

APPENDIX B
REVIEW OF STATE, FEDERAL, INTERNATIONAL,
AND CONSENSUS SAFETY STANDARDS

APPENDIX B
REVIEW OF STATE, FEDERAL, INTERNATIONAL, AND CONSENSUS SAFETY STANDARDS

The purpose of this appendix is to compare existing state, Federal, international, and consensus standards related to, and impacting on, oil and gas well drilling. Included are the OSHA General Industry Standards (29 CFR 1910) [70]; state standards with oil and gas well drilling regulations; international standards from Canada (Alberta) [69]; and consensus standards developed by API [74].

The first section of this appendix tabulates existing national standards that relate to oil and gas well drilling. The second section reviews state, international, and consensus standards that specifically address activities, operations, tasks, tools, and conditions typical of well drilling operations.

A. Existing National Standards

National standards do not specifically regulate oil and gas well drilling, but OSHA General Industry Standards (29 CFR 1910) apply to many of the operations, tasks, and conditions typically present at a well site. Table B-1 presents existing national standards which may be applicable to the activities or conditions at a well site.

B. Existing State, International, and Consensus Standards

An examination of standards from all 50 states, plus Puerto Rico and the Virgin Islands, determined that only Alaska [77], California [75], Michigan [86], Utah [73], and Wyoming [78] have standards that specifically address oil and gas well drilling. The remaining states reprint the national standards. The California Petroleum Safety Orders are in the process of revision; the revised standard, not yet enacted into law, is used in this appendix to represent drilling regulations in California.

Occupational safety and health standards for oil and gas well drilling operations were requested from Germany, the United Kingdom, France, the Netherlands, Sweden, Australia, Canada, and Mexico. The Canadian (Alberta) standards that regulate oil and gas well drilling operations are included for review [67]. The United Kingdom has standards for the petroleum industry, but does not regulate drilling operations. The remaining countries do not have safety standards that specifically address well drilling operations.

The industry consensus standards developed by API have been reviewed and compared with existing state standards. In many instances, state standards have adopted portions of the API standards.

TABLE B-1
 GENERAL INDUSTRY STANDARDS WHICH MAY BE APPLICABLE
 TO THE OIL AND GAS WELL DRILLING INDUSTRY

General Industry Standard	Area of Impact
Part 1910	
Subpart C	Employee Exposure Records
Subpart D	Guarding Floor and Wall Openings, and Holes, Portable Wood and Metal Ladders, Fixed Ladders, Scaffolding and other Walking-Working Surfaces
Subpart E	Means of Egress, Emergency Plans and Fire Prevention Plans
Subpart G	Occupational Health and Environmental Control
Subpart H	Hazardous Materials
.101	Compressed gases
.102(a)	Acetylene cylinders
.106(a) through (e)	Flammable and combustible liquids
.109	Explosives and blasting agents
.110	Storage and handling of liquefied petroleum gases
Subpart I	Eye and Face Protection, Respiratory Protection, Head Protection, and other types of Personal Protective Equipment
Subpart J	General Environmental Controls
.141	Sanitation
.142	Temporary labor camps
.145	Specifications for accident prevention signs and tags
Subpart K	Medical Services and First Aid
Subpart L	Fire Protection
.157	Portable fire extinguishers
Subpart M	Compressed Gas and Compressed Air Equipment
.169	Air receivers

TABLE B-1
 GENERAL INDUSTRY STANDARDS WHICH MAY BE APPLICABLE TO
 THE OIL AND GAS WELL DRILLING INDUSTRY (Concluded)

General Industry Standard	Area of Impact
Part 1910	
Subpart N	Materials Handling and Storage
.176	Handling materials
.179	Overhead and gantry cranes
.180	Crawler locomotive and truck cranes
.184	Slings
Subpart O	Machinery and Machine Guarding
.212	General requirements for all machines
.215	Abrasive wheel machinery
.219	Mechanical power-transmission apparatus
Subpart P	Hand and Portable Power Tools and other Hand-Held Equipment and Guarding Requirements
Subpart Q	Welding, Cutting, and Brazing
Subpart S	Electrical Systems and Equipment
Subpart Z	Toxic and Hazardous Substances

A topical comparison and evaluation of existing state, international, and API standards referenced in this document are presented in this section; however, the subject matter discussed is either not addressed or only partly addressed by the national standards (Table B-1).

1. First Aid and Communications

a. First Aid

Alaska requires all supervisors and foremen to be trained and certified in first aid and at least one trained person to be onsite at all times when work is in progress. The presence of certified first-aid personnel is similarly required by California, Michigan, Wisconsin, and Utah. Canada requires the tool pusher and one additional worker per crew to be certified in first aid. The API

consensus standard requires the presence of a person certified in first aid when medical services are not reasonably available.

