Recommended Practice for Occupational Safety for Onshore Oil and Gas Production Operation

API RECOMMENDED PRACTICE 74
FIRST EDITION, OCTOBER 2001

REAFFIRMED, JANUARY 2013

AMERICAN PETROLEUM INSTITUTE

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Upstream Segment

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FOREWORD

This recommended practice was prepared by the API Production Safety Subcommittee. This publication is under the jurisdiction of the American Petroleum Institute Upstream Department's Executive Committee on Drilling and Production Operations. The goal of this recommended practice is to assist the oil and gas industry in promoting personnel and public safety. This publication has intentionally stressed recommended safe operating practices concentrating on personnel and public safety. THE PUBLICATION DOES NOT, HOWEVER, PURPORT TO BE SO COMPREHENSIVE AS TO PRESENT ALL OF THE RECOMMENDED SAFE OPERATING PRACTICES THAT CAN AFFECT SAFETY IN ONSHORE OIL AND GAS PRODUCTION OPERATIONS. It is intended that this voluntary recommended practice will promote and maintain safe working conditions for personnel engaged in onshore production operations. Every effort has been made by API to assure the accuracy and reliability of data contained in this document. However, the Institute makes no representation, warranty, or guarantee in connection with the publication of this recommended practice and hereby expressly disclaims any liability or responsibility for loss or application hereunder or for any violation of local, state, or federal laws with which the contents may conflict. INFORMATION CONCERNING SAFETY AND HEALTH RISKS AND PROPER PRECAUTIONS WITH RESPECT TO PARTICULAR MATERIALS AND CONDITIONS SHOULD BE OBTAINED FROM THE EMPLOYER, THE MANUFACTURER OR SUPPLIER OF THAT MATERIAL, OR THE MATERIAL SAFETY DATA SHEET (MSDS). Users of this publication are reminded that constantly developing technology and specialized or limited operations do not permit complete coverage of all operations or alternatives. Recommendations presented herein are not intended to inhibit developing technology and equipment improvements or improved operational procedures. This document is not a substitute for qualified engineering analysis and judgment to fit the specific operations situation. The publication is available for review by federal and state agencies or authorities and possible use as a model safe practice to assist in preparation or revision of occupational safety codes or regulations. Recommendations set forth in this publication are viewed as one satisfactory method for accomplishing a desired result. They should not be considered as the only method for achieving the desired results. This publication includes usage of the verbs "shall" and "should," whichever is deemed most applicable for the specific situation. For the purposes of this publication, the following definitions are applicable:

Shall: Denotes that the recommended practice has universal application to that specific activity.

Should: Denotes a recommended practice: (1) where a safe comparable alternative practice is available; (2) that may be impractical under certain circumstances; or (3) that may be unnecessary for personnel safety under certain circumstances. Proposed changes in these interpretations and usages should be brought to the attention of the responsible authorizing committee to determine that the intent of the publication will be sustained.

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1 General

1.1 PURPOSE

The purpose of this document is to recommend practices and procedures for promotion and maintenance of safe working conditions for personnel engaged in onshore oil and gas production, including special services.

1.2 SCOPE

These recommendations apply to production operations as defined herein. For information on drilling, well servicing and workover operations, see API RP 54.

1.3 RESPONSIBILITY

These recommendations are made recognizing that owners, operators, contractors, and their personnel have separate responsibilities that may be contractual in nature. To ensure the safe performance of work covered by these recommendations, each employer should provide training and instruction for its personnel. It is not the intent of these recommendations to alter the contractual relationship(s) between the parties. The well owner or operator should provide and the contractor should seek pertinent information that is known or assumed and that the contractor may need to assure a safe operation. At all times, the specific work activity being performed should be under the immediate supervision of an authorized person who has the authority to commence, modify, or cease the work methods or operations, as necessary, to ensure the safety of affected personnel and the general public. The authorized person should observe changing conditions and improve, whenever required, the work methods to promote increased protection for the personnel.

2 References

2.1 REFERENCES—INDUSTRY CODES, PRACTICES, AND STANDARDS

The following publications are either referenced in this recommended practice or would be useful in its implementation:

American Petroleum Institute

Spec 6A	*Wellhead and Christmas Tree Equipment*
Spec 11E	*Pumping Units*
RP 11ER	*Guarding of Pumping Units* (ANSI)
Spec 12J	*Oil and Gas Separators*
Spec 12K	*Indirect-Type Oil Field Heaters*
Spec 12L	*Vertical and Horizontal Emulsion Heaters*
RP12N	*Operations, Maintenance and Testing of Firebox Flame Arrestors*
RP 12R1	*Setting, Maintenance, Inspection, Operation, and Repair of Tanks in Production Service*
RP49	*Drilling and Well Servicing Operations Involving Hydrogen Sulfide*
RP 54	*Occupational Safety for Oil and Gas Well Drilling and Servicing Operations*
RP 55	*Oil and Gas Production and Gas Processing Plant Operations Involving Hydrogen Sulfide*
RP 75	*Recommended Practice for Development of a Safety and Environmental Management Program for Outer Continental Shelf (OCS) Operations and Facilities*
RP 500	*Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 and Division 2*
RP505	*Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1 and Zone 2*
Publ 510	*Pressure Vessel Inspection Code: Maintenance Inspection, Rating, Repair, and Alteration*
Publ 520	*Sizing, Selection, and Installation of Pressure-Relieving Devices in Refineries*
Publ 521	*Guide for Pressure-Relieving and Depressuring Systems*
RP 750	*Management of Process Hazards*
RP 752	*Management of Hazards Associated with Location of Process Plant Buildings, CMA Managers Guide*
Publ 761	*Model Risk Management Program Guidance for E&P Facilities—Guidance for Complying with EPA's Rule* (40 *CFR* 68)
Std 1104	*Welding of Pipelines and Related Facilities*
RP 1107	*Pipeline Maintenance Welding Practices*
RP 2003	*Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents*
Publ 2009	*Safe Welding and Cutting Practices in Refineries, Gasoline Plants, and Petrochemical Plants*
Std 2015	*Safe Entry and Cleaning Petroleum Storage Tanks*
Publ 2201	*Procedures for Welding or Hot Tapping on Equipment in Service*
Publ 2207	*Preparing Tank Bottoms for Hot Work*
Publ 2217A	*Guidelines for Work in Inert Confined Spaces in the Petroleum Industry*

RP 2220 *Improving Owner and Contractor Safety Performance*
RP 2221 *Managers Guide to Implementing a Contractor Safety Program*
Publ 2510 *Design and Construction of Liquefied Petroleum Gas (LPG) Installations*
Publ 2510A *Fire-Protection Considerations for the Design and Operation of Liquefied Petroleum Gas (LPG) Storage Facilities*
Publ 9100 *Model Environmental Health and Safety Management System and Guidance Document*

ACGIH[1]
Threshold Limit Values and Biological Indices
Industrial Ventilation, A Manual of Recommended Practice, 22nd Edition

ANSI[2]
B15.1 *Safety Standard for Mechanical Power Transmission Apparatus*
S1.13-1995 *Measurement of Sound Pressure Levels in Air*
S12.6-1997 *Methods for Measuring the Real-Ear Attenuation of Hearing Protectors*
S12.19-1996 *Measurement of Occupational Noise Exposure*
S12.36 *Survey Methods for the Determination of Sound Power Levels of Noise Sources*
Z41.1-1979 *Men's Safety-Toe Footwear*
Z87.1 *Standard Practice for Occupational and Educational Eye and Face Protection*
Z87.2 *Safety Requirements for Industrial Protective Helmets for Electrical Workers, Class B*
Z88.2-1992 *Respiratory Protection*
Z89.1 *Safety Requirements for Industrial Head Protection*
Z117.1-1995 *Safety Requirements for Confined Space*
Z358.1 *Emergency Eyewash and Shower Equipment*
Z359.1 *Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components*
2117.1 *Confined Space*

ANSI/IES[3]
RP7-1988 *Industrial Lighting*

ASME[4]
ASME Boiler and Pressure Vessel Code, Sections VIII and IX

ASNT[5]
Recommended Practice No. ASNT-TC-1A

NACE[6]
Std MR0175 *Requirements for Sulfide Stress Cracking Resistant Metallic Material for Oil Field Equipment*

NFPA[7]
NFPA 10 *Standard for Portable Fire Extinguishers*
NFPA 30 *Flammable and Combustible Liquids Code*
NFPA 51B *Standard for Fire Prevention in Use of Cutting and Welding Processes*
NFPA 58 *Standard for the Storage and Handling of Liquefied Petroleum Gases*
NFPA 70 *National Electrical Code*
NFPA 77 *Recommended Practice on Static Electricity*

OSHA[8]
29 *CFR* 1910
29 *CFR* 1926

3 Definitions and Acronyms

The following definitions and abbreviations are provided to help clarify and explain use of certain terms in this publication. Users should recognize that some of these terms could be used in other instances where the application or meaning may vary from the specific information provided herein.

