

*California State Lands Commission*

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# **Safety and Oil Spill Prevention Audit**

**DCOR Ft. Apache  
DCOR LLC, Oil Company**



**January 2010**

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## **EXECUTIVE SUMMARY**

## **EXECUTIVE SUMMARY**

### **Ft. Apache Safety Audit**

The objective of each Safety Audit is to ensure that all oil and gas production facilities on State leases or granted lands are operated in a safe and environmentally sound manner complying with all applicable federal, state and local laws, rules, regulations, and codes, as well as industry standards considered good engineering practice.

The safety audit of DCOR's Ft. Apache was conducted from March 2009, through November 2009 with the final report being issued in January 2010.

#### ***Background***

DCOR LLC is a privately owned company categorized under Oil and Gas Exploration and Development, located in Ventura, CA. The company was established in 2001 and incorporated in Texas. Current estimates show this company processes approximately 1100 Bbl./day of oil through Ft. Apache from platform Eva and employs a staff of five at the facility. The facility processes crude oil on a continuous basis from an 8" subsea pipeline from Platform Eva. The crude oil is processed through a dehydration unit before storage and shipment through the Chevron pipeline to sales. Produced water is discharged by permit into the Orange County Sanitation District sewer. The facility is manned 12 hours per day and monitored 24 hours a day by Platform Eva Personnel. In the event of an emergency after hours, Platform Eva personnel can contact an on-call operator to assess the condition of the facility.

#### ***Safety Audit Results***

The facility was found to be in generally good operating condition except where noted by specific action items listed in the Action Item listing contained in the report. Ft. Apache consists of mainly the original equipment at the facility as originally designed and constructed. Operations and maintenance personnel assure the facility is being maintained and upgraded so that its systems and equipment perform their intended function safely. In particular, the external coatings of tanks, pressure vessels, and piping were observed to be in generally good condition. Firefighting and other emergency and spill response equipment were also observed to be maintained in good working order. Personal protective equipment was readily available and conscientiously used with all typical company safety programs in place and functioning. The facility control and safety shutdown systems also appeared to be designed, installed and maintained following the applicable governing codes and standards for the original date of installation and these systems are typical of other similar facilities within California.

The safety audit revealed 57 action items, none of which were considered a Priority One Action Item. The following table shows the Priority level and the nature of the Action Items:

<b>Action Item Priority</b>				
	<b>1</b>	<b>2</b>	<b>3</b>	<b>Amount</b>
ADM	0	0	15	15
EFI	0	10	18	28
ELC	0	0	14	14
TEC	0	0	0	0
<b>TOTAL</b>	<b>0</b>	<b>10</b>	<b>47</b>	<b>57</b>

Equipment Functionality and Integrity issues accounted for 28 of the 57 Action Items or about 49 percent. These items are typically related to required maintenance that is overdue, that poses some particular hazard from operating equipment, or is caused by inspection records that are missing.

Electrical items accounted for another 14 (25 percent) of the 57 Action Items. This was notably lower than in other audits for several reasons. The facility has received ongoing maintenance and upgrades by DCOR’s electrician and instrumentation personnel who have typically demonstrated attention to the requirements in the National Electric Code (NEC) and California Electric Code (CEC); fewer installation and maintenance Action Items identified as a result. The remaining 26 percent were all considered administrative items relating to required plans and manuals.

**Conclusion**

DCOR’s Ft. Apache was found to be in a relatively high degree of compliance with applicable regulations, codes, standards and MRMD regulations. The 57 action Items identified are typical for a facility of this size, based on previous safety audits.

The assessment of maintenance and equipment conditions indicates there are some opportunities to improve the overall effectiveness of their facility planned maintenance program. In particular, activities related to record keeping and scheduling of periodic and long term preventive maintenance would improve conditions and provide greater risk reduction benefits. Enhanced use of the Mainsaver maintenance management software could likely satisfy this concern.

Throughout the audit, DCOR personnel were very cooperative and demonstrated responsiveness, when action items were identified. When all Safety Audit Action Items have been fully addressed, DCOR’s accident and spill prevention will be at a level considered commensurate with risk, comparing favorably with similar offshore production facilities along the coast.

# ***Introduction***

## **1.0 INTRODUCTION**

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### **1.1 Background:**

The California State Lands Commission (CSLC) Mineral Resources Management Division (MRMD) staff is conducting detailed safety audits of operators and/or contractors for lands in which the State has an interest. The objective of these safety audits is to ensure that all oil and gas production facilities on State leases or granted lands are operated in a safe and environmentally sound manner and comply with Federal, State, and local codes/permits, as well as industry standards and practices. The MRMD staff is tasked with providing for the prevention and elimination of any contamination or pollution of the ocean and tidelands, for the prevention of waste, for the conservation of natural resources, and for the protection of human health, safety and property by sections 6103, 6108, 6216, 6301, and 6873(d) of the Public Resources Code (PRC). These PRC sections provide authority for MRMD regulations as well as the existing inspection program and the safety audit program that augments it.