All States and Canada require the presence of unit-type, first-aid kits (usually 24-unit size), stretchers, and blankets. In addition, Wyoming requires arm and leg splints. Provisions for eyewash facilities are made by Wyoming, Utah, Michigan, and API. The availability of a transportation vehicle of sufficient size to accommodate a stretcher is required by Canada, while the listed States require only that transport be available. Canada also mandates that alternative means of transportation be supplied if the condition of the road is detrimental to the injured person.

b. Communication

All pertinent State standards and Canada provide for the presence of adequate communication to emergency facilities and the posting of phone numbers. Wyoming requires that radio numbers be posted and specifies that radio communication be provided when phones are not available.

2. Personal Protective Equipment

a. General

All standards prohibit the wearing of loose clothing, jewelry, and long hair in the work area.

b. Foot Safety

Safety-toed footwear is required in work areas by API, Utah, Wyoming, and Canada. Wyoming also requires metatarsal protection when necessary.

c. Fall Protection

The API requires that safety belts and attached lanyards be worn when the fall potential is greater than 10 feet, except when freedom of movement is required and during rigging-up and rigging-down operations. California, Michigan, Utah, and Wyoming require that safety belts be worn in accordance with the OSHA construction or general industry standards. Canada requires safety belts or alternative means of fall protection when working above 10 feet 6 inches. Alaska requires safety nets when workplaces are more than 25 feet above ground and when safety belts are impractical.

Ladder cages with platforms or ladder climbing devices are required by all the examined standards.

d. Respiratory Protection, Hydrogen Sulfide

Wyoming and Utah require increasingly stringent hydrogen sulfide detection and warning systems as well as respiratory protection programs to be coordinated with increasing levels of hydrogen sulfide. The API consensus standards (which references their safe work practices guide for hydrogen sulfide environments [72]) and the "Outer Continental Shelf Standard: Safety Requirements for Drilling in Hydrogen Sulfide Environments" [87] offer adequate worker protection.

3. Fire Protection and Prevention

a. Fire Prevention

California and Alaska prohibit smoking and the carrying of unprotected matches or lighters in the well area. The well area is variously defined as 50-100 feet from the well bore. Open flames, spark sources, and exhaust heat from internal combustion engines are prohibited in the well area by Alaska, California, Wyoming, and Utah. The API qualifies its fire protection requirements by "designated areas" and "safety heater" provisions.

Adequate standards for the lighting of flare pits and lines are in effect in Utah, Alaska, California, Wyoming, and Canada. The API does not address this problem.

Grounding and bonding of the derrick to ensure protection against static electricity is adequately regulated in Alaska, California, and Canada. The API does not address static discharge.

b. Fire Protection

Provisions are made in all the well drilling standards for the presence and inspection of portable fire extinguishers. The API, Michigan, Utah, and Wyoming require that four 20-pound, B:C-rated fire extinguishers be readily available on drilling rigs. California requires a 10-pound extinguisher, whereas Canada mandates that four 30-pound extinguishers be available on the drill rig. Wyoming also requires that a 150-pound, B:C-rated fire extinguisher be located at each well drilling site.

4. Derricks

All of the standards address the problems of derrick integrity. Identification, rating capacity, guying patterns, anchoring, and inspection are mandated in Alaska, Michigan, Utah, California, and Wyoming. The API has similar requirements for worker protection. Procedural guying diagrams and wind effects are included in the Wyoming standards. A yearly magnaflux inspection of A-legs, elevator links, block hooks,

and pins is required by Alaska. The API tabulates soil stabilities relative to derrick support.

a. Derrick Ladders

The examined standards regulate the construction of derrick ladders.

b. Derrick Floor

All existing standards attend to housekeeping and maintaining the derrick surface free from oil and grease. Utah specifies cleats, mats, and grates if the surface condition necessitates it.

c. Mousehole, Rathole

Only the California standard specifies that if a rathole is unoccupied and does not have at least a 12-inch protruding pipe guide, then it must be covered or guarded. Utah requires that all floor holes be guarded when not in use.

d. Vee-doors

A chain or wire rope cable is required by all standards to protect the worker from falls through the Vee-door.

e. Derrick Exits

The API requires a minimum of two access/egress stairs (one of which may be a ladder) for derricks with floors over 6 feet in height. Canada, Alaska, Michigan, and Wyoming have similar requirements for providing alternative exits from the derrick floor, and they also provide for exit locations relevant to prevailing winds and potential gas accumulations. Utah requires three exits from the derrick floor. No mention is made in any standard of emergency escape facilities such as slides from elevated derrick floors.

5. Hoisting Lines and Operation

a. Hoisting Lines

The API standard for wire rope specification, slipping, and cutoff procedures [85] referenced by all states, requires a safety factor of "3" for normal operations and "2" when "setting casing, pulling on stuck pipe, or similar infrequent operations."

b. Deadline Anchors

Deadline anchors are required by API to be constructed so that their strength equals or exceeds the working strength of the

hoisting line. Similar regulations exist in the State standards.

c. Weight Indicators

The API standards and all referenced States similarly require the presence of an accurate (5%) weight indicator. Monthly calibration to calculated drill string weight is required by API and Michigan.

d. Crown and Traveling Blocks

Alaska and California regulations address the engineering design and use of crown and traveling blocks. The API has similar requirements in its standard and their recommended "Specification for Rotary Drilling Equipment" [88] details proper guarding techniques.

e. Drawworks

Drawworks guards are required by Alaska, Utah, California, and Canada. Visual inspection of the drawworks is required by all standards. Brake testing by the driller (each shift) is mandated by Alaska.

f. Hoist Operations

Drillers are required by all standards to be at their stations during load movements. Alaska and California also require clearly labeled controls. All standards require that brake handles be tied down when the driller is not at his station (autofeed drawworks are exempt). All standards allow an employee to ride an unloaded traveling block if he is tied off with approved safety belt and lanyard.