3.1 adequate ventilation: Adequate ventilation is for the prevention of fire and explosions. Adequate ventilation is ventilation (natural or artificial) that is sufficient to prevent the accumulation of significant quantities of vapor-air mixtures in concentrations above 10% of their lower explosive limit (LEL).

3.2 ANSI: American National Standards Institute.

3.3 API: American Petroleum Institute.

3.4 approved: Sanctioned, endorsed, accredited, certified, or accepted by a duly constituted and recognized authority or agency.

[1]American Conference of Governmental Industrial Hygienists, 1330 Kemper Meadow Drive, Suite 600, Cincinnati, Ohio 45240-1634.
[2]American National Standards Institute, 11 West 42nd Street, New York, New York 10036.
[3]Illuminating Engineering Society of North America, 120 Wall Street, New York, New York 10005-4001.
[4]ASME International, 3 Park Avenue, New York, New York 10016-5990.
[5]American Society of Nondestructive Testing, 1711 Arlington Lane, Columbus, Ohio 43228.
[6]NACE International, 1440 South Creek Drive, P.O. Box 218340, Houston, Texas 77218-8340.
[7]National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, Massachusetts 02269-9101.
[8]Occupational Safety and Health Administration, U.S. Department of Labor, Washington, D.C. 20402.

3.5 ASTM: American Society for Testing and Materials.

3.6 authorized person: A qualified person assigned by an employer to perform or supervise the performance of a specific type of duty or duties at the work site.

3.7 cellar: Excavation around the wellhead to provide space for items of equipment at the top of the wellbore.

3.8 Christmas tree: The valves and fittings assembled at the top of a completed well to control the flow of hydrocarbons and other fluids. See API Spec 6A.

3.9 combustible liquid: Any liquid having a flash-point at or above 100°F.

3.10 contractor: Any person or company that contracts or subcontracts to perform all or any part of oil and gas well production operations.

3.11 critical equipment: Equipment and other systems determined to be essential in preventing the occurrence of, or mitigating the consequences of an uncontrolled event.

3.12 electrical classification of areas: Locations are classified according to API RP 500 or API RP 505.

3.13 flammable liquid: Any liquid having a flashpoint below 100°F.

3.14 full body harness: Straps which may be secured about a person in a manner that will distribute the fall arrest forces over at least the thighs, pelvis, waist, chest, and shoulders, with means for attaching it to other components of a personal fall arrest system.

3.15 guarded: Covered, shielded, fenced, enclosed, or otherwise protected by means of suitable covers or casings, barrier rails, or screens to eliminate the possibility of accidental contact with or dangerous approach by persons, animals, or objects.

3.16 hazardous substance: Any substance that, by reason of being explosive, flammable, toxic, corrosive, oxidizing, irritating, or otherwise harmful, has the potential to cause injury, illness, or death.

3.17 hot oil treatment: The process of heating oil and pumping it into piping, tubing, casing, or a formation to remove paraffin.

3.18 hot tapping (pipe tapping): The process of drilling a hole through the wall of pipe that is under pressure. A special saddle is used to attach a valve and lubricator to the pipe.

3.19 hot work: Work involving electric or gas welding, cutting, brazing, grinding or similar flame or spark producing operations.

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

3.21 lockout/tagout: A procedure to control hazardous energy.

3.22 NFPA: National Fire Protection Association.

3.23 operator: Lease owner or his designated agent who is responsible for the overall operation of the lease.

3.24 personal fall arrest system (PFAS): A system designed to provide protection to a person from falls. The PFAS should consist of an anchorage, connector and a synthetic webbing full body harness which may include a lanyard and a deceleration device.

3.25 PPE: Personal Protective Equipment.

3.26 pumping unit: Surface equipment used for the purpose of mechanically lifting fluids from a well. See API Spec 11E and API/ANSI 11ER.

3.27 qualified person: A person who, by possession of a recognized degree, certificate, or professional standing, or who by knowledge, training, or experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter or the work.

3.28 rated working pressure: The maximum internal pressure that equipment is designed to contain and/or control. Working pressure is not to be confused with test pressure.

3.29 shall: For the purpose of this document, shall indicates that the recommended practice(s) has universal application to that specific activity.

3.30 should: For the purpose of this document, should denotes a recommended practice(s) (a) where a safe comparable alternative practice(s) is available; (b) that may be impractical under certain circumstances; or (c) that may be unnecessary for personnel safety under certain circumstances.

3.31 simultaneous operations: Two or more of the following activities being performed in close proximity: production, drilling, completion, workover, wireline (except routine operations), major construction operations, well testing and maintenance.

3.32 supervisor: Person who has been given the control, direction, or supervision of work performed by one or more personnel.

3.33 well servicing: Well work involving pulling or running tubulars or sucker rods, to include but not limited to redrilling, completing, recompleting, workover, and abandoning operations.

4 Safety

4.1 SAFETY PRACTICES

4.1.1 Personnel shall be properly trained in relation to their job duties. Additionally, pre-job safety meetings that include all affected personnel, including contractors, should be held to review responsibilities for the operation(s) to be performed.

4.1.2 Personnel should receive instruction in correct work methods to reduce chance of injury to themselves or fellow personnel.

4.1.3 A safety program should be established and maintained. The following elements should be considered when developing a comprehensive safety program:

confined space entry
contractor safety
electrical safety
emergency response
fire prevention and protection
first aid
general safety rules
hazard communication
hazardous environment
hot working/welding
housekeeping
hydrogen sulfide and sulfur dioxide
lifting
lockout/tagout
other equipment safety (hoists, cranes, etc)
periodic reviews
personal protective equipment
personnel training
production equipment safety
roles and responsibilities
safe use of hand tools
safety meetings
transportation
trenching and excavation

Note: Appendix A and Appendix B are examples of safety checklists that may be used to periodically access lease production and compressor/booster stations.

4.1.4 Unsafe and potentially dangerous conditions should be eliminated immediately, if possible, or reported to the supervisor in charge for corrective action.

4.1.5 The offgoing supervisor shall inform the incoming supervisor of any known special hazards or work in progress that may affect the safety of the crew. Incoming personnel shall be alerted to work in progress that could affect their safety.

4.2 HAZARD COMMUNICATION

A Hazard Communication Program that evaluates the presence and potential hazards of chemicals found in the workplace shall be established for onshore oil and gas production operations. Workers shall be provided with information concerning the hazard of chemicals and appropriate measures to protect themselves while working with hazardous chemicals. The program shall be written and include information about hazard evaluation, labeling, material safety data sheets, employee training and methods to review and update changes in the program based on chemical usage.

Elements of a program include:

a. Hazard Evaluation—An inventory of all the hazardous chemicals in the work area shall be completed. An evaluation of the potential hazard of a chemical should be conducted before the hazardous chemical is handled. Generally applicable measures including engineering controls, safe work practices and PPE should be considered for safe handling and use of a hazardous chemical. This information shall be communicated to the worker.

b. Labeling—a labeling system shall be developed that warns of the potential hazards of working with a hazardous chemical. Hazardous chemicals shall identify (at minimum) the material or substance and the physical and health hazards.

c. Material Safety Data Sheet (MSDS)—Chemical manufacturers are normally responsible for developing MSDSs. A MSDS shall be available and readily accessible for each hazardous chemical used in the workplace. A system to collect, maintain, and inform workers about the chemical hazard information found on a MSDS shall be part of the program.

d. Training—Personnel should be provided hazard communication training upon:

1. Initial assignment to a work area.
2. When a new chemical has been introduced.
3. A new physical or health hazard has been identified or a process change has occurred that involves a hazardous chemical.

At minimum the training should include:

1. Information regarding the method and observations that can be used to detect the presence of a release of a hazardous chemical in the work area.
2. Physical and health hazard information.
3. Measures to protect the worker from harmful exposure, including, engineering, safe work practices, emergency procedures, PPE use, etc.
4. Specific details on how to recognize and understand labels in the work area, MSDS interpretation, and safe procedures when working with hazardous chemicals.

e. Non-Routine Task—special considerations should be developed to handle non-routine work (e.g., upset or emergency conditions, cleaning out vessels).

f. Contractors—Hazard communication information shall be shared with contractors and their employees. Refer to API RP 2221.

4.3 PERSONAL PROTECTIVE EQUIPMENT (PPE)

4.3.1 General

Employers should assess their work sites to evaluate the types of hazards present at their onshore oil and gas production operations. When it is impractical to reduce a hazard to acceptable levels by administrative or engineering controls, personal protective equipment appropriate for the hazard shall be selected for use.

Personal protective equipment for hearing, eyes, face, head, extremities, protective clothing, respiratory protection and fall protection shall be considered for use to protect personnel.