The Safety Audit Program (SAP) was developed in response to Public Resources Code (PRC) 8757 (a), which originated from the Lempert, Keene, and Seastrand Oil Spill Prevention Act. In this Act, existing oil spill prevention programs were considered insufficient to reduce the risk of significant discharges of petroleum into marine waters. This Act also required Marine facilities to employ “best achievable technology” or protection to promote the updating and upgrading of oil and gas facilities. As a result, the CSLC is required to regularly inspect and monitor all marine facility operations for their effects on public health, safety, and the environment. The SAP was established to further prevent oil spills and other undesirable events at oil and gas processing facilities. This program supplements prevention efforts by thoroughly reviewing facility design, maintenance, training, human factors engineering and management activities. Adherence to local, state and federal codes and regulations are also evaluated as part of this program.

Five MRMD teams are used to conduct the safety audit. Each team has a specific focus and systematically evaluates the facility, operations, personnel, and management from many different perspectives. The five teams and their areas of emphasis include:

- 1) Equipment Functionality and Integrity (EFI)
- 2) Electrical (ELC)
- 3) Technical (TEC)
- 4) Administrative (ADM)
- 5) Human Factors (HF)

Each team reports progress and findings periodically throughout their audit evaluations. For each of the teams appropriate company contacts and resources are identified. Each team records findings on an action item matrix for its area with



recommended corrective actions and a priority ranking for the specified corrective action.

The audit report highlights the findings of each team and the most significant action items on a system-by-system basis that helps to avoid duplication in findings presented by various teams. It also includes the complete matrix of action items. Draft copies of the audit report and the matrix of action items are provided to the company periodically throughout the audit. The final audit report is provided to company management during a formal presentation of the results. The presentation affords the opportunity to discuss the findings and the corrective actions proposed in the final report. The MRMD continues to assist the operator in resolving the action items and tracks progress of the proposed corrective actions. Adjustments to the inspection program are then made based on the Safety Audit.

This program could not be successfully undertaken without the cooperation and support of the operating company. It is designed to benefit both the company and the State by reducing the risk of personnel or environmental accidents, damage, and in particular, oil spills. Previous experience shows that the safety assessments help increase operating effectiveness and efficiency and lower cost. History has shown that improving safety and reducing accidents makes good business sense.

## **1.2 DCOR, LLC History:**

The facility began operation in 1963, as an asset of Unocal Oil. Nuevo Energy Company, a Houston based company, purchased Ft. Apache in conjunction with the purchase of Platform Eva in April of 1996 from Unocal Oil. Nuevo Energy exclusively owned and operated the facility until May of 2004 when Plains Exploration and Production Company (PXP) took over after a merger with Nuevo Energy. PXP subsequently entered into a purchase and sales agreement with DCOR, a Texas based LLC, in September of 2004, which involved the sale of PXP assets including Platform Eva and Ft. Apache to DCOR. The sale closed in December of 2004 with the approval of the lease assignment by the State Lands Commission on October 20, 2005.

DCOR is owned entirely by Castle Peak Resources, LLC, a Texas based LLC, which in turn is owned by Crescent Resources, LLC, a California limited liability company. All of these limited liability companies are 99% owned and controlled by Mr. William M. Templeton. DCOR's reported production is approximately 14,000 BOE/D.

The company owns and operates eleven offshore platforms. These include Platform Esther in State Waters and Platform Edith located in Federal Waters, as well as, eight other offshore platforms located within the Santa Barbara/Ventura areas.

## **1.3 DCOR Ft. Apache Facilities:**

The DCOR, LLC onshore processing facility for Platform Eva is known as Ft. Apache. Ft. Apache is located in a Huntington Beach residential area bounded by Heil

Avenue on the south, residences on the east and west, and a storm drainage channel on the north.

