

Recommended Practice for Development of a Safety and Environmental Management Program for Offshore Operations and Facilities

API RECOMMENDED PRACTICE 75
THIRD EDITION, MAY 2004

REAFFIRMED, APRIL 2013



AMERICAN PETROLEUM INSTITUTE

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Upstream Segment

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FOREWORD

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Recommended Practice for Development of a Safety and Environmental Management Program for Offshore Operations and Facilities

SECTION 1—GENERAL

1.1 PURPOSE AND OBJECTIVE

1.1.1 Owners and Operators

This recommended practice is intended to assist in development of a management program designed to promote safety and environmental protection during the performance of offshore oil and gas and sulphur operations. This recommended practice addresses the identification and management of safety hazards and environmental impacts in design, construction, start-up, operation, inspection, and maintenance, of new, existing, or modified drilling and production facilities. The objective of this recommended practice is to form the basis for a Safety and Environmental Management Program (SEMP). By developing a SEMP based on this Recommended Practice, owners and operators will formulate policy and objectives concerning significant safety hazards and environmental impacts over which they can control and can be expected to have an influence.

The SEMP is based on the following hierarchy of program development:

1. Safety and environmental policy
2. Planning
3. Implementation and operation
4. Verification and corrective action
5. Management review
6. Continual improvement

It is recommended that each operator have a safety and environmental management program for their operations. The owner(s) should support the operator's SEMP.

Management (owner and operator) should require that the program elements discussed in Sections 2 through 12 of this publication are properly documented and available at field and/or office locations, as appropriate for each program element.

1.1.2 Contractors

The offshore oil and gas industry uses a wide variety of contractors to assist in drilling, production, and construction activities. Contractors typically are in one of the following categories, but this is not an exhaustive list: drilling, work-over, well servicing, construction, electrical, mechanical, diving, boat and helicopter transportation, painting, operating, and catering/janitorial. Operators expect contractors to provide safe and reliable equipment as well as trained employees who are familiar with offshore oil and gas operations.

This recommended practice does not require contractors to develop a SEMP. However, contractors should be familiar

with the operator's SEMP and should have safety and environmental policies and practices that are consistent with the operator's SEMP.

Contractors with significant operations and/or contractor-owned facilities (MODU, derrick barge, lift boat, etc.) may consider developing a complete SEMP. A Bridging Document may be utilized to manage operations. Such a document will specify which SEMP's requirements are relevant for specific operations. This may avoid confusion as to operational control and work practices.

Contractors with few operations and/or contractor-owned facilities may want to develop safety and environmental policies and practices addressing elements of this recommended practice that are appropriate to the contractor's activities and considers the safety hazards and environmental impacts of its activities, products and services.

1.2 MANAGEMENT PROGRAM ELEMENTS AND PRINCIPLES

1.2.1 Management Program Elements

The program elements described herein address the following 11 areas:

- a. Safety and environmental information (Section 2)
- b. Hazards analysis (Section 3)
- c. Management of change (Section 4)
- d. Operating procedures (Section 5)
- e. Safe work practices (Section 6)
- f. Training (Section 7)
- g. Assurance of quality and mechanical integrity of critical equipment (Section 8)
- h. Pre-startup review (Section 9)
- i. Emergency response and control (Section 10)
- j. Investigation of incidents (Section 11)
- k. Audit of safety and environmental management program elements (Section 12).
- l. Documentation and record keeping (Section 13).

1.2.2 Principles

This recommended practice is based on the following principles:

- a. Management is responsible for the overall success of the safety and environmental management program. Manage-

ment is responsible for developing and endorsing a written program which addresses the elements identified in 1.2.1.

b. Management provides leadership in establishing goals and performance measures, demands accountability for implementation, and provides necessary resources for carrying out an effective program.

c. Management appoints specific representatives who will be responsible for establishing, implementing and maintaining the safety and environmental management program.

d. Management designates specific representatives who are responsible for reporting to management the performance of the safety and management program.

e. Management should at intervals it determines, review the safety and environmental management program to determine if it continues to be suitable, adequate and effective. The management review should address the possible need for changes to policy, objectives, and other elements of the program in light of program audit results, changing circumstances and the commitment to continual improvement. Observations, conclusions and recommendations should be documented.

f. Management has developed and endorsed a written description of the company's safety and environmental policies and organizational structure that define responsibilities, authorities, and lines of communication required to implement the management program.

g. Management utilizes the expertise of personnel in identifying safety hazards, environmental impacts, optimizing operations, developing safe work practices, developing training programs and investigating incidents.

h. Owner, operator, and contractor management each have their own responsibility to protect the environment and safety and health of their work forces.

i. The facilities are designed, constructed, maintained, monitored, and operated in a manner compatible with applicable industry codes, consensus standards, and generally accepted practice as well as in compliance with all applicable governmental regulations.

j. Management of safety hazards and environmental impacts is an integral part of the design, construction, maintenance, operation, and monitoring of a facility.

k. Suitably trained and qualified personnel are employed to carry out all aspects of the safety and environmental management program.

l. The management program described herein is maintained and kept up to date by means of periodic audits to ensure effective performance.

m. Safety and environmental management enhances operational performance, protection of personnel and property, and protection of the environment by reducing the probability

and/or severity of uncontrolled releases and other undesirable events.

n. Human factors may be considered in the design and implementation of the company's Safety and Environmental Management Program.

1.2.3 Setting Objectives and Goals

Management is responsible for establishing safety and environmental objectives, goals and performance measures and should consider the following:

a. A commitment to continuous improvement.

b. Responsibility for achieving objectives and goals at each relevant function and level of organization should be designated.

c. Objectives and goals should specify the means and timeframes by which they are to be achieved.

d. Performance measures should be established for Operators to gauge safety and environmental performance. Consideration should be given to using the definitions and formulas in Appendix E as they allow operators to compare their performance from year to year and with industry "averages" or other operators.

e. An internal program to effectively communicate the safety and environmental objectives, goals and performance measures should be established. Additionally, external communication programs should be considered.

1.2.4 Communication

Management should consider the establishment of procedures for both internal and external communication of safety and environmental information.

a. With regard to SEMP, procedures should be established for effective internal communication between the various levels and functions within the organization.

b. Consideration should be given to establishing procedures and policies for receiving, documenting and responding to relevant communications from external interested parties.

c. Consideration should be given to establishing processes for external communication on significant safety and environmental events as well as the safety and environmental management program.

1.3 SCOPE

1.3.1 Applications

1.3.1.1 This recommended practice is intended for application to offshore oil, gas, and sulphur facilities and associated equipment. This includes well drilling, servicing, production, and pipeline facilities and operations that have the potential for creating a safety hazard or significant environmental impact.

The elements of these recommended practices should be applied to these facilities, as appropriate. For simple and nearly identical facilities (such as well jackets and single well caissons), certain elements of the safety and environmental management program, as applicable, need be addressed only once, after verifying that site specific deviations have been evaluated.

When actions are taken in accordance with this recommended practice, such actions should conform to the most current requirements of applicable federal, state, local regulations, or flag State requirements.

It is recognized that some safety and environmental management systems may have been developed using guidelines of other organizations which may be more appropriate for certain applications (e.g., the International Maritime Organization's (IMO) International Safety Management (ISM) Code for vessel operations). In assessing these systems against this recommended practice the focus should be on assuring the necessary program elements are addressed, not the format or order of the system documentation.

1.3.1.2 The operator should establish and maintain a procedure to identify the environmental impacts of its activities, products or services that it can control and over which it can be expected to have an influence, in order to determine those which can be expected to have or can have significant impacts on the environment. These should include "toxics", "flammables", and "other material" as described in 1.3.1.3 and 1.3.1.4. Consideration should be given to performing the hazard analysis in accordance with API RP 14J, if applicable.

1.3.1.3 Toxic substances sometimes handled in OCS operations include hydrogen sulfide (H₂S), chlorine (Cl₂), and ammonia (NH₃). The following are examples of facilities other than oil, gas, and sulphur extraction facilities to which this recommended practice also may be applicable:

- a. Offshore liquefied natural gas (LNG) facilities
- b. Hydrogen sulfide and sulphur recovery facilities.
- c. Chlorine handling and storage facilities.
- d. Ammonia storage and refrigeration facilities.

1.3.1.4 Due to their thermal, physical, or chemical properties, other materials handled in offshore operations may constitute a safety or environmental hazard if released in an uncontrolled manner. Such substances include steam, hot

water, certain chemicals, heat transfer fluids, molten sulphur, and naturally occurring radioactive material (NORM).

1.4 DEFINITIONS (SEE APPENDIX D)

1.5 STANDARDS, REGULATIONS, AND REFERENCES

The operator should establish and maintain a procedure to identify and have access to the references and regulations discussed in 1.5.1 and 1.5.2.

