL MECHANISMS, LOCKED SIGNAL DEVICES, WORKING PARTS AND SAFETY DEVICES, AND TO WORKPLACE LIGHTING. SEVERAL ILLUSTRATED EXAMPLES ARE GIVEN FOR SPECIAL REQUIREMENTS RELATING TO COTTON-CLEANING MACHINES AND GINS, BOX FEEDERS. (RUSSIAN)

9478 M3
CONTROL: NIOSH-00015454
ACCESS: CIS 1472-1971
SOURCE:
TITLE: INSTRUCTIONS REGARDING BRUSH-CUTTING SAWS - INSTRUCTIONS FOR MANUFACTURERS AND USERS REGARDING SAFETY MEASURES APPLICABLE TO BRUSH-CUTTING POWER SAWS
REFER1: SWEDISH WORKERS' PROTECTION BOARD, STOCKHOLM, ANVISNINGAR NO. 74; SVENSKA REPRODUKTIONS AKTIEBOLAG, STOCKHOLM, NO. 4414, 10 PAGES
REFER2:
PUBDATE: 70/06/00
CONCH SAFETY-PRECAUTIONS, MACHINE-GUARDING, SAFETY-DEVICES, NOISE-CONTROL
65 THE FIRST PART CONTAINS INSTRUCTIONS FOR MANUFACTURERS OF POLE-MOUNTED POWER CIRCULAR SAWS FOR BRUSH CUTTING: ATTACHMENT OF BLADE, LOCKING OF THE SAW-ARBOR DURING THE REPLACEMENT OF THE BLADE, DRIVING SHAFT, BLADE GUARDS, HANDLE AND CONTROLS, GUARDS TO PREVENT CONTACT WITH HOT PARTS, WASTE-GAS EXHAUSTING, DESIGN OF SAWS WITH LITTLE NOISE OUTPUT, EMERGENCY CUT-OFF DEVICE, HARNESS WITH A RAPID RELEASE FOR CARRYING SAWS. BRUSH-CUTTING POWER CIRCULAR SAWS MAY ONLY BE USED BY TRAINED WORKERS MORE THAN 18 YEARS OLD. THE SECOND PART CONTAINS SAFETY RULES FOR WORKERS USING THESE SAWS. (SWEDISH)

APPENDIX E

NIOSHTIC FOREIGN REFERENCES

49274 --
CONTROL: [illegible]
ACCESS: CIS 2,17-1-68
SOURCE:
AUTHOR:
TITLE: SAFETY CODE FOR THE MANUFACTURE OF POWERED INDUSTRIAL TRUCK.
REFER1: PERMANENT SECRETARIAT, FEDERATION EUROPEENNE DE LA MANUTENTION; SYNDICATS DES INDUSTRIES DE MATERIELS DE MANUTENTION, PARIS, 48 PAGES
REFER2:
PUBDATE: 67/05.00

PONCH MOTOR VEHICLES, CONTROL MEASURES, HOISTING EQUIPMENT, SAFETY EQUIPMENT, ACCIDENT PREVENTION

65 BROCHURE INTENDED FOR POWER TRUCK MANUFACTURERS AND OFFICIAL SAFETY ORGANIZATIONS. THE PRINCIPAL SAFETY RULES TO BE OBSERVED IN THE DESIGN AND CONSTRUCTION OF TRUCKS, WHATEVER THEIR TRAVELING SPEED, ARE STATED UNDER THE FOLLOWING HEADINGS: CLASSIFICATION AND DESIGNATION OF TRUCKS; IDENTIFICATION PLATES; RULES FOR DESIGN AND MANUFACTURE (STABILITY, BRAKES, OPERATING GEAR, WHEELS AND TIRES, KLAXONS, SAFETY LOCKS, MAXIMUM SPEED (6 KILOMETERS PER HOUR - 3.75 MILES PER HOUR), COUPLINGS FOR TRAILERS, FASTENINGS AND SLINGS FOR HOISTING TRUCKS); POWER SYSTEMS; DEVICES FOR HOISTING AND TIPPING AND OTHER MOVEMENTS (MECHANICAL AND HYDRAULIC DEVICES, DEVICES FOR LIMITING HOIST, FORK ARMS, PROTECTIVE DEVICES (OVERHEAD

APPENDIX F

DIALOG File14: ISMEC-MECH ENGR 73-78/AUG (Copr. ISMEC)

(Item 7 of 44) User 834 8nov78

45944 D7600681
VALVE-LOCKING DEVICE ENHANCES PLANT SAFETY
DES. ENG. (GB) 13 JUNE 1976 Coden: DEMCBS
Treatment: X
02
Descriptors: VALVES; FIXINGS
Identifiers: PLANT SAFETY; VALVE LOCKING DEVICE; SPECIALLY CODED KEY
Section Class Codes: D2450, D3750