4.3.2 Wearing Apparel

4.3.2.1 When identified as part of the employer's PPE assessment, a safety hard hat shall be worn by each person in the work area. The safety hard hat shall meet the requirements of ANSI Z89.1 *Safety Requirements for Industrial Head Protection*; or ANSI Z89.2 *Safety Requirements for Industrial Protective Helmets for Electrical Workers, Class B.*

4.3.2.2 Eye protection equipment appropriate for the work being done shall be worn by personnel where there is a reasonable probability of injury to the eyes from flying objects, chemicals, or injurious light or heat that can be prevented by such equipment. This protective equipment shall meet the requirements of ANSI Z87.1 *Practice for Occupational and Educational Eye and Face Protection.*

4.3.2.3 When identified as part of the employer's PPE assessment, safety shoes, safety boots, or toe guards shall be worn. Safety-toe footwear shall meet the requirements of ANSI Z41.1 *Men's Safety-Toe Footwear.*

4.3.2.4 The employer's PPE assessment should include possible chemical exposures that may necessitate the use of gloves, aprons, boots, or other protective equipment, as appropriate. The assessment should also evaluate the need for gloves or other protective clothing to provide protection from temperature extremes or sharp objects.

4.3.2.5 Appropriate clothing should be worn at all times. Loose or poorly fitted clothing should not be worn.

4.3.2.6 Personnel should not work in clothing that is saturated with any flammable, hazardous, or irritating substance(s). Such clothing should be immediately removed and replaced with suitable clothing after the affected skin area has been thoroughly washed and, if necessary, treated.

4.3.2.7 Personnel should not wear jewelry or other adornments subject to snagging or hanging and causing injury while in the work area.

4.3.2.8 Personnel with hair of such length as to be a hazard in work areas should keep it contained in a suitable manner while performing their duties. Hair and beard styles shall not interfere with the effective functioning of head, eye, face, or respiratory protective equipment, if such equipment is required at the work site.

4.3.2.9 Personnel working over or near water where a danger of drowning exists shall be provided with approved personal flotation devices in serviceable condition.

4.3.3 Hearing Protection

4.3.3.1 Protection against the effects of noise exposure shall be provided when the sound levels exceed those shown in Table 1. For guidance on measuring sound levels, see ANSI S12.19-1996 *Measurement of Occupational Noise Exposure*; ANSI S1.13-1995 *Measurement of Sound Pressure Levels in Air*; and ANSI S12.36-R1997.

4.3.3.2 When personnel are subjected to sound levels exceeding those listed in Table 1, feasible administrative or engineering controls should be utilized. If such controls fail to reduce sound levels within the levels of Table 1, personal protective equipment shall be provided and used to reduce sound levels within the levels of the table. For guidance on hearing protection equipment, see ANSI S12.6-1997 *Methods for Measuring the Real-Ear Attenuation of Hearing Protectors.*

4.3.3.3 Employers should consider implementing the elements of a hearing conservation program as appropriate to protect the hearing of personnel.

Table 1—Maximum Permissible Noise Exposures[a]

Duration per day, hours	Sound level[b] dBA slow response
12	85
8	90
6	92
4	95
3	97
2	100
1 1/2	102
1	105
1/2	110
1/4 or less	115

Notes:
[a] When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect shall be considered rather than the individual effect of each. Exposure to impulsive or impact noise should not exceed 140 dBA peak sound pressure level.
[b] Measured on the A scale of a standard sound level meter at slow response.

4.3.4 Respiratory Protection

4.3.4.1 An assessment of the work area shall be done to identify the potential hazards that may require respiratory

protection. Employees shall wear respiratory protection appropriate for potential workplace atmospheric hazards.

4.3.4.2 For respiratory protection practices, including equipment selection, use, medical surveillance, fit testing, storage, inspection, maintenance, and training, see ANSI Z88.2-1992, *Respiratory Protection*.

4.3.4.3 Tight-fitting air purifying respirators shall be used only in areas where sufficient oxygen exists.

4.3.4.4 Approved self-contained or supplied-air breathing equipment shall be used for those atmospheres where tests indicate toxic or hazardous gases are present in quantities immediately dangerous to life or health (IDLH) or oxygen content is less than necessary to sustain life. Air from the utility system shall not be used as the source for breathing air supply.

4.3.4.5 Cartridge type respirators shall not be used for protection from hydrogen sulfide or sulfur dioxide.

4.3.4.6 Personnel who may be expected to use breathing equipment shall be trained in the use and operation of breathing equipment available at the work site. Personnel shall be advised of the potential dangers of flammable, hazardous, and insufficient oxygen atmosphere. See API RP 55, *Conducting Oil and Gas Producing and Gas Processing Plant Operations Involving Hydrogen Sulfides*.

4.4 FALL PROTECTION

4.4.1 All personnel, when engaged in work 6 ft or higher above the ground or adjacent working surfaces, shall be protected at all times from falling by guardrail systems, safety net systems, or personal fall arrest systems (PFAS). When the employer can demonstrate that it is unfeasible or creates a greater hazard to use these systems, the employer shall develop and implement an alternative fall protection plan that provides for personnel safety. When PFAS are used, the following shall apply:

a. Personnel shall use a full body harness manufactured in accordance with ANSI Z359.1.
b. PFAS shall be inspected prior to each use.
c. The full body harness shall be attached by means of a lanyard with double-locking snap-hooks to an anchor or structural member capable of supporting a minimum dead weight of 5,400 pounds.
d. A separate lanyard shall be used by each person requiring a lanyard. The lanyard shall be adjusted to permit a maximum drop of 5 ft in case of a fall.
e. Manufacturer's instructions for inspection and replacement of PFAS should be followed.

4.5 HOUSEKEEPING

4.5.1 Work areas should be maintained clean and free of debris and tripping hazards.

4.5.2 Leaks or spills should be promptly cleaned up to eliminate personnel slipping and fire hazards.

4.5.3 If personnel are required to work in a cellar, it should be kept reasonably clear of water or oil accumulation. No loose equipment or materials should be in the cellar except those in use or about to be used.

4.5.4 Care should be taken to leave egress routes open.

4.5.5 Tools and equipment should be securely placed and stored in a position or manner so they will not fall.

4.5.6 Clear access to control devices, emergency shutdown, emergency equipment, etc, shall be maintained.

4.6 MACHINERY AND TOOLS

4.6.1 Personnel shall only operate machinery that they are qualified to operate.

4.6.2 All belts, drive chains, gears, and drives shall have guards installed to prevent personnel from coming in contact with moving parts. See ANSI B15.1, *Safety Standard for Mechanical Power Transmission Apparatus,* and API/ANSI 11ER for construction specifications and clearances for such equipment guards.

4.6.3 Machinery shall not be operated unless all guards are in position and are in properly maintained condition. During maintenance or repair work limited testing may be performed by qualified personnel without guards in place.

4.6.4 Maintenance personnel should report to the supervisor prior to beginning repairs. They should report hazards that may be introduced. They should report when repairs are completed.

4.6.5 Personnel shall not clean, lubricate, or repair any machinery where there is a hazard of contact with moving parts until such machinery has been stopped or such parts have been properly guarded. See Lockout/Tagout.

4.6.6 Hand power tools and similar equipment shall be maintained in a safe condition.

4.6.7 Electric hand tools shall be double insulated or grounded as specified in NFPA 70. Ground fault circuit interruption protection shall be used in damp locations.

4.6.8 Electric or pneumatic hand tools shall have a deadman switch or be arranged so that the starting switch cannot be locked in.

4.6.9 When personnel are climbing ladders, any tools or other such materials they are carrying should be secured rather than hand held.

4.7 WELDING AND CUTTING EQUIPMENT

4.7.1 Apparatus such as torches, regulators, hoses and arc welding machines shall be in good operating condition and repair. Only approved oxygen and acetylene cylinders shall be used.

4.7.2 Oxygen and acetylene torches shall be equipped with flash-back arrestors.

4.7.3 All cylinders shall be equipped with a valve protection cap, a collar, or recess to protect the valve. Valve caps should be in place except when cylinders are connected for use.

4.7.4 Cylinders should be stored in assigned places and shall be secured to prevent accidental overturning.

4.7.5 Cylinders should not be kept in unventilated enclosures, such as lockers and cupboards.

4.7.6 Oxygen cylinders in storage shall be separated from fuel gas cylinders or combustible materials a minimum distance of 20 ft (6.1 m) or by a noncombustible barrier at least 5 ft (1.5 m) high.

4.7.7 Acetylene cylinders shall be stored valve end up with protective caps affixed and properly secured. When a job using acetylene devices is completed or prior to transporting acetylene cylinders, the valve on the acetylene cylinder shall be closed and pressure on the hoses bled to zero.

4.7.8 When transporting cylinders by a crane or derrick, a cradle, bin, or other suitable platform should be used. Slings alone shall not be used on a cylinder being transported or lifted. Also, cylinders should not be dropped, struck, or permitted to strike each other.

4.7.9 On arc welding machines, the control apparatus shall be enclosed except for the operating wheels, levers, or handles.

4.7.10 Input power terminals, top charge devices, and electrically energized metal parts shall be completely enclosed and accessible only by means of tools.

4.7.11 Terminals from welding leads shall be protected from accidental contact by personnel or metal objects.

4.7.12 The frame or case of an electrically driven arc welding machine shall be grounded.

4.7.13 Cables with splices within 10 ft (3.1 m) of the rod holder shall not be used. The welder should not coil or loop welding electrode cables around parts of his body.