1.5.1 Industry Codes, Practices, and Standards

Codes, practices and standards, useful in the design, fabrication, installation, layout, operation, inspection, testing, and maintenance of facilities are listed in Appendix B. These references are not to be considered a part of this recommended practice except for those specific sections of documents referenced elsewhere in this recommended practice.

1.5.2 Government Codes, Rules, Conventions, and Regulations

Governmental regulatory agencies, including federal, state, municipal and local, have established certain requirements for the design, fabrication, installation, layout, and operation of facilities. These requirements may influence the design, fabrication, installation, layout, testing, inspection, maintenance, and operation of facilities..

Governmental regulations can change frequently and should be monitored as part of the management program. Environmental management relies on compliance with these regulations and an understanding of the substances that are present in the process and associated discharge streams.

1.5.3 References

Numerous textbooks, references, and technical articles have been written on the design, fabrication, installation, layout, and safety analysis of offshore production facilities. A partial list of the references that have substantial acceptance by industry and governmental bodies are listed in Appendix C. These references are not to be considered a part of this recommended practice and are included only as they may provide a source of additional information for the reader.

SECTION 2—SAFETY AND ENVIRONMENTAL INFORMATION

2.1 GENERAL

The management program should require that a compilation of safety and environmental information be developed and maintained for any facility subject to this recommended practice. This information will provide the basis for implementing succeeding program elements. Management should consider the requirements of Section 3, “Hazards Analysis,” if applicable, in determining the extent and detail of required information. The information should include documentation on process and mechanical design. The individual elements of the information may exist in various forms and locations and should be referenced in the compilation. Process, mechanical, and facilities design information should be retained for the life of the facility.

For simple and nearly identical facilities within the same area (such as well jackets and single well caissons), a common compliance documentation package may be compiled, except that documentation must reflect site-specific deviations from the norm for facilities within the area.

2.2 PROCESS DESIGN INFORMATION

2.2.1 The process 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 composition. Where process design material and energy balances are available, these should be included. API RP 14J, *Recommended Practice for Design and Hazards Analysis for Offshore Production Facilities* (latest edition), contains guidance as to the process design information required for offshore production facilities. On a mobile offshore unit (MOU), API RP 14J is only applicable to a production processing system.

2.2.2 Where the original process design information no longer exists, information may be developed in conjunction with a hazards analysis in sufficient detail to support the analysis.

2.3 MECHANICAL AND FACILITIES DESIGN INFORMATION

2.3.1 The mechanical design information should include, as appropriate, piping and instrument diagrams, electrical area classifications, equipment arrangement drawings, design basis of the relief system, description of alarm, shutdown, and

interlock systems, description of well control systems, and design basis for passive and active fire protection features and systems and emergency evacuation procedures. If applicable, information on materials of construction, equipment and piping specifications, corrosion detection and prevention systems, and design codes, regulations, and standard practices employed may also be included. API RP 14J contains guidance as to the mechanical design information recommended for offshore production facilities.

Note: On an MOU, API RP 14J is only applicable to a production processing system.

2.3.2 The mechanical and facility design for mobile offshore units (MOUs) should conform to the applicable requirements of the flag State and classification society. The combination of appropriate and valid flag State certificates (e.g., International Load Line Certificate, U.S. Coast Guard Certificate of Inspection, IMO MODU code certificate, or International Oil Pollution Prevention Certificate) and classification society certificates generally provide substantial evidence of conformance with these requirements.

2.3.3 The mechanical and facility design should be consistent with the applicable consensus codes and standards in effect at the time the design was prepared or, in the absence of such codes and standards, recognized and generally accepted engineering practices as well as the applicable governmental regulations. When the mechanical design is not consistent with applicable consensus codes and standards or when a hazards analysis or other review reveals that existing equipment is designed and is constructed in accordance with consensus codes, standards, or practices that are no longer in general use, suitability of design for intended use should be documented.

2.3.4 Where the original mechanical design information no longer exists, suitability of equipment design for intended use should be verified and documented. This may be done on the basis of engineering analysis or documentation of successful prior operating experience.

2.3.5 Design and installation of new facilities and major modifications should include consideration of human factors. ASTM F1166-95, *Standard Practice for Human Engineering Design for Marine Systems, Equipment, and Facilities*, is a related resource.

SECTION 3—HAZARDS ANALYSIS

3.1 APPLICATION

The management program should require that a hazards analysis be performed for any facility subject to this recommended practice. The purpose of this analysis is to identify, evaluate, and, where unacceptable, reduce the likelihood and/or minimize the consequences of uncontrolled releases and other safety or environmental incidents. Human factors should be considered in this analysis.

3.2 METHODOLOGY

3.2.1 Hazards analysis should take an orderly, systematic approach, following one or more methodologies such as those recommended in API RP 14J or References 1 and 2. As a minimum, hazards analysis requirements for production equipment may be met by ensuring that the facility conforms to the requirements of API RP 14C, *Recommended Practice for Analysis, Design, Installation and Testing of Basic Surface Safety Systems on Offshore Production Platforms*. Management should determine, dependent on risk, whether additional analysis techniques are warranted. API RP 14J should be consulted for guidance in selecting analysis techniques appropriate to the risk of each facility, if applicable. Locations with clusters of structurally interconnected platforms should be analyzed together. For nearly identical well jackets and single well caissons, a single hazard analysis may be applied to all such facilities within a field, after verifying that site specific deviations are addressed.

3.2.2 Hazards Analysis for Mobile Offshore Units

- a. For most mobile offshore units a marine hazards analysis is implicit in the flag State and classification society certification process, but may be supplemented by specific instructions regarding conditions of operation, e.g., a stability letter, loading manual, or MODU Operations Manual.
- b. It may be necessary to perform site-specific hazard analyses for certain operations to assure that the mobile offshore unit is not exposed to conditions beyond its designed limits. Such analyses will often require an exchange of information between the operator and the owner of the mobile offshore unit. Examples of information that might be required include results of surveys for seafloor and seabed obstructions or interferences, anticipated reservoir pressure and temperature, drilling plans, casing plans, and any information necessary to coordinate and integrate emergency response and control.

3.3 INITIAL ANALYSIS

3.3.1 The hazards analyses for existing facilities should be performed in order of priority. The following factors (not nec-

essarily in prioritized order) may be considered when establishing priority ranking for performing hazards analyses:

- a. Areas with continuous offshore population, such as living quarters on major platforms, and platform clusters or complexes.
- b. Inventory and flow rate of flammable, toxic, or other materials that may constitute a safety hazard or cause a significant environmental impact.
- c. Locations involving simultaneous operations such as producing while drilling, or producing while constructing above or below the water line.
- d. Facilities that remove natural gas liquids or handle hydrogen sulfide.
- e. Facilities with severe operating conditions, such as high pressures, highly corrosive fluids, or conditions such as abnormal sand production or high flow rates that may cause severe erosion or corrosion.
- f. Facilities in proximity to areas the operator considers to be environmentally sensitive areas.

3.3.2 In performing a hazards analysis on a new or modified facility, special consideration should be given to the following:

- a. Previous experience with a similar facility.
- b. Design circumstances, such as changes in the design team or the design itself, after the project is underway.
- c. Unusual facility location, design or configuration, equipment arrangement, or emergency response considerations.
- d. Any findings that need to be brought to resolution before startup or that require immediate attention should be clearly identified.
- e. Operating procedures and practices, including simultaneous operations guidelines.

3.4 PERIODIC ANALYSES

Management should establish a program for updating hazards analyses to verify that the most recent hazards analysis reflects the current process. Hazards analyses should be reviewed periodically and updated as appropriate, with typical review intervals ranging between 5 years for high-priority facilities and 10 years for low-priority facilities. The priority factors listed in 3.3.1 and changes in the facility (refer to Section 4) should be considered in establishing review frequency.

3.5 ANALYSIS PERSONNEL

The hazards analyses should be performed by a person(s) knowledgeable in engineering, operations, design, process, safety, environmental, and other specialties as appropriate. At least one person should be proficient in the hazards analysis methodologies being employed. If only one person performs

the hazard analysis, that person should not have participated in the original design of or modifications to the facility.

3.6 ANALYSIS REPORT

The management program should require that the findings of a hazards analysis are presented in a written report. This report should describe the hazards that have been identified and recommended steps to be taken to mitigate them. Qualitative assessments of the severity of the findings may be made

as appropriate. The management program should require the communication of all identified hazards and follow-up actions to the appropriate personnel. When resolution before startup is stipulated, or when immediate action is required, the management program should mandate that such action is taken or that the hazardous conditions are otherwise remedied. A complete hazards analysis report, including any updates, should be kept on file for the life of the facility.