Ft. Apache processes the crude oil emulsion that is continuously shipped to the facility via an 8-inch sub-sea pipeline from Platform Eva. The facility handles approximately 1,345 barrels of oil per day (BPD), and 203 barrels of produced water per day (BWPD). The produced fluid travels to free water knockout (FWKO) V-5 where 3-phase separation occurs before being routed to the heater treaters. The produced fluid then flows into the heater treaters where additional separation and dehydration occurs. Water from the treaters then flows into the wastewater vessel V-1 and then on to produced water tanks T-1 and T-2. Natural gas from the FWKO and heater treaters flows into gas piping which supplies the blanket gas for the heater treaters, and stock tank T-4. Oil flows from the heater treaters into the crude oil shipping tank T-4. Lease Automatic Custody Transfer (LACT) pumps then transfer the oil into a sales pipeline owned by Chevron USA. The permitted wastewater (30,000 gallons maximum) from T-1 and T-2 is discharged into the Orange County Sanitation Districts sewer line along with any surface runoff. The wastewater contains less than (100) milligrams/liter of oil and is processed through a clarification system prior to sewer discharge that has been approved by the local Fire Department.

The control room is located on the south end of the facility. One operator monitors the facility for 12 hours during the day. In addition, personnel on Platform Eva also monitor the facility 24 hours per day. On-call personnel are available to respond to the facility by notification from Platform Eva operators in the event of equipment failure or emergency after normal business hours. Visitor and contract personnel attendance at Ft. Apache varies based on facility operations and maintenance.

***Equipment  
Functionality &  
Integrity Audit***

## **2.0 EQUIPMENT FUNCTIONALITY & INTEGRITY AUDIT**

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### **2.1 Goals and Methodology:**

The primary goal of the Safety Audit Team was to evaluate the design, condition, and maintenance of Ft. Apache and associated process equipment. A series of safety system, and equipment inspections, field verifications of key drawings/plans, and technical design review of systems were employed by teams to accomplish this goal. Although the field inspection work was conducted in steps by teams with particular tasks or following checklists, this written evaluation report has been organized on a system basis for convenience of the user.

There were four main teams to conduct this Safety Audit. The Equipment Functionality and Integrity Team (EFI) field checked required Piping and Instrumentation Diagrams (P&IDs), Process Flow Diagrams (PFDs), other key drawings, and evaluated conditions, maintenance, and equipment functionality. A Technical Team (TEC) reviewed design documentation including the Safety Analysis Function Evaluation (SAFE) Chart, Hazards Analysis, and other design considerations and standards. The goal of the Electrical Audit Team (ELC) was to evaluate Electrical Single-Lines and Area Classification Drawings, electrical systems and operations to determine conformance to the California Electric Code (CEC) and industry standards. Finally, The Administrative Team (ADM) reviewed the various required plans and manuals.

The Action Item Matrix at the end of the report provides a detailed listing of the locations and items identified for correction. The matrix is organized in sections. Significant findings are discussed below along with examples of typical items encountered.

### **2.2 General Facility Conditions:**

2.2.1 Housekeeping: The Ft. Apache process facility was clean and orderly. It appeared to be well maintained and operated in a responsible manner with few exceptions. Refuse containers were clearly marked with no excess of oilfield wastes. Unused equipment and scrap is negligible with any excess trucked off site to metal recyclers.

The production office was organized with appropriate reference materials readily available. The cleanliness of the production office restroom was found to be satisfactory with no obvious health concerns.

2.2.2 Stairs, Walkways, Gratings, and Ladders: Stairs, walkways, and gratings appear to be of a safe design and construction. Safeguards were in place wherever there was a need to transition between levels and for routine access to equipment. The aisles, passageways, stairs, and gratings had sufficient safe clearances, were in good repair, and were clear with no obstructions that could create a hazard. The portable

ladders observed appeared in good usable condition free from oil and grease. Fixed metal ladders and appurtenances were painted to resist corrosion and rusting.

2.2.3 Escape / Emergency Egress / Exits: Emergency exits, escape routes and gathering points were clearly recognizable, readily accessible and easily seen from any location within the facility. Due to the design, size, and open arrangement of the facility, and equipment, there were no areas of concern regarding access and egress. The tanks and vessels throughout the facility were clearly identified as confined spaces with warning placards posted at manways to warn personnel of potential hazards.

2.2.4 Labeling, Color Coding and Signs: The design, application, signs and symbols within the facilities are used to define the specific hazards to workers and/or public. Employees are instructed on what the signs indicate and what, if any, special precautions are necessary to perform their task safely. In addition, physical dangers such as tripping hazards are identified by yellow and fire protection equipment by red.

Fire diamonds are posted on the exterior walls of the facility and on all tanks, vessels, chemical storage totes and access to rooms and areas where emergency responders are likely to enter. The posting of fire diamonds is an indication of good facility emergency planning and awareness of The Uniform Fire Code. NFPA 704 and Material Safety Data Sheets (MSDS) are used for the identification of the Hazards of Materials for Emergence Response. These guidelines are used to help determine chemical ratings when posting fire diamonds.