6. Rotary Equipment and Guarding

The examined States all require guarding of the rotary table by substantially constructed material extending downward and covering all gears, pins, and sprockets. Wyoming, Alaska, and California specifically exclude the kelly bushing and the kelly from guarding requirements as does API. Utah and Michigan require that all gears, pulleys, and rotating parts be guarded but do not specifically address the kelly.

Standards exist in all States, Canada, and API requiring that the driller shall not operate the rotary table while personnel and/or equipment are in contact with the rotating parts. The driller is also required to watch the rotary area when it is in motion.

All standards require exposed moving gears, chains, sprockets, belts, and other similar parts to be guarded. The ANSI B15.1-1972 "Safety

Standard for Mechanical Power Transmission Apparatus" [89] is referenced in the API standard. California, Wyoming, and Alaska provide the specific guarding requirements in the text of their regulations.

7. Catheads and Catlines

All States, Canada, and API provide adequate standards for operator controls, friction surface wear, rope splices, unattended catheads, headache posts, and automatic cathead mechanisms. Alaska, California, and Wyoming also provide for rope antifouling devices. Cathead protection, rope coiling, and employee hand position have been addressed in the California standard.

Riding on the catline is prohibited except in emergency situations by all standards.

8. Tongs, Backup Posts, Safety Lines, and Breaking/Making Connections

All standards provide for the tongs to be attached to a backup system. Provisions are made in all standards for proper attachment of lines to girders or posts. Canada specifies that a derrick girder not be used as a backup post unless it is designed as such. Inspection and maintenance procedures are similar in all standards.

Rotary tables are specifically excluded by all standards as a power source for the initial "breaking" of a connection. The rotary table is allowed to spin the joint once it has been broken. Safety lines to prevent backspin of tong handles are required in California, Alaska, and Canada. There are no regulations that address the employee's position during pipe joint breaking and making procedures.

9. Elevators and Latching

Specific regulations for elevator latching procedures and safety latch requirements are not addressed by any of the standards.

10. Slips and Slip Handles

The handling and positioning of slips are not addressed by any of the standards. The California standards regulate slip handle length.

11. Chains

All standards address the hazards of moving chain.

12. Pipe Racks and Pipe Handling

Wyoming, Utah, Michigan, Canada, and API similarly address the problems of drill pipe racking and transfer of pipes from trucks. Alaska and California regulate in greater detail pipe chocking, binding, and employee positions during pipe transfer from trucks to racks.

Techniques for transfer of drill pipe from pipe racks to catwalk to inclined ramp to Vee-door are not addressed by any of the standards. Employee positions under pipe loads stored or being rigged in the Vee-door area do not exist. Pipe handling, rigging, and tag lines are only partly addressed by the existing standards.

Racking and securing of pipe stands during tripping is covered by all the standards.

13. Circulating Fluid, Tanks, Reserve Pits

a. Circulating Fluid

Chemical exposure to harmful additives in circulating fluids is regulated by Federal OSHA standards (29 CFR 1910.1001-.1046). Personal protective equipment is also regulated by Federal OSHA Standards (29 CFR 1926.100 and .102).

b. Tanks

Guarding of both sides of walkways over mud tanks is mandated in Canada. Wyoming specifies that the inside section of walkways on mud tanks be provided with standard guardrails and the outside be guarded if more than 4 feet above ground level. Wyoming also requires hazardous substance testing prior to employee entry of tanks that have contained toxic material. These provisions are not required by API.

c. Reserve Pits

California requires open pits constituting a hazard to employees to be guarded or fenced. Water rescue equipment specific to reserve pits is not addressed by any standard.

14. Electrical--Hazard Zones

Wyoming, Utah, Michigan, and API diagrammatically depict hazard zones (e.g., shale shakers, mud pits, and various enclosed areas on rig sub-structures) that are classified into different explosive hazard areas. Electrical equipment specified by the national electrical code, NFPA 70-1980 [90], is mandated by national, State, and API standards for these zones.

15. Cellars

Access/egress to cellars is regulated by all standards. Guarding of the cellar perimeter should be attended to, thus preventing employees from falling into it. Atmospheric testing for flammable gas and hydrogen sulfide prior to cellar entry is not specified in existing regulations.

16. Blowout Prevention

Employee training in blowout prevention equipment, blowout drills, and practices referenced by the API standard "Recommended Practice for Blowout Prevention Equipment Systems" [76] provide necessary worker protection.

17. Employee Training

All standards require that employees be trained in hazard recognition specific to their tasks. Specific guidelines are not given for operational training areas, duration of training, and certification.