SECTION 4—MANAGEMENT OF CHANGE

4.1 GENERAL

The management program should establish procedures to identify and control hazards associated with change and maintain the accuracy of safety information. A facility is subject to continual change to increase efficiency, improve operability and safety, accommodate technical innovation, and implement mechanical improvements. On occasion, temporary repairs, connections, bypasses, or other modifications may be made out of operating necessity. Any of these changes can introduce new hazards or compromise the safeguards built into the original design. Care must be taken to understand the process, facility, and personnel safety and environmental implications of any changes. Although some changes may be minor with little likelihood of compromising safety or environmental protection, all changes may have the potential for disruption, injury, or business loss.

4.2 CHANGE IN FACILITIES

Change in facilities arises whenever the process or mechanical design, as described in Section 2, is altered. Change in facilities may also occur as a result of changes in produced fluids, process additives, product specifications, by-products or waste products, design inventories, instrumentation and control systems, or materials of construction. Typical instances in which change in facilities would likely occur include the following:

- a. Construction of new production or process facilities.
- b. New facility projects that involve production or process tie-ins to existing facilities, equipment reconfiguration, or modification of existing facilities/equipment.
- c. Modification of existing facilities that result in changes to facility or equipment design, structural support, layout, or configuration.
- d. Projects to increase facility throughput or accommodate different produced fluids.
- e. Significant changes in operating conditions, including pressures, temperatures, flow rates, or process conditions different from those in the original process or mechanical design.
- f. Equipment changes, including the addition of new equipment or modifications of existing equipment. These can include changes in alarms, instrumentation, and control schemes.
- g. Modifications of the process or equipment that cause changes in the facility's pressure relief requirements. These can include increased process throughput, operation at higher temperatures or pressures, increased size of equipment, or the addition of equipment that might contribute to greater pressure relief requirements.

h. Bypass connections around equipment that is normally in service.

i. Operations outside the scope of current written operating procedures, including procedures for start-up, normal shutdown, and emergency shutdown.

j. Changes made in the process or mechanical design or in operating procedures that result from a hazards analysis performed as described in Section 3, "Hazards Analysis."

k. Introduction of new or different process chemicals (for example, corrosion control agents, anti-foulants, anti-foam agents), drilling muds or workover/completion fluids.

l. Change in facilities may include mechanical changes that would not necessarily appear on a process and instrument diagram, including drilling and construction equipment and temporary connections or replaced components that are "not in kind," such as:

1. Replacement equipment or machinery that differs in specifications from the original equipment or previously approved modification.
2. Temporary piping, connections, pipe repairs, or hoses.
3. An alternate supply of process materials, catalysts, or reactants, such as temporary tanks or drums located within the facility.
4. Temporary electrical equipment or utility connections, other than for emergency situations.
5. Modifications to drilling diverter system that have not been previously approved.
6. Modifications to blowout preventers (BOPs) that have not been previously approved.
7. Modifications to drilling top drives that have not been previously approved.

4.3 CHANGE IN PERSONNEL

Change in personnel, including contractor personnel, as appropriate, occurs whenever there is a change in the organization or in personnel that supervise or operate the facility. Routine personnel vacancies and replacements, rotation, and shift or tour changes are addressed in operating procedures, safe work practices, and training established in accordance with Sections 5, 6, 7, and 10 and should not require additional management of change action.

Organization changes, particularly those brought about by acquisition or sale of a facility, may necessitate a thorough review of the facility's safety and environmental management program. Upon acquisition or transfer of management control, a screening level review should be conducted and the facility incorporated into the new organization's safety and environmental management program. It is appropriate to consider the factors listed in 3.3.1 when establishing review priorities.

4.4 MANAGING THE CHANGES

The management program should establish and implement written procedures to manage change in facilities and personnel. These procedures should be flexible enough to accommodate both major and minor changes. These procedures should cover the following:

- a. The process and mechanical design basis for the proposed change.
- b. An analysis of the safety, health, and environmental considerations involved in the proposed change, including, as appropriate, a hazards analysis. The effects of the proposed change on separate but unrelated upstream or downstream facilities (i.e., structures/platforms, pipelines, process equipment, emergency isolation and control systems and equipment, mitigative systems and equipment, accommodations areas, emergency evacuation facilities and equipment) and on area wide emergency plans (i.e., evacuation or oil spill) should also be reviewed.
- c. The necessary revisions of the operating procedures, safe work practices, and training program.
- d. Communication of the proposed change and the consequences of that change to appropriate personnel. For significant changes, training consistent with the guidance in Section 7 may be appropriate.
- e. The necessary revisions of the safety and environmental information.
- f. The duration of the change, if temporary.
- g. Required authorizations to effect the change.

SECTION 5—OPERATING PROCEDURES

5.1 GENERAL

The management program should include requirements for written facility operating procedures designed to enhance efficient, safe, and environmentally sound operations. Within a given company the designs of several offshore facilities may differ only in the size and/or number of equipment items present. Consequently, standard operating procedures may apply to multiple facilities. By their very nature, operating procedures directly address human factors issues associated with the interaction between facilities and personnel. The human factors associated with format, content, and intended use should be considered to minimize the likelihood of procedural error.

5.2 CONTENT OF OPERATING PROCEDURES

Written procedures should include the following:

- a. The job title and reporting relationship of the person or persons responsible for each of the facility's operating areas.
- b. Instructions for the sound operation of each facility that are consistent with the safety and environmental information including, as appropriate: startup, normal operations, temporary operations, simultaneous operations, emergency shutdown and isolation, and normal shutdown.
 1. Refer to API RP 14J, *Recommended Practice for Design and Hazards Analysis for Offshore Production Facilities* (latest edition), for information on startup, normal operations, and shutdown of production facilities.
 2. Refer to the MODU Operations Manual developed in conformance with flag State requirements and/or the IMO MODU Code for information on routine operations and operating limits on mobile offshore drilling units.
- c. The operating limits resulting from the information specified in Section 2 and, where safety and environmental considerations are present, a description of the following:

1. The safety and environmental consequences of deviation outside the operating limit envelop.
 2. The steps required to correct or avoid a deviation from the operating limits.
- d. Environmental and occupational safety and health considerations, including the following:
1. The special precautions required to prevent environmental damage and personnel exposure, including engineering controls and personal protective equipment.
 2. The control measures to be taken if physical contact or airborne exposure occurs.
 3. Any special or unique hazards.
 4. Continuous and periodic discharge of hydrocarbon materials, contaminants, or undesired by-products into the environment is restricted by governmental limitations. These discharge limitations represent the degree of effluent reduction attainable by application of the best practicable control technology. Written guidance should be provided for facility operating personnel and contractors governing the disposal of materials within terms of the applicable permits.
 5. Any lease or concession stipulations established by the recognized governmental authority.

5.3 PERIODIC REVIEW

When changes are made in facilities, operating procedures should be reviewed as part of the management of change procedure described in Section 4. In addition, operating procedures should be reviewed periodically to verify that they reflect current and actual operating practices. The frequency of the review should correspond to the degree of hazard presented. Review of and changes to the procedures should be documented and communicated to appropriate personnel.



SECTION 6—SAFE WORK PRACTICES

6.1 GENERAL

The management program should establish and implement safe work practices. These practices should be designed to minimize the risks associated with operating, maintenance, and modification activities and the handling of materials and substances that could affect safety or the environment. Human factors should be considered in the development of safe work practices. These safe work practices will normally apply to multiple locations and will normally be in written form (safety manual, safety standards, work rules, etc.). For some locations, site-specific work practices may be appropriate. The program should provide guidelines for selection and performance evaluation of contractors. API RP 76, *Improving Owner and Contractor Safety Performance*, may be helpful in developing guidelines for contractor selection.

Contractors should have their own written safe work practices. Contractors may adopt appropriate sections of the operator's safety and environmental management program. Regardless, an operator and contractor should agree on appropriate contractor's safety and environmental policies and practices before the contractor begins work at the operator's facilities. As an example, for routine contractor services, agreement could be reached at the operator's on-site safety meeting. For non-routine and complex contractor services a more rigorous operator's review of the contractor's safety and environmental policies and practices may be warranted. Additionally, where a contractor works at several operator's facilities, a single safety and environmental policies and practices review by that operator may be acceptable instead of a review at each facility where the contractor performs work.

6.2 SAFE CONDUCT OF WORK ACTIVITIES

Safe work practices for all personnel, including contractors, should provide for the safe conduct of operating, maintenance, and modification activities, including simultaneous operations. Specifically, safe work practices should cover:

- a. Opening of pressurized or energized equipment or piping.
- b. Lockout and tagout of electrical and mechanical energy sources.
- c. Hot work and other work involving ignition sources.
- d. Confined space entry.
- e. Crane operations.

A work authorization or permit to work system should be implemented for tasks involving items a, b, c, or d. This system should include provisions for adequate communication of work activities to shift change and replacement personnel. Contractors should be included in these communications if they will perform the work or may affect or be affected by it.