2.2.5 Security: Entry of authorized personnel into the facility is controlled and monitored by facility personnel at the main entrance. The facility is manned by at least one operator for 12 hours during the day and is monitored by Platform Eva personnel for the remainder. In addition, block walls and entrance gates are in place to secure and control access to oil handling equipment, master flow and drain valves and prevent unauthorized access to starter controls on oil pumps. Process workstations and network access is secured through passwords and locked office doors. Security lighting is also in place to help prevent acts of vandalism and assist in the discovery of any oil discharges. The combination of these security measures provide environmental protection in areas where a discharge to storm drains could originate.

2.2.6 Hazardous Material Handling and Storage: DCOR has an employee training and education program designed to communicate information to each employee about the hazardous substances to which they are exposed. The program also includes an established mechanism for employees to obtain and use the appropriate Material Safety Data Sheets (MSDS). This training is normally provided within the first few days of employment and the education includes the nature of the hazards, appropriate work practices, protective measures and emergency procedures.

Flammable and combustible liquids are stored and labeled in accordance with CAL-OSHA and NFPA 30 regulations. Bulk chemical totes were also properly labeled,

appeared structurally sound, and had adequate containment in the event of a leak. No loose combustible material or empty drums were present within the containment areas.

Compressed gas cylinders were secured properly and legibly marked identifying the gas content. Valves were closed and protective caps were in place on all empty and unused cylinders. The cylinders were generally stored in places where they would not be knocked over or damaged by falling objects.

Material Safety Data Sheets (MSDS) containing information on all chemicals used in the workplace were readily accessible to all personnel.

## **2.3 Field Verification of Plans:**

2.3.1 Process Flow Diagrams (PFD): DCOR's PFD drawing shows the general flow through plant equipment along with references to mass balances. The drawing was current, error free and displayed the appropriate information on the PFD.

2.3.2 Piping and Instrumentation Diagrams (P&ID): The P&IDs were accurate in most instances but some updates were needed. It appears that some red line corrections to the drawings were missing in some instances.

2.3.3 Electrical Area Classification Drawings: The API recommended practices and California Electrical Code (CEC) requirements provide specific guidelines for the electrical classification of hazardous areas and installation practices for electrical equipment and materials within classified areas. The Electrical Team's comments for all hazardous areas based on API RP 500, API RP 14F and CEC documents.

The purpose of an Electrical Area Classification Drawing is to define the locations of boundaries and areas where specific electrical installation practices are required to manage the explosive properties of flammable liquids, vapors and other volatile materials. Installation and maintenance of electrical systems requires attention to the type of hazard and the level of the hazard in order to insure compliance with the CEC. Electrical Area Classification Drawings are required to contain the information necessary for a qualified electrician to perform work in and around classified areas.

The addition, relocation or change in process equipment, piping and valves requires that classified areas be reassessed and that classified boundaries be redrawn if appropriate. If the Area Classification drawings in some cases do not show the present conditions, all new electrical equipment purchased for installation should meet the most stringent requirements and be rated explosion-proof in accordance with the Code if located in an area classified as likely to contain explosive vapors.

Conduit seals are required at classification boundaries. Locations where conduits originate outside of classified areas and travel through classified areas without use of a box, fitting or coupling may cross boundaries of Division 2 areas without a seal.

Some recently added seals need to be poured, and the seal marked in red for verification.

The area classification drawing DCOR-FA-EL-D-0101 used in the evaluation was dated as August 16, 2007. Some equipment locations (i.e. Pig receiver, Vessel V-11 and associated pumps) did not match the drawing. A copy of the drawing was red marked and given to DCOR for update.

The electrical single-line drawing DCPR-FA-EL-D-0100 was used for review of facility. The drawing is generally representative of the electrical power system but several items lacked cable sizes and other information necessary to adequately evaluate the power system. The audit focused on power distribution systems 480 V and above and excluded the lower voltage systems. DCOR will need to add missing information and incorporate the corrected information into updated single-line drawing.

2.3.4 Fire Protection Drawings: The fire protection drawing included the firewater pump, main valves, stationary monitors and hose reels. The drawing appeared to be accurate and up-to-date. Emergency and Evacuation Site Plans were reviewed and found to be accurate.

## **2.4 Condition and Integrity of Major Systems:**

2.4.1 Piping: The purpose of the piping system assessment is to evaluate the mechanical integrity and maintenance of the piping systems. The piping assessment included:

- Reviewing company piping maintenance and inspection information
- Evaluating the results of company piping and corrosion monitoring inspections
- Visual external inspection to identify piping systems in need of repair

The visual external piping inspection also checked for the presence of leaks, defects in the support system, excess vibration, and external corrosion. Piping components such as valves, flanges, bolts, welds, etc. were also included in the assessment. The inspection revealed that the condition and maintenance of piping throughout the facility was good. There were a few noted exceptions pertaining to temporary repair clamps on one in-service line and missing or broken piping support brackets at several other locations.