5 Contractor Safety and Training

When selecting contractors, operators should obtain and evaluate information regarding a contractor's safety policies and practices, and performance thereunder, and the contractor's procedures for selecting subcontractors. See API RP 2220.

Contractors shall train their personnel in the work practices necessary to perform their jobs in a safe manner. The training provided to contract personnel should include applicable site-specific safety procedures and rules pertaining to the facility and the applicable provisions of emergency action plans. This section applies to contractors performing operating duties, maintenance or repair, turnaround, major renovation, or specialty work at the facility. Except for transportation safety orientation, emergency evacuation training, and other applicable safety training, this paragraph does not apply to contractors providing incidental services that do not influence operation of the facility, such as, janitorial work, food and drink services, laundry, delivery, other supply services, etc.

The operator should verify contractor training utilizing a variety of methods, which may include audits of the contractor's safety training programs; worksite checks of individual contractor employees' training; and operator observation of contractor work performance.

A major step in achieving acceptable contractor performance is selecting a safe contractor. Therefore, it is appropriate for operators to request that contractors submit specific performance information in their contract response proposals. For example, such information might include:

a. Assurance of a contractor's written safety policies and practices endorsed by the contractor's top management.

b. A statement of commitment by the contractor to comply with all applicable safety regulations and provisions of this publication.

c. Recordable injury and illness experience for the previous 3 years.

d. Experience Modification Rates (EMR) for Worker's Compensation Insurance for the previous three years.

e. An outline of the contractor's initial employee safety orientation.

f. Evidence of the existence of a disciplinary action procedure dealing with safety and environmental related infractions.

g. Descriptions of the contractor's various safety programs, including: accident investigation procedures; how safety inspections are performed; safety meetings; safety incentive programs; substance abuse prevention programs.

h. Description of the safety and environmental training that each contractor employee has received and the contractor's programs for refresher training.

6 Safe Work Practices

6.1 LOAD LIFTING

The manufacturer's rated load capacity shall not be exceeded on cranes or other load lifting devices. This equipment should be operated and maintained in accordance with manufacturers' recommendations. Tag lines should be used to guide and steady all loads being lifted.

6.2 CONFINED SPACE, EXCAVATIONS, AND HAZARDOUS ENVIRONMENTS

6.2.1 Where hydrogen sulfide, sulfur dioxide, carbon dioxide or other hazardous atmosphere is known or suspected to exist, the operator shall ensure that personnel, contractor, and service company supervisors are advised of the potential hazards. Safety guidelines and recommendations for use in production operations where hydrogen sulfide or sulfur dioxide gas may be encountered are contained in API RP 55. Also see ANSI 2117.1.

6.2.2 A confined space is an area which:

a. Has adequate size and configuration for people to enter.
b. Has limited means of entry or exit.
c. Is not designed for continuous employee occupancy.

6.2.3 Examples of confined spaces that can be found at onshore producing facilities are:

a. Well cellars
b. Electrical vaults
c. Fin fan coolers
d. Tanks
e. Vessels
f. Some diked areas
g. Valve pits

6.2.4 Confined space hazards should be identified for all facilities in the workplace and safe work practices should be established for working in the confined spaces.

6.2.5 A confined space entry permit shall be used to enter any confined space that has atmospheric, engulfment or configuration hazards. Attendant and emergency rescue service shall be provided for all permit required confined spaces.

6.2.6 When preparing the confined space for entry, precautions must be in place to ensure the space remains safe. This may include forced air ventilation, equipment isolation or other measures. For equipment isolation, consideration should be given to blinding, double block and bleed, or other equipment and energy isolation controls.

6.2.7 Trenching and Excavations

When operations require excavating and preparing trenches, persons should be knowledgeable regarding the hazards and precautions necessary for preparing and working in trenches.

1. Underground Hazards

When preparing an excavation, consider the hazards of underground installations. These include electrical equipment, oil and gas transmission, sewers, water lines, telephone lines and other utilities.

2. Toxic Gas and Low Oxygen Hazards

Any trench 4 ft or greater in depth is usually considered a "confined space". Entry into these spaces is controlled by special safety procedures where oxygen deficient or toxic gas hazards can reasonably be expected, such as near landfills or near where hazardous materials are used or stored. There is concern that heavy gases can collect inside a trench.

3. Vehicle Traffic and Falling Loads

Vehicles on nearby roadways and construction equipment can present hazards at an excavated site. Ensure that barricades and warnings are in place.

Construction equipment shall not lift material over people in the trench or excavation.

The soil from the trench is also a hazard to personnel inside the trench, for this reason it must be piled at least 2 ft from the edge of the trench.

4. Stability of Nearby Structures

Before beginning an excavation it is important that consideration be given to nearby buildings, light poles or other structures in the area. Additional support, installed by professionals, may be needed.

5. Escape Means from Trenches

A stairway, ladder or ramp should be located in any trench that is at least 4 ft (1.2m) deep. The escape means should be placed so that a person is never more that 25 ft away from an escape means.

6. Inspections

A qualified person should inspect the trench at least daily and more frequently if needed, such as after a rainstorm or other hazardous occurrence.

7. Prevention of Cave-Ins

Any trench 5 ft or deeper, that is not in entirely stable rock, must be sloped or shored in accordance with recognized engineering practices.

6.3 LOCKOUT/TAGOUT

6.3.1 A lockout/tagout program shall be established to control hazardous energy as follows:

a. Locks and/or tags should be placed to plainly identify the equipment or circuits being worked on. Systems locked or tagged should include the identity or job title of person installing the lock or tag.

b. Personnel should be trained and disciplined in the use of this system to prevent unexpected operation of any equipment

that stores any type of energy that might inflict injury to personnel.

c. The lock or tag should be removed by the person who installed it. In the event the individual is not available, the lock or tag may be removed by the supervisor after ensuring that no hazard will be created by energizing the locked or tagged equipment or circuit(s).

Note: See NFPA 70.

6.3.2 Well Pumping Units

6.3.2.1 Power to the pumping unit should be deenergized and locked or tagged out to eliminate potential hazards during well servicing operations. In confined locations, overhead electric power to the pumping unit control panel should be deenergized. Where necessary, power service should be deenergized while moving the rig in or out and during rig-up and rig-down operations. See Lockout/Tagout.

6.3.2.2 During well servicing operations, the pumping unit shall be secured to prevent unintended movement. Use of the brake only or the brake and brake pawl are not acceptable means of securing the pump unit

6.3.2.3 Chain or wire rope sling of suitable strength should be used to handle the horsehead if removal or installation operations are necessary. On installation, the horsehead should be bolted or latched in accordance with the manufacturer's specifications.

6.3.2.4 Upon completion of well servicing operations and before energizing the power source, precautions shall be taken to ensure that all personnel and equipment are clear of the weight and beam movement.

6.3.2.5 Brake systems on all pumping units in service should be maintained in safe working order.

6.3.2.6 After well servicing operations are completed all pumping unit guards and enclosure guards (belt and motor sheaves) should be reinstalled prior to startup. Guards need not be in place until all final adjustments (pump, spacing, etc.) are made, so long as the safety of personnel is not compromised.

6.4 HOTWORK, WELDING, AND FLAME CUTTING OPERATIONS

6.4.1 General

6.4.1.1 A written safe work permit (hot work permit) system covering welding and flame cutting operations should be observed. See NFPA 51B. In general, a safe work permit system should consist of authorization to do the work along with the following:

a. Pre-Work Stage Communications meetings addressing the following:
   1. Simultaneous operations.
   2. Air/gas testing.
   3. Equipment isolation.
   4. Equipment preparation.
   5. Identification of hazards.
   6. Emergency procedures.

b. Work-in-Progress Stage:
   1. Posting of permit.
   2. Air/gas testing.
   3. Personal protective equipment requirements.
   4. Fire watch.
   5. Special procedures/precautions.

c. Return to Service Stage:
   1. Authorization and turnover signatures

6.4.1.2 The supervisor should hold a pre-job meeting with the crew and other involved persons to review responsibilities for the operation to be performed.

6.4.1.3 Welding and flame cutting operations shall not be permitted close to flammable liquids, accumulations of crude oil, escaping gas, or locations where sparks, flames, heat, or hot slag could be sources of ignition.

6.4.1.4 Only qualified persons should perform welding or flame cutting operations on equipment used to contain hydrocarbons or hazardous materials.

6.4.1.5 Appropriate personal protective equipment shall be utilized for hot work operations.

6.4.2 Welding and Flame Cutting Operations

6.4.2.1 If the object to be cut or welded cannot readily be moved, all movable fire hazards in the vicinity shall be taken to a safe place.

6.4.2.2 If the object to be welded or cut cannot be moved, and if all the fire hazards cannot be removed, guards shall be used to confine the heat, sparks, and slag and to protect the immovable fire hazards.

6.4.2.3 A safe welding area may be designated. In this area, welding and flame cutting operations can be conducted with minimal concern of providing an ignition source for flammable hydrocarbons or combustible materials. A safety work permit is not normally required for welding operations in an approved safe welding area.