Safe work practices should meet the most current provisions of any applicable federal, state, or local regulations or flag state requirements. Certain safe work practices that should be addressed can be found in Appendix B.

6.3 CONTROL OF HAZARDOUS MATERIALS

Materials specifications, inventories, separation, confinement, and handling of toxic or hazardous materials that can affect safety and environmental protection should be determined, documented, and communicated to appropriate personnel.

6.4 CONTRACTOR SELECTION

When selecting contractors, operators should obtain and evaluate information regarding a contractor's safety and environmental management policies and practices, and performance thereunder, and the contractor's procedures for selecting subcontractors. API RP 76 is a useful reference for selecting contractors.

The operator should communicate their safety and environmental management system expectations to contractors and identify any specific safety or environmental management requirements they have for contractors.

SECTION 7—TRAINING

7.1 GENERAL

The management program should establish and implement training programs so that all personnel are trained to work safely and are aware of environmental considerations offshore, in accordance with their duties and responsibilities. Training should address the operating procedures described in Section 5, the safe work practices recommended in Section 6, and the emergency response and control measures recommended in Section 10. Any change in facilities that requires new or modification of existing operating procedures per Section 5 may require training for the safe implementation of those procedures. Training should be provided by qualified instructors and documented.

7.2 INITIAL TRAINING

7.2.1 Due to the nature of offshore operations, certain training elements should be provided for the basic well-being of personnel and protection of the environment. Certain examples of appropriate training are:

- a. All personnel should receive orientation training per API RP T-1, *Recommended Practice for Orientation Program for Personnel Going Offshore for the First Time* (latest edition) or the equivalent, prior to their first work assignment offshore.
- b. All personnel regularly assigned offshore should receive training, as applicable, in non-operating emergencies per API RP T-4, *Recommended Practice for Training of Offshore Personnel in Non-Operating Emergencies* (latest edition), rescue of persons in the water per API RP T-7, *Recommended Practice for Training of Personnel in Rescue of Persons in Water* (latest edition), and fire fighting per API RP 14G, *Recommended Practice for Fire Prevention and Control on Open Type Offshore Production Platforms*.
- c. Appropriate personnel, regularly or occasionally assigned as required by the circumstances, should be trained for safe work practices (e.g., hot work, hot tapping, safe entry, lock-out/tagout), simultaneous operations planning, and hazards communication.
- d. All regularly assigned offshore personnel should be trained as appropriate per applicable governmental regulations.

7.2.2 The management program should require that qualification criteria be developed and implemented for operating and maintenance personnel, as applicable. Procedures should be developed to ensure that persons assigned to operate and maintain the facility possess the required knowledge and skills to carry out their duties and responsibilities, including startup and shutdown. Some examples of appropriate training are:

- a. Safety and anti-pollution device training per API RP T-2, *Recommended Practice for Qualification Programs for Offshore Production Personnel Who Work With Anti-Pollution*

Safety Devices (latest edition), for those who maintain and test safety valves and controls.

- b. Crane operation and maintenance training per API RP 2D, *Recommended Practice for Operation and Maintenance of Offshore Cranes* (latest edition), for those who operate platform cranes.

- c. Well control training per API RP T-6, *Recommended Practice for Training and Qualification of Personnel in Well Control Equipment and Techniques for Completion and Workover Operations on Offshore Locations* (latest edition) or the equivalent, API RP 59, *Recommended Practices for Well Control Operations* (latest edition), safe drilling of wells containing hydrogen sulfide per API RP 49, *Recommended Practice for Drilling and Well Servicing Operations Involving Hydrogen Sulfide* (latest edition), if well target is to or through horizons suspected of containing hydrogen sulfide; production operations where hydrogen sulfide is known to be present per API RP 55, *Recommended Practices for Oil and Gas Producing and Gas Processing Plant Operations Involving Hydrogen Sulfide* (latest edition).

- d. Operating and maintenance training may utilize API recommended training modules and films, or equivalent, and should be reinforced by appropriate demonstrations and “hands-on” training. Reinforcement through on-the-job training is permissible if under the supervision of a knowledgeable operating/maintenance person of proven performance.

- e. If hydrogen sulfide is present at levels that require training, appropriate training is required for all personnel, including visitors.

- f. All regularly assigned personnel, as applicable, should be trained in environmental protection and pollution control.

7.3 PERIODIC TRAINING

Refresher training should be provided to maintain understanding of and adherence to the current operating procedures. Procedures should be established, such as periodic drills, to verify adequate retention of the required knowledge and skills.

7.4 COMMUNICATION

The management program should require that whenever a change is made in the procedures recommended in Sections 5, 6, or 10, personnel will be trained in or otherwise informed of the change before they are expected to operate the facility.

7.5 CONTRACTOR TRAINING

Contractors should train their personnel in the work practices necessary to perform their jobs in a safe and environmentally sound manner. The training provided to contract personnel should include applicable site-specific safety and

environmental procedures and rules pertaining to the facility and the applicable provisions of emergency action plans. This paragraph applies to contractors performing operating duties, maintenance or repair, turnaround, major renovation, or specialty work at the facility.

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 should be trained to perform their jobs in a safe and envi-

ronmentally sound manner. They should also receive training in transportation safety, emergency evacuation and other applicable safety and environmental procedures.

The operator should verify contractor training utilizing a variety of methods, which may include audits of the contractor's environmental, health and safety training programs; and operator observation of contractor work performance. (Refer to Appendix A).

SECTION 8—ASSURANCE OF QUALITY AND MECHANICAL INTEGRITY OF CRITICAL EQUIPMENT

8.1 GENERAL

The management program should require that procedures are in place and implemented so that critical equipment for any facility subject to this recommended practice is designed, fabricated, installed, tested, inspected, monitored, and maintained in a manner consistent with appropriate service requirements, manufacturer's recommendations, or industry standards. Contractors should have programs in place to address their own critical equipment.

Human factors should be considered, particularly regarding equipment accessibility for operation, maintenance and testing. The overall quality assurance strategy to require conformance to specifications/requirements should be developed at the beginning of the project and become a part of the overall project execution plan and maintenance program. The quality assurance strategy should carry over into the operating and maintenance procedures and management of change.

8.2 PROCUREMENT

Written procedures for procurement of critical equipment should be developed as part of the overall quality and mechanical integrity assurance program to verify equipment compliance with applicable design and material specifications.

8.3 FABRICATION

Where appropriate, written quality control procedures and specifications for critical equipment should be established and implemented to confirm that materials and construction, during the fabrication stage, are in accordance with the design specifications.

8.4 INSTALLATION

Appropriate checks and inspection procedures should be established and implemented before startup to verify that the installation of critical equipment is consistent with design specifications and the manufacturer's instructions.

8.5 MAINTENANCE

Maintenance programs that include appropriate inspection and testing should be established and implemented for critical equipment to sustain ongoing mechanical integrity. Maintenance activities focused on this equipment should be structured to enhance safety and protect the environment.

Maintenance personnel includes both operator and contract employees involved in maintenance.

The maintenance program should include the following provisions:

- a. Procedures and work practices to maintain the mechanical integrity of equipment.
- b. Training of maintenance personnel in the application of the procedures, relevant hazards, and safe work practices.
- c. Quality control procedures to verify that maintenance materials and spare equipment and parts meet design specifications.
- d. Procedures to review all changes in facilities in accordance with Section 4.

8.6 TESTING AND INSPECTION

Testing, inspection, calibration and monitoring programs for critical equipment should be established. Programs may be required for environmental protection compliance monitoring. The management plan should document the technologies utilized and measurement systems used for compliance. Such programs should include the following items:

- a. A list of critical equipment and systems that are subject to inspection and testing. The list should specify the method and interval of testing and inspection, acceptable limits, and criteria for passing the test or inspection.
- b. Testing and inspection procedures that follow commonly accepted standards and codes, such as API 510, *Pressure Vessel Inspection Code: Maintenance Inspection, Rating, Repair, and Alteration* (latest edition).
- c. Documentation of completed testing and inspection. Pressure vessel testing and inspection documentation should be retained for the life of the equipment. All other documentation should be retained for a minimum of 2 years or as needed to determine any changes that may be needed in frequency of testing, inspection, and preventive maintenance, or as required by regulatory agencies or for the preparation or revision of hazards analyses.
- d. Procedures to document and correct critical equipment deficiencies or operations that are outside acceptable limits.
- e. A system for reviewing and authorizing changes in tests and inspections.
- f. The testing, inspection and monitoring programs should include appropriate auditing procedures to ensure compliance with the program.