6.4.2.4 Properly maintained fire extinguishing equipment shall be available for immediate use. A minimum of at least one 30-lb dry chemical fire extinguisher shall be immediately

available during welding or cutting operations. This equipment is in addition to the general fire protection equipment.

6.4.2.5 Fire watches with extinguishing equipment shall be required whenever welding or cutting is performed in locations other than designated safe welding areas.

6.4.2.6 A fire watch shall be maintained for at least one-half hour after completion of welding or cutting operations.

6.4.2.7 Before cutting or welding is permitted in areas outside a designated safe welding area, the area shall be inspected by the individual responsible for authorizing cutting or welding operations. This individual shall designate the precautions to be followed in granting authorization to proceed.

6.4.2.8 Cutting or welding shall not be permitted in the following situations:

a. In areas not authorized by the supervisor.
b. In the presence of an explosive atmosphere.
c. In areas near storage of large quantities of exposed readily-ignitable materials.
d. Where ignition can be caused by heat conduction, such as on metal walls or pipes in contact with combustibles on the other side.
e. On used containers such as drums unless properly cleaned.

6.4.2.9 Welding Fumes and Ventilation

6.4.2.9.1 Toxicity depends on the composition and concentration of the fumes. The composition and quantity of fumes depends on the materials being welded, the composition of the welding rods, any coatings or paints encountered in the welding operations, the process used, and the circumstances of use. Toxic fumes can be generated from welding on metals coated with or containing alloys of lead, zinc, cadmium, beryllium, and certain other metals. Some paints and cleaning compounds may also produce toxic fumes when heated. The potential health effects range in type and severity, depending on these factors; and some effects can be extremely serious.

6.4.2.9.2 For more information on the toxicity and health hazards of welding fumes and the appropriate protective measures, consult the following references: Industrial Ventilation, A Manual of Recommended Practice, 22nd Edition; Threshold Limit Values and Biological Indices for 1997-98; and API Publication 2201.

6.4.2.9.3 Mechanical ventilation at the minimum rate of 2,000 ft^3/min (0.944 m^3/s) per welder shall be provided when welding:

a. In confined spaces or where the welding space contains partitions, balconies, or other structural barriers to the extent that they significantly obstruct cross ventilation.
b. Where the nature of the welding, cutting, or brazing work is such that the release of toxic fumes or gases is possible. This includes work on stainless steel, zinc, lead, and degreasing or cleaning compounds containing hydrocarbons.

6.4.2.9.4 Adherence to confined space entry procedures shall be followed prior to any re-entries. For example, releases from acetylene cutting equipment could change the atmosphere within the confined space.

6.5 WORK IN PROXIMITY TO EXPOSED ENERGIZED POWER SOURCES

6.5.1 Neither equipment nor machines on rigs (includes guylines) shall be operated closer to power lines than the recommended minimum clearances shown in Table 2, except when such lines have been deenergized and visibly grounded or when barriers are present to prevent physical contact with the lines.

6.5.2 An individual should be designated to observe equipment clearance as defined in Table 2. The operator should notify the observer if he is having any difficulty in determining the clearance. The observer should sound a warning at any time the clearance is not maintained.

6.5.3 When cage-type boom guards, insulating guylines, insulating links, or proximity warning devices on rigs or guylines are used, the recommendations of Table 2 are applicable.

6.5.4 Overhead wires should be considered energized (live) unless either the electrical system owner reports them to be non-energized, or a qualified electrical person tests and finds them to be non-energized.

Table 2—Recommended Minimum Clearances Between Power Lines and Derricks, Masts, or Guylines

Equipment	Line Voltage, Volts	Minimum Clearance
Operating	All	10 ft plus 4 in. for each additional 10 kV over 50 kV
In transit (lowered mast)	less than or equal to 50 kV	4 ft
	greater than 50 kV	4 ft plus 4 in. for every additional 10 kV

7 Design

7.1 EMERGENCY EYE OR BODY WASH STATIONS

Where the eyes or body of personnel may be exposed to injurious materials, eyewash and shower equipment for emergency use shall be provided. For information on emergency eyewash and shower equipment, see ANSI Z358.1.

7.2 CRITICAL EQUIPMENT

Critical equipment is defined as equipment and other systems determined to be essential in preventing the occurrence of, or mitigating the consequences of an uncontrolled event. Such equipment may include pressure vessels, pressure relief devices, compressors, alarms, interlocks, and emergency shutdown systems.

7.2.1 Critical equipment should be periodically inspected and tested as recommended by the manufacturer or in accordance with recognized engineering practices.

7.2.2 When using nondestructive testing (NDT) methods, qualified persons should conduct the tests in accordance with recognized methodology and acceptance criteria. Certified NDT inspectors shall be trained per ASNT RP No. ASNT-TC-1A.

7.2.3 Other types of inspection should be conducted by qualified persons.

7.2.4 When critical equipment is removed from service, a program should be in place to ensure equivalent protection is provided.

7.3 CHANGES TO CRITICAL EQUIPMENT

Procedures to manage changes (except for "replacements in kind") to critical equipment should be implemented, as appropriate. These procedures should address the following prior to making the change:

1. The basis for the proposed change.
2. Impact of change on safety and health.
3. Modifications to operating procedures.
4. Authorization requirements for the proposed change.

Employees whose job tasks will be affected by the change in the critical equipment should be informed of the change prior to start-up.

7.4 FIRE PREVENTION

7.4.1 Safe storage and location of combustible and flammable materials and the prevention of accumulation of rubbish are important to fire prevention.

7.4.2 Smoking shall be prohibited at or in the vicinity of operations that constitute a fire hazard. Such locations should be conspicuously posted with a sign, "NO SMOKING OR OPEN FLAME," or equivalent.

7.4.3 Smoking shall be permitted only in areas designated for smoking.

7.4.4 Change rooms and other buildings where smoking is permitted should be located in areas designated safe for smoking.

7.4.5 No source of ignition should be permitted in an area where smoking has been prohibited, unless it is first determined safe to do so by the supervisor in charge or his designated representative.

7.4.6 Potential sources of ignition should be permitted only in designated areas located at a safe distance from the wellhead or flammable liquid storage areas.

7.4.7 Equipment, cellars, ground areas around and adjacent to the facility should be kept free from oil and gas accumulations that might create or aggravate fire hazards.

7.4.8 Combustible materials such as oily rags and waste should be stored in covered metal containers and the covers kept in place.

7.4.9 Natural gas or liquefied petroleum gas shall not be used to operate spray guns or pneumatic tools.

7.4.10 Material used for cleaning should have a flash point of not less than 100°F.

7.5 FIRE PROTECTION

7.5.1 Fire fighting equipment shall not be tampered with and shall not be removed for other than fire protection, fire fighting purposes, and services. A fire fighting water system may be used for wash down and other utility purposes so long as its fire fighting capability is not compromised.

7.5.2 Fire extinguishers and other fire fighting equipment should be suitably located, readily accessible, and plainly labeled as to their type and method of operation.

7.5.3 Fire suppression equipment (extinguishers, fixed systems, etc.) should be periodically inspected and maintained in operating condition at all times. A record of the most recent equipment inspection should be maintained.

7.5.4 Portable fire extinguishers shall be tagged with a durable tag showing the date of the last inspection, maintenance, or recharge or accomplished using other acceptable recordkeeping media. Inspection and maintenance procedures should comply with NFPA 10.

7.5.5 Personnel should be familiar with the location of fire control and selected personnel trained in the use of such equipment. Fire fighting equipment shall be accessible and free of obstructions.

7.6 GROUNDING AND BONDING

Production facilities are subject to various forms of electrical hazards that must be protected against. Static electricity can be generated by fluid movement in vessels, piping and tankage. This results in static sparks being generated which can be an ignition source. Lightning strikes to a facility are also an ignition source. Electrical equipment failure can occur exposing personnel to shock hazards. For guidelines to address these potential risks, refer to industry recommended practices such as API RP 2003 *Protection Against Ignition Arising Out of Static, Lightning, and Stray Currents* and NFPA 77 *Static Electricity.*

7.7 FLAMMABLE LIQUIDS

7.7.1 Containers

7.7.1.1 Hand portable containers for storing flammable liquids should be Underwriters Laboratories (UL) listed or Factory Mutual (FM) approved, or equivalent.

7.7.1.2 Tanks, drums, and other containers containing flammable liquids should be properly labeled to denote their contents and should be properly stored when not in use.

7.7.1.3 Metal or other conductive material containers should be used in handling, storing, or transporting flammable liquids. The handling of flammable liquids in plastic containers is potentially dangerous due to static charge buildup. Metal parts on any plastic containers used in such service shall be bonded to the fill connection. If plastic containers are used, the conductive fill connection or a grounded rod should be inserted prior to filling the container with any flammable liquid. See NFPA 77 and API RP 2003.

7.7.2 Fuel and Oil Transfers and Refueling

7.7.2.1 Hydrocarbon-fueled engines should be shut down during refueling operations.

7.7.2.2 Fuel tanks should be monitored while they are being filled to prevent overfill and spillage.

7.7.2.3 During refueling operations, the filling nozzle should be kept in contact with the intake pipe to ensure bonding and prevent fuel spillage.

7.7.3 Liquified Petroleum Gas (LPG) and Compressed Gas

7.7.3.1 Handling, connecting, and transfer operations involving liquefied petroleum gas (LPG) shall conform to NFPA 58 *Standard for the Storage and Handling of Liquefied Petroleum Gases*, and NFPA 55 *Compressed and Liquefied Gases in Portable Cylinders*.

7.7.3.2 Ignition Source Control. Ignition source controls shall be established in any area where flammable or oxidizing compressed gases are stored or used.

7.7.3.3 Protective Caps. Where compressed gas cylinders are designed to accept valve protective caps, the user should keep such caps on compressed gas cylinders at all times except when being filled or connected for use.

7.7.3.4 Where gas-tight valve outlet caps or plugs are provided, the user should keep such devices on the valve outlet at all times except when compressed gas cylinders are being filled or connected for use.

7.7.3.5 Compressed or liquefied gas cylinders in use or in storage shall be secured to prevent them from falling or being knocked over.

7.7.3.6 Compressed gas cylinders should be transported, stored and used in an upright position.

7.7.3.7 Compressed gas cylinders exposed to fire shall not be used until they are requalified in accordance with the pressure vessel code under which they were manufactured.

7.7.3.8 Containers that show denting, bulging, gouging, or excessive corrosion should be removed from service.

7.7.3.9 Repair or alteration of containers shall comply with the regulations, rules, or code under which the container was fabricated.

7.7.3.10 Compressed gas cylinders should be marked or labeled in accordance with CGA C-7 *Guide to the Preparation of Precautionary Labeling and Marking of Compressed Gas Containers*. Such markings or labels should not be removed.

7.7.3.11 Compressed gas cylinders shall not be placed where they could become a part of an electrical circuit.

7.7.3.12 Compressed gas cylinders should not be exposed to temperatures exceeding 125°F. Cylinders shall not be subjected to direct heating to increase vapor pressure.

7.7.3.13 Stoves and heaters used with LPG fuel should only be used in well-ventilated areas. Personnel should ensure proper ventilation exists before lighting the heater/stove. All hoses and connections on LPG stove or heater systems should be checked frequently to ensure they do not leak.

7.7.3.13.1 Only qualified personnel should be allowed to fill LPG bottles. Protective gloves should be worn when refilling or replacing LPG bottles. There is a possibility of freeze burns if propane comes in contact with skin.

7.7.4 Storage

7.7.4.1 Flammable liquids storage areas within any building or shed should:

a. Be adequately vented.
b. Have unobstructed exit(s) leading from the building.
c. Be maintained with due regard to fire potential with respect to housekeeping and materials storage.
d. Be identified as a hazard and have appropriate warning signs posted.
e. Have a Class BC fire extinguisher (see NFPA 10) readily available.
f. Be properly classified for electrical installations in accordance with API RP 500 or API RP 505.

7.7.4.2 Paint and solvents should be stored in an adequately vented area safely away from heat and ignition sources.

7.7.4.3 Flammable liquids should not be stored within 50 ft (15.2 m) of the wellbore, except for fuel in the tanks of operating equipment. Where terrain and location configuration do not permit maintaining this distance, equivalent safety measures should be taken.

7.8 EQUIPMENT

7.8.1 Generators, Motors, and Lighting

7.8.1.1 All electrical conductors and switch gear shall be sized in accordance with NFPA 70.

7.8.1.2 All generators should have an overload safety device that will provide protection from shorting and burnout.

7.8.1.3 When adequate fixed illumination cannot be made available, temporary portable lights approved for the electrical classification should be provided. Where possible, floodlights in use should be placed in positions so as not to impair vision of persons in the work area. Operations should not be performed using vehicle headlights as a substitute for lighting.

7.8.1.4 All electrical extension cords shall be properly insulated and plugs and receptacles shall be in good condition.

7.8.1.5 Light fixtures should be placed and maintained to provide illumination for work areas in conformance with NECA/IESNA-502-99 *Installing Industrial Lighting Systems ANSI Approved*.

7.8.1.6 Repairs to electrical equipment shall not be performed unless the power source has been isolated and the control has been locked out/tagged out, and the person making the repairs is authorized to do so.

7.8.1.7 Electric motors, generators, and control panels shall be grounded.

7.8.2 Electrical Systems

7.8.2.1 Electrical Systems Equipment

7.8.2.1.1 Electrical equipment used in hazardous locations should be designed for such locations, and listed or approved by a nationally recognized testing laboratory. All wiring components and electrical equipment should be maintained in accordance with the manufacturer's recommendation.

7.8.2.1.2 Wiring should be replaced or properly repaired and sealed as necessary when insulation damage is detected. Because of fire and other hazards, makeshift wiring components and installations should not be used.

7.8.3 Classification of Areas

7.8.3.1 Classification of areas shall be in accordance with API RP 500 and RP 505.

7.8.4 Tanks, Separators and Heater Treaters

7.8.4.1 Tanks, separators and heater treaters should be installed and maintained in accordance with accepted engineering practices or manufacturers recommendations. See API RP12R1, Specs 12J, 12K, 12L, 12P and RP12N.

7.8.4.2 Walking directly on the roof of a tank is discouraged. However, if personnel are required to access the roof of a tank, roof integrity shall be checked and appropriate walking surfaces, guardrails or fall protection shall be provided.

7.8.5 Vapor Recovery Systems (Systems Designed to Minimize Vapor Releases to the Environment)

7.8.5.1 This section describes the safety guidelines for vapor recovery systems, specially thermal combustion systems and carbon absorption systems. See NFPA 30 for additional information.

7.8.5.2 Vapor recovery systems should be considered potential sources of ignition; facility design shall consider system location with respect to potential sources of hydrocarbon vapors.

7.8.5.3 Procedures should be developed for switching carbon beds and changing out the activated carbon in the absorbers.

7.8.5.4 Devices should be installed to prevent a flame from propagating from the vapor recovery unit into the production equipment. See API RP12N.

8 Training

8.1 GENERAL

All personnel should be trained to work safely in accordance with their duties and responsibilities. Personnel should

understand the safety and health hazards associated with the chemicals and processes they work with. Contractor personnel performing operating duties, maintenance or repair, turnaround, major renovation or specialty work should be knowledgeable of site-specific safety procedures and rules pertaining to the facility and the applicable provisions of emergency action plans. Persons assigned to operate the facility or maintain the integrity of the equipment should possess the required knowledge and skills to carry out their duties and responsibilities and should be evaluated periodically to determine if the necessary skills and knowledge are adequate. Any major change that requires modification of existing operating practices may require additional training before personnel are expected to operate or maintain the facility.

9 Procedures

9.1 WELL STARTUP

9.1.1 General

Introducing a new or worked-over well to a separation process, pipeline or storage facility may create additional hazards to the operation. The properties of the well should be reviewed to determine the extent of the hazards. Depending upon the risks of the hazards the following elements should be considered.

9.1.2 Design Review

9.1.2.1 A design review should be performed to verify that the facility's equipment can safely process the wellstream.

9.1.2.2 The design information should include, as appropriate, a simplified process flow diagram and acceptable upper and lower limits, where applicable, for items such as temperature, pressure, flow and hydrocarbon composition.

Where process flow diagrams no longer exist, similar information may be developed in conjunction with a hazards analysis in sufficient detail to support the analysis.

9.1.3 Pressure Relief

Pressure relief systems should be properly sized, installed, maintained and operated to minimize overpressure. See API 520 and 521.

9.1.4 Startup Procedures

9.1.4.1 General

Oil and gas wells have varying characteristics as follows:

–Shallow vs deep

–Low vs high pressure

–Sweet vs sour

Startup procedures should be tailored to the particular well characteristics. Well startups are classified as initial startup, normal or routine startups, and startup after an extended shutdown.

9.1.4.2 Pre Startup Safety Review

Prior to startup of a new facility, or after modification of an existing facility, certain activities should be conducted to prepare the facility for safe operations. The following areas should be considered:

1. Construction has been completed according to design requirements.
2. Piping and valves are properly installed.
3. All safety and control devices are set and operate properly.
4. Applicable safety and control devices are functioning properly.
5. Eliminate potential ignition sources.
6. Pre-job safety meeting.

9.1.4.3 Initial Startup

The following procedures should be considered:

1. Pressure test from well to choke at maximum wellhead pressure.
2. Pressure test from choke to production equipment, including flowlines, at expected line pressure.
3. Pressure relief systems are operable.
4. Valves are set correctly.
5. Purge air from the well and associated equipment using hydrocarbons or other acceptable means.
6. Monitor flow and bring well online.
7. Pre-job safety meeting.

9.1.4.4 Normal or Routine Startup

The following procedures should be considered:

1. Pressure relief systems are operable.
2. Valves are set correctly.
3. Monitor flow and bring well online.
4. Pre-job safety meeting.

9.1.4.5 Startup After Extended Shutdown

After an extended shutdown, an equipment assessment should be conducted prior to well startup. This assessment should include inspections for corrosion, missing or modified equipment, and overall integrity of the facility. After the assessment is competed, and repairs and corrections are made, well startup should follow initial startup procedures or normal startup procedures, as applicable.