SECTION 9—PRE-STARTUP REVIEW

9.1 GENERAL

The management program should require that the commissioning process include a pre-startup safety and environmental review for new and significantly modified facilities that are subject to this recommended practice to confirm that the following criteria are met:

- a. Construction and equipment are in accordance with specifications.
- b. Safety, environmental, operating, maintenance, and emergency procedures are in place and are adequate.
- c. Safety and environmental information is current.

d. Hazards analysis recommendations have been considered-addressed, and implemented as appropriate.

e. Training of operating personnel has been completed.

f. Programs to address management of change and other elements of this publication are in place.

g. Safe work practices are in place.

Refer to API RP 14J, *Recommended Practice for Design and Hazards Analysis for Offshore Production Facilities* (latest edition), for additional information for production facilities.

Refer to applicable standards in Appendix B for mobile offshore units and other relevant references.

SECTION 10—EMERGENCY RESPONSE AND CONTROL

10.1 GENERAL

The management program should require that emergency response and control plans are in place and are ready for immediate implementation. These plans should be validated by drills carried out to a schedule defined by the management program. The drills should address the readiness of personnel and their interaction with equipment.

10.2 EMERGENCY ACTION PLAN

Written action plans should be established to assign authority to the appropriate qualified person(s) at a facility for initiating effective emergency response and control. These plans should also address emergency reporting and response requirements and comply with all applicable governmental regulations.

10.3 EMERGENCY CONTROL CENTER

An emergency control center(s) should be designated for each facility and have access to the following:

- a. Emergency action plans (refer to 10.2) that address events such as:
 1. Spills of hazardous substances
 2. Collisions
 3. Fire and/or blowouts
- b. Oil spill contingency plan.
- c. Safety and environmental information (refer to Section 2).

10.4 TRAINING AND DRILLS

Training incorporating emergency response and evacuation procedures should be conducted periodically for all personnel (including contractor's personnel), as required by the management program. Drills based on realistic scenarios should also be conducted periodically to exercise elements contained in the facility or area emergency action plan. An analysis and critique of each drill should be conducted to identify and correct weaknesses, as appropriate.

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SECTION 11—INVESTIGATION OF INCIDENTS

11.1 GENERAL

The management program should establish procedures for investigation of all incidents with serious safety or environmental consequences. The program should also require investigation of incidents that are determined by facility management to have possessed the potential for serious safety or environmental consequences. Incident investigations should be initiated as promptly as possible, considering the necessity of securing the incident scene and protecting people and the environment.

The intent of the investigation should be to learn from the incident and help prevent similar incidents. A corrective action program should be established based on the findings of the investigation in order to analyze incidents (e.g., uncontrolled release or non-compliant pollution incident) for common root causes. The corrective action program is a follow-up system to the incident analysis procedures. The investigation should be expedited and findings and recommendations resolved in a timely manner.

The incident investigation should be conducted by personnel designated by the operator and/or contractor. An incident investigation should be conducted by personnel knowledgeable in the process involved, investigation techniques, and other specialties that are viewed as relevant or necessary.

In appropriate circumstances, consideration should be given to establishing a “work-in-progress privilege” covering any documents generated during the course of an incident investigation or to conducting the entire investigation under attorney-client privilege.

11.2 INVESTIGATION

The investigation of an incident should address the following:

- a. The nature of the incident.
- b. The factors (human or other) that contributed to the initiation of the incident and its escalation/control.
- c. Recommended changes identified as a result of the investigation.

11.3 FOLLOW-UP

11.3.1 The findings of the investigation should be retained for possible use in the next hazard analysis update, company audits, or for a minimum of 2 years, whichever is greater.

11.3.2 Management should establish a system to determine and document the response to each finding to ensure that agreed-upon actions are completed.

11.3.3 Companies should implement a system whereby conclusions of investigations are distributed to similar facilities and/or appropriate personnel within their organization.

SECTION 12—AUDIT OF SAFETY AND ENVIRONMENTAL MANAGEMENT PROGRAM ELEMENTS

12.1 GENERAL

The operators (and contractors with SEMP's) should establish and maintain an audit program and procedures for the periodic audit of the safety and environmental management program in order to determine if the program elements have been properly implemented and maintained and to provide information on the results of the audit to management.

The audit program and procedures should cover:

- a. The activities and areas to be considered in audits.
- b. The frequency of audits
- c. The audit team
- d. How audits will be conducted
- e. Audit Reporting

Sufficient resources should be committed by management to the audit in order to meet its intended scope.

12.2 SCOPE

The scope of the audit should include the following:

- a. Determine if the management program elements of Sections 2 through 11 are in place.
- b. Determine if the management program elements incorporate the required components.
- c. Testing system to evaluate the effectiveness of the management program. The system should include a review of records and documentation as discussed in Section 13, private interviews of various levels and disciplines of personnel, and facility inspections.
- d. Identify areas of potential improvement in the safety and environmental management program.

12.3 AUDIT COVERAGE

When selecting facilities to audit, consideration should be given to common features (e.g., field supervisors, regulatory districts, facility design, systems and equipment, office management, etc.) to obtain a cross-section of practices for the facilities operated.

The testing system of the audit need not be applied to each facility; rather, interviews and inspections should be conducted at fields that differ significantly (e.g., oil vs. dry gas). This should include a number of facilities sufficient to evaluate management's commitment to items a, b, and c in 12.2.

During each audit, at least fifteen percent (15%) of the facilities operated, with a minimum of one facility, should be audited. The facilities included in the audit should not be the same as those included in the previous audit. When sufficient deficiencies are identified in the effectiveness of any safety

and environmental management program elements, the test sample size shall be expanded for that program element.

12.4 AUDIT PLAN

Prior to an audit, a written audit plan should be developed. The audit plan should be designed to be flexible in order to permit changes in emphasis based on information gathered during the audit, and to permit effective use of resources.

The plan should include the following elements to the extent they are applicable to the specific audit:

- a. Audit objectives and scope
- b. Audit criteria
- c. Identification of the audit team
- d. Identification of the facilities to be audited
- e. Identification of the program elements to be audited.
- f. Procedures to be used in the audit.
- g. Confidentiality requirements
- h. Report contents and format, expected date of issue and distribution of the audit report.

It should be recognized that the audit material collected during the audit will only be a sample of the information available. This will lead to a level of uncertainty which should be taken into account when planning the audit.

12.5 AUDIT FREQUENCY

The first audit should be accomplished within 2 years of initial implementation of the management program. The audit interval for the management program should not exceed 4 years.

12.6 AUDIT TEAM

Audits may be performed by personnel from within the organization and/or by external persons selected by the organization. The audit should be conducted by one or more persons knowledgeable in the process involved and other specialties deemed necessary. Care should be exercised when selecting the audit team to ensure impartiality.

12.7 AUDIT REPORT

The audit team should prepare an audit report. The topics to be addressed in the audit report should be those determined in the audit plan. It should contain the audit findings. The audit report should be dated and signed by the audit team.

Audit related information that may be in audit reports, includes, but is not limited to:

- a. Identification of the facilities audited
- b. Identification of the program elements audited

- c. Summary of objectives and scope of the audit
- d. Criteria against which the audit was conducted.
- e. Period covered by the audit and the date(s) the audit was conducted
- f. Identification of the audit team
- g. Statement of the confidential nature of the contents
- h. Distribution list for the audit report
- i. Summary of the audit process, including any obstacles encountered

- j. Audit findings and conclusions, such as whether the program element(s) is properly implemented and maintained

The findings and conclusions of the audit should be provided to the management personnel responsible for the SEMP. Management should establish a system to determine and document the appropriate response to the findings and to assure satisfactory resolution. The audit report should be retained at least until the completion of the next audit.

SECTION 13—RECORDS AND DOCUMENTATION

13.1 GENERAL

A documentation system for the safety and environmental management program should be established to ensure that records and documents are maintained in a manner sufficient to implement the management system. Records or documentation may be in either paper or electronic form. The safety and environmental management program documentation does not have to be retained in a separate file or binder, but can be integrated into the operator's filing or document control system. All records and documentation should be dated (with dates of revision) and readily identifiable. Audit requirements in Section 12 should be considered when formatting, distributing and filing the records and documentation related to the safety and environmental management plan.

13.2 DOCUMENTATION

Various elements in the safety and environmental management program identify documentation requirements. In addition to those requirements, documentation should be sufficient to describe the core elements of the program and the interaction between the elements.

13.3 RECORDS

Various elements in the safety and environmental management program identify requirements for record keeping. Examples of records that should be maintained included the following:

- a. Information on applicable regulations or other information
- b. Complaint records
- c. Training records
- d. Process information
- e. Product information
- f. Inspection, maintenance and calibration records
- g. Pertinent contractor and supplier information
- h. Incident report
- i. Information on emergency preparedness and response
- j. Information on significant environmental aspects

- k. audit results
- l. management reviews.

13.4 RELATED DOCUMENTATION

The following are examples of related documentation that may be used in developing or implementing the safety and environmental management program.