9.1.5 Training of Employee and Contractor Personnel

Personnel conducting well startup operations should be properly trained, qualified, and familiar with well startup procedures for the specific facility.

10 Maintenance

10.1 GENERAL

The maintenance supervisor should hold a pre-job meeting with his crew, and others if applicable, to review responsibilities for the operation(s) to be performed.

10.2 TANK CLEANING

Tank cleaning should be completed following API Standard 2015, *Safe Entry and Cleaning of Petroleum Storage Tanks*. API Recommended Practice 2016, *Entering and Cleaning Petroleum Storage Tanks* should also be consulted for recommendations, guidance, safe practices and additional information covering specific aspects of tank entry and cleaning, including a comprehensive tank cleaning checklist.

10.3 DRILLING AND WELL SERVICING

Drilling and well servicing should be performed in accordance with API RP54.

11 Incident Investigation

All incidents with the potential for serious safety consequences should be investigated to determine causal factors and steps taken to prevent a recurrence. The results of the investigation should be communicated to affected personnel including contractors as appropriate.

12 Emergency Response

12.1 GENERAL

Written action plans should be established for production facilities to assign authority to the appropriate qualified person(s) for initiating effective emergency response and control. These plans should also address emergency reporting and response requirements.

12.1.1 Every occupational injury or illness shall be immediately reported to the supervisor. The supervisor shall arrange for any necessary medical or first aid treatment.

12.1.2 A report should be prepared as soon as practical, to record information (or the circumstances) surrounding the injury or illness. Additional reports to regulatory agencies and others may be required.

12.2 MEDICAL SERVICES

12.2.1 Telephone numbers, location, and other relevant information pertaining to availability of medical personnel, transportation, and medical facilities shall be available.

12.2.2 Provisions should be made for medical attention in case of injury.

12.3 FIRST AID

12.3.1 An individual trained in first aid and cardiopulmonary resuscitation (CPR) techniques should be available to render aid. This individual should be trained using approved courses of the American Red Cross, American Heart Association, or equivalent training.

12.3.2 A first aid kit shall be available at the worksite. The kit should contain appropriate materials for the potential injuries, and should be inspected at frequent intervals, replenished as necessary, and be immediately available at all times.

13 Special Operations

13.1 WELL TESTING

A cleanup tank should be used instead of a workover pit during well testing. Testing of casing relief valves using fluids other than fresh water should have the relief piped to a catch tank. When pressure testing surface equipment, use a 50/50 mixture of glycol and 2% potassium chloride (KCl) water or equivalent to prevent ice formation. During well testing, the equipment should be pressure tested to maximum expected formation pressure. The following equipment should be included during the pressure testing:

- Test tree and casing for 10 minutes and record.
- Secure and pressure test lines upstream of choke prior to flowback.
- Test lubricator.
- Test surface lines.

13.2 PUMPING AND HOT OIL OPERATIONS (FLOWLINES)

13.2.1 All trucks and tanks should be located a minimum of 100 ft (30.5 m) upwind from the wellhead, or equivalent safety measures should be taken where terrain, location, or other conditions do not permit. At locations where this recommendation may be impractical, appropriate safety measures should be implemented.

13.2.2 All lines connected from the pumping equipment to the Christmas tree or wellhead should have a check valve installed as close to the well as practicable. In addition, when a multi-pump manifold is used, a check valve should be placed in each discharge line as close to the manifold as possible.

13.2.3 When used, recording equipment should be located a safe distance from the wellhead and discharge line.

When pumping flammable fluids, all blending equipment used should be grounded and all equipment unloading sand into the hopper should be bonded to the blending equipment.

When pumping flammable fluids, all charged suction hoses should be covered with hose covers to deflect fluids in case of rupture.

Lines containing flammable fluids should not be placed under any vehicle.

A pre-treatment pressure test on the pump and discharge lines should be made at a pressure no less than the maximum expected treating pressure specified by the operator, but not to exceed the rated working pressure of the equipment with the lowest rated working pressure.

Personnel not directly involved in the operations should remain beyond a designated minimum distance during all pressure testing and pumping operations.

The supervisor or the person he designates should check to see that all valves in discharge lines are open prior to pumping.

Pump operators should remain at the controls while the pump is in operation, unless relieved as directed by the special services supervisor. Pump operators should remain alert for communications from the special services supervisor.

13.3 PIGGING OPERATIONS

13.3.1 Procedures should be developed for launching and receiving pigs, scrapers, swabs, and internal inspection pigs (smart pigs). These procedures should address the following elements:

- Description of the process fluids and vapors, personnel hazards, and PPE.
- Selecting and verifying the proper pig is available.
- Preparing the pig launcher/receiver, including isolation, depressuring, and setting pig indicators.
- Verifying that the vessel is not pressurized.

CAUTION: Gauges alone may not insure that the vessel is fully depressurized. Intentionally opening a pig launcher/receiver under pressure using any style of opener is prohibited.

- Opening the pig launcher/receiver

CAUTION: Ensure all personnel are positioned at the side of the pig launcher/receiver. Do not stand in front of the pig launcher/receiver closure when the closure is being opened.

- Inserting and removing pigs, including isolation of ignition sources, containment of liquid wastes and exposure to toxic compounds.
- Inspecting and repairing as necessary pig launcher/receiver closures, valves, pressure gauges, pig indicators, and other ancillary components each time the closure is opened.
- Closure of the pig launcher/receiver and returning it to service.
- Procedures to take in event the pig is stuck or any of the valves do not operate properly.

13.3.2 Only qualified persons in pig launching/receiving should perform pigging operations.

13.3.3 A pre-job safety review should be preformed prior to all pig launching/receiving operations. Pig launchers/receivers shall be depressurized whenever left isolated from the pipeline.

13.3.4 Fire extinguishing equipment should be positioned near the pig launcher/receiver when pigging operations are being performed.

13.4 HOT TAPPING ON EQUIPMENT IN SERVICE

13.4.1 Hot tapping operations should be conducted in accordance with API Publ 2201 *Welding or Hot Tapping on Equipment in Service*.

13.4.2 Hot tapping operations should be under the direct supervision of a qualified person.

The rated working pressure of all equipment used in hot tapping operations should be equal to or greater than the rated working pressure of the equipment to which it is being attached.

13.4.3 After necessary equipment has been rigged up to perform hot tapping operations, it should be pressure tested for a minimum of three minutes to a level not exceeding the rated working pressure of either the equipment being tapped or the tapping equipment and not to exceed 1.5 times the expected maximum pressure. The possibility of carrier or untapped pipe collapse from external pressure may dictate a reduction in test pressure.

13.4.4 During the hot tapping operation, pressure inside the lubricator should not exceed the pressure inside the equipment penetrated.

13.4.5 Hot taps or other hot work are not permitted on the roof of a tank or within the gas vapor space of the tank.

APPENDIX A—EXAMPLE LEASE PRODUCTION SAFETY CHECKLIST

Date: _____

Location: _____ **Inspected By:**_____

Codes: √ **— Satisfactory** **X — Unsatisfactory *** **NA — Not Applicable**

ALARMS/SHUTDOWN
_____Are alarms and shutdown systems operable & tested quarterly?
_____Are level switches and dump valves operating properly?

ELECTRICAL
_____Is the wiring in good repair and unexposed?
_____Are junction and switch box covers in place?
_____Are electrical motors grounded?
_____Is the conduit in good condition and all wiring in conduit?
_____Are all electrical control panels labeled as to function and voltage?
_____Is overhead powerline clearance a concern?

FACILITY SIGNS
_____Is a "Hard Hat Required" sign present?
_____Is there a "NO SMOKING" sign at the entrance?
_____If required, are there "Danger Poison Gas, H_2S May Be Present" signs (> 10 ppm)? "Respiratory Protection Required" signs (> 100 ppm) and "Standby Required Beyond This Point" signs (> 300 ppm)?
_____Are there "Unit Starts Automatically" warning signs?
_____Are all process vessels, storage tanks and drums properly labeled (i.e., HAZCOM, NORM, ASBESTOS)?
_____Are Lighting instructions posted on fired vessels (i.e., heater treaters, dehydrators, etc.)?
_____Is there a "No Trespassing" or "Authorized Employees Only" sign at the entrance?
_____Is the tank battery properly identified with a sign?
_____Is there a lease sign at the location?
_____If required, is there a Regulated Confined Space sign?

FIRE EXTINGUISHERS
_____Are all fire extinguishers inspected within the last 30 days?
_____Are fire extinguishers fully charged, sealed and tagged?
_____Have dry chemical cartridge operated fire extinguishers been hydrostatically tested according to schedule?

GAS DETECTION INSTRUMENTS
_____Are fixed and portable monitoring instruments calibrated and in good working condition?

GUARDS
_____Are all sight glasses guarded and in good condition?
_____Do all pumps have the couplings and shafts guarded?
_____Are all belts and pulleys totally enclosed?
_____Are fans, flywheels and other moving parts properly guarded?
_____Is live electrical/transformer equipment guarded?
_____Is there a horse head guard on the pumping unit when below 7 ft?