- a. Organizational Charts
- b. Internal Standards
- c. Operational Procedures
- d. Site Emergency Response Plans
- e. Site Emergency Evacuation Plans
- f. Oil Spill Response Plans

13.5 RECORD AND DOCUMENT CONTROL

The operator should consider establishing and maintaining procedures for controlling records and documents pertaining to SEMP that includes the following considerations:

- a. They can be located and are maintained in an orderly manner
- b. They are readily retrievable and protected against damage, deterioration or loss.
- c. They are periodically reviewed, revised as necessary and approved for adequacy by authorized personnel.
- d. The current versions of relevant documents are available at all locations where operations essential to the effective functioning of the safety and environmental system are performed.
- e. They are retained for specified periods of time.
- f. Obsolete documents are promptly removed from all points of issue and points of use or otherwise assured against unintended use.
- g. Any obsolete documents retained for legal and/or knowledge preservation purposes are suitably identified.
- h. Confidential records and documentation are identified and properly handled.

APPENDIX A—CONTRACTOR SELECTION CRITERIA

A major step in achieving acceptable contractor performance is selecting a safe and environmentally responsible contractor. API RP 76, *Contractor Safety Management for Oil and Gas Drilling and Production Operations*, is a useful reference.

It may be appropriate for operators to request that contractors submit specific performance information. For example, such information might include:

- a. A copy of the contractor's written safety and environmental policies and practices endorsed by the contractor's top management.
- b. A statement of commitment by the contractor to comply with all applicable safety and environmental regulations and provisions of this publication.
- c. Recordable injury and illness experience for the previous 3 years.
- d. An outline of the contractor's initial employee safety orientation.
- e. Descriptions of the contractor's various safety programs, including: accident investigation procedures; how safety HSE inspections are performed; safety meetings; substance abuse testing, inspection and preventive maintenance programs.
- f. Description of the safety and environmental training that each contractor employee has or will receive and the contractor's programs for refresher training.
- g. Description of the contractor's short-service employee training program.
- h. Description of contractor's involvement in industry affairs.

APPENDIX B—INDUSTRY CODES, PRACTICES, AND STANDARDS

The most recent editions of the following publications are related to this recommended practice:

API

Bull E2	<i>Management of Naturally Occurring Radioactive Materials (NORM) in Oil and Gas Production</i>
Publ 510	<i>Pressure Vessel Inspection Code: Maintenance Inspection, Rating, Repair, and Alteration</i>
Publ 521	<i>Guide for Pressure-Relieving and Depressuring Systems</i>
Publ 2004	<i>Inspection for Fire Protection</i>
Publ 2007	<i>Safe Maintenance Practices in Refineries</i>
Publ 2015	<i>Cleaning Petroleum Storage Tanks</i>
Publ 2201	<i>Procedures for Welding or Hot Tapping on Equipment Containing Flammables</i>
Publ 2207	<i>Preparing Tank Bottoms for Hot Work</i>
Publ 2217A	<i>Guidelines for Work in Inert Confined Spaces in the Petroleum Industry</i>
Publ 2510	<i>Design and Construction of Liquefied Petroleum Gas (LPG) Installations</i>
Publ 2510A	<i>Fire-Protection Considerations for the Design and Operation of Liquefied Petroleum Gas (LPG) Storage Facilities</i>
RP 1107	<i>Pipeline Maintenance Welding Practices</i>
RP 2D	<i>Operation and Maintenance of Offshore Cranes</i>
RP 4G	<i>Maintenance and Use of Drilling and Well Servicing Structures</i>
RP 14C	<i>Analysis, Design, Installation and Testing of Basic Surface Safety Systems on Offshore Production Platforms</i>
RP 14E	<i>Design and Installation of Offshore Production Platform Piping Systems</i>
RP 14F	<i>Design and Installation of Electrical Systems for Fixed and Floating Offshore Petroleum Facilities for Unclassified and Class I, Division 1, and Division 2 Locations</i>
RP 14FZ	<i>Design and Installation of Electrical Systems for Fixed and Floating Offshore Petroleum Facilities for Unclassified and Class I, Zone 0, Zone 1 and Zone 2 Locations</i>
RP 14G	<i>Fire Prevention and Control on Open Type Offshore Production Platforms</i>
RP 14J	<i>Design and Hazards Analysis for Offshore Production Facilities</i>

RP 49	<i>Drilling and Well Servicing Operations Involving Hydrogen Sulfide</i>
RP 53	<i>Blowout Prevention Equipment Systems for Drilling Wells</i>
RP 54	<i>Occupational Safety for Oil and Gas Well Drilling and Servicing Operations</i>
RP 55	<i>Oil and Gas Production and Gas Processing Plant Operations Involving Hydrogen Sulfide</i>
RP 59	<i>Well Control Operations</i>
RP 64	<i>Diverter Systems Equipment and Operations</i>
RP 70	<i>Security for Offshore Oil and Natural Gas Operations</i>
RP 70I	<i>Security for Worldwide Offshore Oil and Natural Gas Operations</i>
RP 76	<i>Contractor Safety Management for Oil and Gas Drilling and Production Operations</i>
RP 500	<i>Classification of Locations for Electrical Installations at Petroleum Facilities</i>
RP 505	<i>Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1 and Zone 2</i>
RP T-1	<i>Orientation Program for Personnel Going Offshore for the First Time</i>
RP T-2	<i>Qualification Programs for Offshore Production Personnel Who Work With Anti-Pollution Safety Devices</i>
RP T-4	<i>Training of Offshore Personnel in Non-Operating Emergencies</i>
RP T-6	<i>Training and Qualifications of Personnel in Well Control Equipment and Techniques for Completion and Workover Operations on Offshore Locations</i>
RP T-7	<i>Training of Personnel in Rescue of Persons in Water</i>
Spec 2C	<i>Offshore Cranes</i>
Spec 4F	<i>Drilling and Well Servicing Structures</i>
Std 1104	<i>Welding of Pipelines and Related Facilities</i>
ASME ¹	<i>Boiler and Pressure Vessel Code</i>
F1166-95	<i>Human Engineering Design for Marine Systems, Equipment and Facilities</i>

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APPENDIX C—REFERENCES

1. D.C. Bull and J.A. Martin, "Explosion of Unconfined Clouds of Natural Gas," *Operating Section Proceedings*, American Gas Association, Arlington, Virginia, 1977, pp. T-149-T-153.
2. J. P. Zeuwen, C.J.M. van Wingerden, and R.M. Dauwe, "Experimental Investigation into the Blast Effect Produced by Unconfined Vapor Cloud Explosions," *Symposium Series No. 80*, Prins Maurits Laboratory TNO, Rijswijk, The Netherlands, 1985, pp. D20-D29.
3. V.C. Marshall, "Unconfined Vapor Cloud Explosions," *Chemical Engineering*, June 13, 1982, pp. 149–154.

APPENDIX D—DEFINITIONS

D.1 contractor: The individual, partnership, firm, or corporation retained by the owner or operator to perform work or provide supplies or equipment. The term contractor shall also include subcontractors.

D.2 critical equipment: Equipment and other systems determined to be essential in preventing the occurrence of or mitigating the consequences of an uncontrolled release. Such equipment may include vessels, machinery, piping, blowout preventers, wellheads and related valving, flares, alarms, interlocks, fire protection equipment and other monitoring, control and response systems.

D.3 facility: Wells, structures, living quarters, drilling and workover packages, process equipment, utilities, pipelines, and mobile offshore units (except as noted in 1.3.1.1).

D.4 flag state: The Government of the nation whose flag a vessel is entitled to fly.

D.5 hazards analysis: The application of one or more methodologies that aid in identifying and evaluating hazards. Some sources that may be helpful in performing hazards analysis include References 1 and 2 in Appendix D and API RP 14J, *Recommended Practice for Design and Hazards Analysis for Offshore Production Facilities* (latest edition).

D.6 human factors: The interaction and application of scientific knowledge about people, facilities and management systems to improve their interaction in the work place and reduce the likelihood and/or consequences of human error.

D.7 mobile offshore drilling unit (MODU): A vessel capable of engaging in drilling or well workover operations for the exploration or exploitation of subsea resources.

D.8 mobile offshore unit (MOU): A vessel which can be readily relocated to perform an industrial function related to

offshore oil, gas, or sulphur exploration or exploitation. Such vessels include mobile offshore drilling units (MODUs), lift boats and other units involved in construction, maintenance (including the maintenance of wells) and lifting operations associated with offshore facilities. Mobile offshore units normally do not include vessels such as: supply vessels, standby vessels, anchor handling vessels, or seismic survey vessels.

D.9 operator: The individual, partnership, firm, or corporation having control or management of operations on the leased area or a portion thereof. The operator may be a lessee, designated agent of the lessee(s), or holder of operating rights under an approved operating agreement.

D.10 owner: The individual, partnership, firm, or corporation to whom the United States issues a lease and has been assigned an obligation to make royalty payments required by the lease.

D.11 process: The systems for production, use, storage, handling, treatment, or movement of hydrocarbons, sulphur, or toxic substances.

D.12 simultaneous operations: Two or more of the following activities: production, drilling, completion, workover, wireline (except routine operations as defined in 30 CFR 250.91), and major construction operations.

D.13 uncontrolled release: An accidental release of hydrocarbons, toxic substances, or other materials that is likely to develop quickly, be outside the anticipated range of normal operations, present only limited opportunity for corrective action, require any action to be in the nature of an emergency response, and could result in serious environmental or safety consequences.

APPENDIX E—PERFORMANCE MEASURES

In order for operators and contractors to compare their safety and environmental performance from year to year and with industry averages, common definitions and formulas should be utilized. The definitions and formulas below are consensus definitions and formulas established by government and private industry sources.

While these definitions and formulas were developed for operations on the US OCS, they can be adapted for use for any location.

E.1 Definitions

E.1.1 work-related: An injury or illness is presumed to be work-related if an event or exposure in the work environment either caused or contributed to the resulting condition or significantly aggravated a pre-existing injury or illness. Exceptions include:

- a. Visitor or members of the general public;
- b. Voluntary participation in a wellness program such as the use of company-provided exercise equipment;
- c. Eating, drinking or preparing one's own food;
- d. Cold or flu;
- e. Personal tasks outside working hours;
- f. Personal grooming, self-medication or self-infliction;
- g. Symptoms arising on site solely due to outside factors; or
- h. Motor vehicle accident during commute, provided the injured party is not within course and scope of employment.

E.1.2 recordability: All injuries/illnesses that are work-related shall be considered Recordable if it results in death, days away from work, restricted work or transfer to another job, medical treatment beyond First Aid, loss of consciousness or if it involves a significant injury or illness.

E.1.3 first aid treatment: Any medical treatment rendered by a physician or other licensed health care professional beyond what is detailed below renders the work-related event Recordable.

First Aid Treatment is limited to the following:

- a. Non-prescription medication at non-prescription strength;
- b. Tetanus immunization;
- c. Cleaning, flushing or soaking wounds on the surface of the skin;
- d. Using wound coverings such as a Band-Aid, bandages, gauze pads, etc.; or using butterfly bandages or SteriStrips;
- e. Using hot or cold therapy;
- f. Using any non-rigid means of support such as elastic wraps, bandages, non-rigid back belts, etc.;
- g. Using temporary immobilization devices for transporting an injured person;

- h. Drilling a fingernail to relieve pressure or draining fluid from a blister;
- i. Using eye patches;
- j. Removal of foreign bodies from the eye using only irrigation or a cotton swab;
- k. Removing splinters or foreign material from areas other than the eye by irrigation, tweezers, cotton swabs or other simple means;
- l. Using finger guards;
- m. Using massages (not physical therapy or chiropractic treatment); or
- n. Drinking fluids for relief of heat stress.

E.1.4 restricted work activity case: A work-related injury/illness that prevents the person from working a full shift or the person is restricted by a physician or other licensed health care professional from performing any or all of the routine job functions which are performed at least once per week.

E.1.5 job transfer case: A work-related injury/illness that, based on the recommendations of a physician or other licensed health care professional, the injured party is moved to a different job position or assignment.

E.1.6 significant injury/illness: A work-related case involving any of the following diagnoses by a physician or other licensed health care professional:

- a. Cancer;
- b. Chronic irreversible disease;
- c. Punctured ear drum; or
- d. Fractured or chipped bone.

E.1.7 days away from work case: A case where a physician or other licensed health care professional recommends days away from work in connection with a work-related injury or illness.

E.1.8 DART: An acronym standing for Days Away, Restricted work or job Transfer.

E.1.9 physician or other licensed health care professional: An individual whose legally permitted scope of practice (i.e., license, registration or certification) allows him or her to independently perform, or be delegated the responsibility to perform medically-related treatment. This includes but is not limited to:

- a. Physicians;
- b. Nurses;
- c. Physical and Occupational Therapists;
- d. Medics; or
- e. Chiropractors.

Note: If you receive recommendations from two or more physicians or other licensed health care professionals, you may make a decision as to Recordability and/or classification based on which recommendation is the most authoritative.

E.1.10 PRODUCTION OPERATIONS EMPLOYEES' (COMPANY AND CONTRACTOR) RECORDABLE AND LOST TIME INJURIES/ILLNESSES

E.1.10.1 recordable injuries/illnesses: This value includes all company and contractor recordable injuries and illnesses, including days away cases, utilizing the criteria specified above, from January 1 through December 31 for all production (i.e., production, wireline, maintenance, associated transportation, associated catering) operations employees that are assigned to the operator's OCS locations. It also includes restricted activity and transfer cases that are associated with no-days-away-from-work incidents. Transportation of personnel (e.g., helicopter, boat) injuries and illnesses incurred while supporting OCS activities should be included regardless of the occurrence location (e.g., shore base, OCS, transit). If transportation services are shared between OCS operators and others, only appropriate injuries and illnesses (i.e., those for which the operator is accountable) should be included with the operator's records. Office staff and management who are located onshore should not be included unless the company has an established process to include only the time they spend offshore and any associated offshore injury/illness.

E.1.10.2 DART injuries/illnesses: This value is the number of production operations employee (company and contractor) injuries and illnesses on the OCS for which there were days away from work, transfer and/or restricted duty situations.

E.1.11 DRILLING OPERATIONS EMPLOYEES' (COMPANY AND CONTRACTOR) TOTAL RECORDABLE AND LOST TIME INJURIES/ILLNESSES

E.1.11.1 recordable injuries/illnesses: This value includes all company and contractor recordable injuries and illnesses, including days away cases, utilizing the criteria specified above, from January 1 through December 31 for all drilling (i.e., exploration, development and production) operations employees (includes drilling, well workover/completion/service, plugging and abandonment, maintenance, associated transportation, associated catering, diving, etc.) that are assigned to the operator's OCS locations. It also includes restricted activity and transfer cases that are associated with no-days-away-from-work incidents. Transportation of personnel (e.g., helicopters, boats) injuries and illnesses incurred while supporting OCS activities should be included regardless of the occurrence location (e.g., shore base, OCS, transit). If transportation services are shared between OCS operators and others, only appropriate injuries and illnesses

(i.e., those for which the operator is accountable) should be included with the operator's records. Office staff and management who are located onshore should not be included unless the company has an established process to include only the time they spend offshore and any associated offshore injury/illness.

E.1.11.2 DART injuries/illnesses: This value is the number of drilling operations employee (company and contractor) injuries and illnesses on the OCS for which there were days away from work, transfer and/or restricted duty situations.

E.1.12 CONSTRUCTION OPERATIONS EMPLOYEES' (COMPANY AND CONTRACTOR) TOTAL RECORDABLE AND LOST TIME INJURIES/ILLNESSES

E.1.12.1 recordable injuries/illnesses: This value includes all company and contractor recordable injuries and illnesses, including days away cases, utilizing the criteria specified above, from January 1 through December 31 for construction operations employees (includes offshore construction, piping, platform structural modifications, major equipment additions pipelines, major painting activities, platform installations and decommissioning, maintenance, associated transportation, associated catering, diving, etc) that are assigned to the operator's OCS locations. These activities are usually directed by a construction inspector or supervisor and are larger projects, in most cases. It also includes restricted activity and transfer cases that are associated with no-days-away-from-work incidents. Transportation of personnel (e.g., helicopters, boats) injuries and illnesses incurred while supporting OCS activities should be included regardless of the occurrence location (e.g., shore base, OCS, transit). If transportation services are shared between OCS operators and others, only appropriate injuries and illnesses (i.e., those for which the operator is accountable) should be included with the operator's records. Office staff and management who are located onshore should not be included unless the company has an established process to include only the time they spend offshore and any associated offshore injury/illness.

E.1.12.2 DART injuries/illnesses: This value is the number of construction operations employee (company and contractor) injuries and illnesses on the OCS for which there were days away from work, transfer and/or restricted duty situations.

E.1.13 PRODUCTION, DRILLING, OR CONSTRUCTION EMPLOYEE HOURS WORKED

This value is the number of *actual* hours worked during the calendar year on the OCS by those production, drilling, or construction operations employees (i.e., company and contractor employees) assigned to an operator's OCS locations. Transportation employee hours worked should include all

time worked regardless of location (excluding office staff and management), but allocated among operators if the services are shared. Do not include hours for which the employee is off-work or sleeping. Therefore, record 24 hours only in the unusual event that an employee works through a full day.