HAZARD COMMUNICATION STANDARD
_____Are approved MSDSs provided for all appropriate products?

HOUSEKEEPING
_____Have stumbling, tripping and falling hazards been eliminated or marked?
_____Are all buildings in good repair?
_____Have weeds been cut around the production equipment?
_____Is the cattleguard properly maintained?

LADDERS
_____Are ladder rungs, rails, brackets, etc., in good condition?
_____Are all ladders caged when over 20 ft?
_____Do side rails of through or side-step ladders extend at least $3^1/_2$ ft above landings?
_____Is the access opening to ladders provided with a swinging gate or chain closure?

PRODUCTION EQUIPMENT
_____Are all pressure gauges in good working order?
_____Are all wellhead master and wing valves in good condition?
_____Are valves and connections properly bolted, supported, and in good condition?
_____Are aluminum, copper tubing and rubber hose not being used for hydrocarbon service?
_____Is all process equipment properly anchored for movement from wind and vibration?
_____Are burner flame arrestors in good condition?

PUMPING UNIT
_____Are there guard rails around the unit?
_____Is there proper spacing between the guard rails and the counter weights (min-15"/max-42")?
_____Does the brake function properly?
_____Is the throat bolt present and tight (if required by the manufacturer)?
_____Is there 4" clearance between the polish rod yoke and top of stuffing box at bottom of stroke?

RELIEF VALVES
_____Are relief valve inspections current?
_____Are block valves which affect the operation of relief valves, sealed or locked in the open position?
_____Are relief valves discharged up and away from personnel and equipment?
_____Are relief valves set at or under the maximum allowable working pressure of the protected equipment?
_____Are all pressure vessels protected with relief valves?
_____Rupture disk(s) visually examined for leakage?

RESPIRATORY EQUIPMENT (If provided)
_____Are all respirators sanitized and properly stored?
_____Have all emergency use respirators been inspected and documented within the last 30 days?

ROADWAYS
_____Are there any roadway hazards that need to be marked, guarded or eliminated? (anchors, pipelines, risers, etc.)

TANKS, VESSELS
_____Are walkways and stairways in good order?
_____Are there toeboards on elevated walkways over 4 ft?
_____Do the tank thief hatches seal and are they in good repair?
_____Are process vessels and storage tanks in sound condition with no sign of corrosion problems?
_____Is the insulating or protective coating material in good condition?
_____Are vessel/tank foundations in good repair and free of washout or undercutting?
_____Does the tank have a vent line attached and is it free of obstruction?
_____Are all pressure vessels operating at or below their maximum allowable working pressure?
_____Has the insulation been analyzed and labeled if it contains asbestos?
_____Are tanks examined visually to check for leaks, tank distortion, corrosion, coating and cathodic protection conditions?

PIPING

_____Are all valves and connections in good operating condition?

_____Are the facility piping systems in sound condition, with no sign of leaks or potential corrosion problems?

REMARKS: _____

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Note: Requires clarification (specify items and locations)

APPENDIX B—EXAMPLE COMPRESSOR/BOOSTER STATIONS SAFETY CHECKLIST

Work Group: _____ **Date:** _____

Location: _____ **Inspected By:**_____

Codes: √ **— Satisfactory** **X — Unsatisfactory *** **NA — Not Applicable**

ALARMS/SHUTDOWN
_____Are alarms and shutdown systems tested quarterly?
_____Are tests documented and records maintained.

GAS DETECTION INSTRUMENTS
_____Are fixed monitoring instruments (i.e., hydrogen sulfide, hydrocarbon) calibrated and in good working condition?

ELECTRICAL
_____Are electrical tools and cords in good operating condition?
_____Where appropriate, is explosion proof lighting and equipment provided and used?
_____Are electrical cords properly insulated and/or provided with ground?
_____Are all electrical installations in good condition and installed according to regulations (any exposed wiring)?
_____Are ground fault circuit interrupters (GFCIs) utilized?
_____Are PCB containing systems labeled and documented?
_____Are all electrical control panels labeled as to function and voltage?
_____Are junction and switch box covers in place?
_____Are electrical motors properly grounded?

EMERGENCY RESPONSE
_____Is an emergency response plan provided?
_____Are drills conducted and documented?
_____Are emergency phone numbers provided and updated?
_____Is the facility properly identified and an emergency number provided?

EQUIPMENT
_____Are all sight glasses guarded?
_____Are pump couplings, belts, gears, chain drives, shafts, pulleys and flywheels properly guarded?
_____Are high temperature systems insulated or equipped with guards for personnel protection where needed?
_____Is engine/piping vibration at a minimum? Are vibration shutdowns effective?
_____Are all vessels and equipment properly grounded?
_____Are the ignition system components free from broken insulation, cracks or grease?
_____Are all pressure gauges in good working order?
_____Are all lights working and do they provide adequate illumination?
_____Is the concrete in good structural condition?
_____Is the compressor's exhaust system free of leaks?
_____Are gas starters leak free and properly vented?
_____Are skids equipped with migrant oil containment systems?
_____Are pressurized drains separate from non-pressurized drains?
_____Are there water traps on drains?
_____Are start-up and shutdown procedures posted?
_____Is manual starting valve on the opposite side of the starter and is fuel regulator vented to cooler?
_____Are compressor rod distance pieces vented away from unit?
_____Are there any underground storage tanks at this location?

FACILITY SIGNS

_____Is a “Hard Hat Required” sign present?
_____Is there a “NO SMOKING” sign, as appropriate?
_____Are there “Danger Poison Gas, H2S May Be Present” signs (> 100 ppm), “Respiratory Protection Required” signs (> 10 ppm), and “Standby Required Beyond This Point” signs (> 300 ppm), if required?
_____Are there “Danger, This Unit Starts Automatically” warning signs, if required?
_____Are “Hearing Protection Required” signs present where noise level exceeds 85 dBA?
_____Are lighting instructions posted on fired vessels (i.e., heater treaters)?
_____Is there a “No Trespassing, Authorized Employees Only” sign at the principle entrance?
_____Is there a “Regulated Confined Space” sign?
_____If a NORM notification sign is required, is it posted?

FIRE EXTINGUISHERS

_____Are all fire extinguishers inspected within the last month?
_____Are fire extinguishers fully charged and tagged?
_____Have cartridge operated fire extinguishers been hydrostatically tested within the past 12 years?
_____Are records maintained on each fire extinguisher?

HAZARD COMMUNICATION STANDARD

_____Are MSDSs provided for all appropriate products?
_____Are all process vessels, storage tanks and drums properly labeled (i.e., HAZCOM, NORM)?
_____Has lead paint use been eliminated?
_____Has lead paint been identified/labeled?

HOUSEKEEPING

_____Have stumbling, tripping, and falling hazards been eliminated or marked?
_____Are all buildings in good repair?
_____Have weeds been cut around the location?
_____Is the road at the facility in good condition?

LADDERS

_____Are fixed ladders caged when over 20 ft?
_____Are portable ladders in good condition?
_____Are scaffolds in good condition?
_____Do through or side-step ladders extensions extend at least 3.5 ft above landings?
_____Are ladder rungs, rails, brackets, etc., in good condition?

MATERIAL HANDLING

_____Are aisles and passageways accessible for entering and exiting?
_____Are all hoists properly labeled and in good condition?
_____Is preventive maintenance up to date?
_____Are cranes inspected monthly and in good condition?
_____Are slings, ropes and chains inspected regularly and in good condition with appropriate recordkeeping?
_____Are load tests on file?

PIPING

_____Are all valves and connections in good operating condition?
_____Are the facility piping systems in good condition, with no sign of leaks or potential corrosion problems?
_____Are cathodic protection rectifier readings current (per the manufacturer's recommendations)?
_____Is the cathodic protection system inspected annually?
_____Are open-ended valves plugged?

RELIEF VALVES

_____Are relief valve inspections current?
_____Are rupture disks visually examined for leakage?
_____Are test records and tags available?
_____Are block valves upstream of the relief valves sealed or locked in the open position?
_____Are relief valves discharged up and away from personnel and equipment?
_____Are relief valves set at or under the maximum allowable working pressure of the protected equipment?

RESPIRATORY PROTECTION

_____Are respirators appropriate for exposure being worn?
_____Are all respirators sanitized and properly stored?
_____Have all emergency use respirators been inspected within the last 30 days? (Records maintained?)
_____Is the air supply for respirators sufficient?

PPE

_____Is eye protection provided and used?
_____Is appropriate footwear being worn?
_____Are hard hats being worn?
_____Is hearing protection available and being worn?

TANKS, VESSELS

_____Are walkways and stairways in good order?
_____Are there toeboards on elevated walkways?
_____Are process vessels and storage tanks in sound condition with no sign of potential corrosion problems?
_____Is the insulation or protective coating material in good condition?
_____Has the insulation been analyzed for asbestos content?
_____Do tank thief hatches seal and are they in good repair?

REMARKS: _____

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