E.1.14 ENVIRONMENTAL PROTECTION AGENCY (EPA) NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM NONCOMPLIANCES

This value is the total number of noncompliances from OCS leases as reported to the EPA on an annual Discharge Monitoring Report (DMR). It includes the number of noncompliances from production, exploration and production drilling and workover activities performed on the operator's OCS locations. For companies that submit DMRs to EPA on a monthly basis, this value is the number of noncompliances from OCS leases that occurred in the calendar year being reported.

E.1.15 OIL SPILL: NUMBER AND VOLUME OF OIL SPILLS < 1 BARREL

E.1.15.1 Number of spills: This value is the annual calendar-year total number of oil spills of less than 1 barrel from production, construction, and drilling-related operations on the OCS. It includes lessee spills and contractor spills directly involved in supporting lessee's operations. It includes spills from (1) pipelines within the facility where operator had/should have had containment, and (2) pipeline company-owned pipelines, operated by the facility. It does not include sightings, shipping-related incidents such as non-lease-related shipping spills, hazardous substance spills, or NPDES-related spills or sheens.

E.1.15.2 Volume of spill: This value is the total volume of spills from 15.1.

E.1.16 OIL SPILL: NUMBER AND VOLUME OF SPILLS > 1 BARREL

E.1.16.1 Number of spills: This value is the annual calendar-year total number of oil spills greater than 1 barrel from production, construction and drilling-related operations on the OCS. It includes lessee spills and contractor spills directly involved in supporting lessee's operations. It includes spills from (1) pipelines within the facility where operator had/should have had containment, and (2) pipeline company-owned pipelines, operated by the facility. It does not include sightings, shipping-related incidents such as non-lease-related shipping spills, hazardous substance spills, or NPDES-related spills or sheens.

E.1.16.2 Volume of spill: This value is the total volume of spills from 16.1

E.1.17 FIRE/EXPLOSION INCIDENT RATE

This value is the number of fires and explosions reported to MMS for a calendar year. An explosion is the bursting or rupture of a building or a container due to development of internal pressures. A fire is the phenomenon of combustion manifested in light, flame, and heat.

E.1.18 BLOW-OUT INCIDENT RATE

This value is the number of blowouts reported to MMS by the operator. A blowout, surface or underwater, is an uncontrolled flow of gas, oil or other well fluids into the atmosphere or between the sea floor and the water surface. A blowout occurs when formation pressure exceeds the pressure applied to it by the column of drilling or other fluids in the wellbore.

E.1.19 MAJOR PLATFORMS

Major platforms contain at least six or more completions or two or more pieces of production equipment.

E.1.20 MINOR PLATFORMS

Minor platforms contain less than six completions and less than two pieces of production equipment.

E.1.21 MMS INCIDENTS OF NON-COMPLIANCE (INCs) RATE

E.1.21.1 Number of production incidents: Annual calendar-year number of MMS production INCs issued to an operator. The production INC's are associated with non-rig production activities including those from full site inspections, sample site inspections, spot site inspections as well as construction, decommissioning and production-related MMS office issued INCs.

E.1.21.2 Number of production inspections: Annual calendar-year number of components inspected by MMS for an operator. This includes the number of components inspected by MMS during full site inspections, sample site inspections and spot site inspections.

E.1.21.3 Number of drilling, workover, completion and well plugging and abandonment incidents: Annual calendar-year number of MMS drilling, workover, completion and well plugging and abandonment INCs issued to an operator.

E.1.21.4 Number of rig inspections: Annual calendar-year number of MMS rig inspections of rigs performed on drilling, workover, completion, and well plugging and abandonment activities at an operator's OCS locations.

E.1.22 WELLS SPUDDED

This value is the number of wells spudded for drilling within a calendar year.

E.1.23 GROSS OPERATED PRODUCTION

E.1.23.1 crude oil and condensate production: This value is the annual gross operated production of crude oil and condensate on the OCS by an operator in millions of barrels.

E.1.23.2 gas production: This value is the annual gross operated production of gas on the OCS by an operator in millions of barrels.

E.1.23.3 barrel equivalent: This value equates the gas production volume to oil production volume. A factor of 5.614 MCF/BOE is used.

E.2 Safety Performance Measures

E.2.1 PRODUCTION OPERATIONS EMPLOYEES' (COMPANY & CONTRACTOR) TOTAL RECORDABLE AND DART INCIDENT RATES

E.2.1.1 $[(\text{Annual number of production operations employees' Recordable injuries and illnesses})/(\text{Annual total number of production operations employee hours worked})] \times 200,000$.

E.2.1.2 $[(\text{Annual number of production operations employees' injuries and illnesses for which there were lost workdays (days away), transfer and restricted duty})/(\text{Annual total number of production operations employee hours worked})] \times 200,000$.

E.2.2 DRILLING OPERATIONS EMPLOYEES' (COMPANY & CONTRACTOR) TOTAL RECORDABLE AND DART INCIDENT RATES

E.2.2.1 $[(\text{Annual number of drilling operations employees' Recordable injuries and illnesses by operator})/(\text{Annual total number of drilling operations employee hours worked for operator})] \times 200,000$

E.2.2.2 $[(\text{Annual number of drilling operations employees' injuries and illnesses by operator for which there were lost workdays (days away), transfer and/or restricted duty})/(\text{Annual total number of drilling operations employee hours worked for operator})] \times 200,000$.

E.2.3 CONSTRUCTION OPERATIONS EMPLOYEES' (COMPANY & CONTRACTOR) TOTAL RECORDABLE AND DART INCIDENT RATES

E.2.3.1 $[(\text{Annual number of construction operations employees' Recordable injuries and illnesses by operator})/(\text{Annual total number of construction operations employee hours worked for operator})] \times 200,000$.

E.2.3.2 $[(\text{Annual number of construction operations employees' injuries and illnesses by operator for which there were lost workdays (days away), transfer and/or restricted duty})/(\text{annual total number of construction operations employee hours worked for operator})] \times 200,000$.

E.2.4 FIRE/EXPLOSION INCIDENT RATE

E.2.4.1 $(\text{Annual number of fires and explosions})/[(\text{Number of major platforms}) + 0.5 (\text{Number of minor platforms}) + (\text{Number of wells spudded for drilling during the year})]$.

E.2.5 BLOW-OUT INCIDENT RATE

E.2.5.1 Annual number of blowouts by operating company.

E.2.5.2 $(\text{Annual number of total industry blow-outs})/(\text{Total wells spudded for drilling by industry during the year})$.

Environmental Performance Measures

E.2.6 EPA NPDES NON-COMPLIANCE RATE

E.2.6.1 $(\text{Number of reported non-compliances on EPA NPDES Discharge Monitoring Reports (DMRs) on the OCS for the reporting year})/[(\text{Number of major platforms on the OCS}) + (\text{Number of wells spudded for drilling during the year})]$.

E.2.7 OIL SPILL INCIDENT RATE – NUMBER OF SPILLS AND VOLUME OF SPILLS > 1 BARREL

E.2.7.1 $(\text{Annual number of all oil spills greater than or equal to 1 barrel and less than 10 barrels for the calendar year})/[(\text{Number of major platforms}) + 0.5 (\text{Number of minor platforms}) + (\text{Number of wells spudded for drilling during the year})]$.

E.2.7.2 $(\text{Annual number of all oil spills greater than or equal to 10 barrels for the calendar year})/[(\text{Number of major platforms}) + 0.5(\text{number of minor platforms}) + (\text{Number of wells spudded for drilling during the year})]$.

E.2.7.3 $(\text{Annual total volume of all oil spills greater than or equal to 1 barrel and less than 10 barrels for the calendar year})/(\text{Gross operated crude oil and condensate production on the OCS in millions of barrels})$.

E.2.7.4 $(\text{Annual total volume of all oil spills greater than or equal to 10 barrels for the calendar year})/(\text{Gross operated crude oil and condensate production on the OCS in millions of barrels})$.

E.2.8 OIL SPILL INCIDENT RATE-NUMBER AND VOLUME OF OIL SPILLS < 1 BARREL

E.2.8.1 $(\text{Annual number of oil spills less than 1 barrel on the OCS})/[(\text{Number of major platforms}) + 0.5(\text{Number of$

minor platforms) + (Number of wells spudded for drilling during the year)].

E.2.8.2 (Annual total volume of all oil spills less than 1 barrel)/(Gross operated crude oil and condensate production on the OCS in millions of barrels).

E.2.9 MMS PRODUCTION INCIDENTS OF NON-COMPLIANCE (INCS) RATE

E.2.9.1 (Annual MMS production INCs)/[Annual components inspected by MMS).

E.2.10 MMS DRILLING, WORKOVER, COMPLETION, AND WELL PLUGGING & ABANDONMENT INCS

E.2.10.1 (Annual number of MMS drilling, workover, completion and well plugging & abandonment INCs)/(Annual number of MMS rig inspections).



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