DCOR uses a combination of on-going routine and condition based piping inspections to achieve a desired level of quality assurance, facility safety, environmental protection, and prevention of unscheduled downtime. The established inspection frequencies are based on API RP 570 piping classifications (I, II and III) with DOT pipeline inspections occurring more frequently than class based assessments. Results from thickness measurements, inspections, repairs and other tests are readily available.

DCOR's selection of piping materials appears compatible with the process, operating variables and the environment. Because corrosion problems are a primary method of failure to piping systems, a proactive approach to corrosion control has been adopted by DCOR. Several different methods are used to improve the life of the piping systems, including:

- Epoxy and Tape Coatings
- Pipeline Pigs
- Cathodic Protection
- Chemical Treatment

The production pipeline has the highest safety and environmental consequences if failure or loss of containment should occur. The production pipeline consists of a double-wall construction with high-pressure interior tubing and low-pressure outer casing for leak detection. An increase in pressure in the outer pipe would indicate a product line leak, while a decrease in pressure indicates outer casing leak.

Shorter interval inspections and corrosion protection from an impressed current rectifier (cathodic protection) are measures that affirm DCOR's commitment to pipeline integrity.

2.4.2 Pipelines: The condition of the incoming subsea pipeline is discussed in the Platform Eva report. The trunk pipeline extending from the processing area to the refinery is owned by Chevron USA and is beyond the scope of this report.

2.4.3 Tanks: Atmospheric tanks provide processing or temporary storage of liquid hydrocarbons and wastewater. Both welded steel and bolted tanks are being used at Ft. Apache. These tanks were constructed with fixed cone roofs, flat bottoms and are placed on gravel foundations.

Exterior structural members, foundations, shell courses, roofs, drains, valves, piping, as well as, maintenance records were examined by the audit team as part of the inspection process. These evaluations were performed to determine:

- Extent of internal/external corrosion and/or pitting damage
- Serviceability
- Corrosion allowance remaining
- Condition of the vacuum/relief valves
- Condition of the foundation

Facility tanks are subject to periodic inspection throughout their service life for signs of damage. Inspection methods commonly used include ultrasonic testing (U.T.) as well as visual interior and exterior inspections to search for flaws and service related damage as recommended in API RP 653. Scheduled internal/external inspections are necessary to establish corrosion rates and evaluate the condition of the tank. Inspection records form the basis of a scheduled inspection/maintenance program and



normally contain construction records, inspection and repair/alteration history. Owner/operators are required to maintain a complete record file and may use checklists when conducting in-service or out-of-service inspections. Routine inspections assure continued tank integrity and limit the potential risk of air or water pollution. While it is recognized that records may not exist for older tanks inspection frequency can be scheduled based on experience with tanks in similar service.

After a comprehensive review of the facility tanks and records, some concerns were noted. Produced Water Tank T-1(bolted tank), was out-of-service for an internal inspection during the safety audit. The internal inspection findings determined the tank should be replaced as soon as possible. While the tank was returned to service after the inspection, it is scheduled to be replaced in early 2010. (EFI - 3.19) Produced Water Tank T-2 was also showing signs of leakage along several different shell plates. DCOR operations were notified and the leaks were repaired immediately. UT information was provided from March 2007 but the results were inconclusive due to incorrect corrosion rate information. Clarification is needed to help assess the actual condition of the tank interior. Crude Oil Shipping Tank T-4 (welded tank) had no construction, inspection and repair/alteration history files available. An internal and external inspection should be performed and documentation established for the tank. (EFI - 3.01)

2.4.4 Pressure Vessels: The audit team used a visual examination to assess the general exterior condition of pressure vessels and their maintenance history. This method detects specific problems such as external coating failure, corrosion, leaks, labeling, inadequate anchoring or foundations, lack of internal inspections and required instrumentation.

Pressure vessels found within the facility are of the stationary and fired type. They are constructed of carbon steel and are used for the containment of gases and liquids. Safety instrumentation for these vessels typically included pressure gauges and sensors. These devices were either direct read-out or the pressure information was communicated to a process control computer. This type of control system is utilized on most of the pressure vessels in the production system and is used to maintain pressure within desired limits or shut down all, or parts of the process system.

The facility pressure vessels and control systems were designed with sufficient safety devices and redundancy to prevent and/or isolate any unintentional release of flammable gas or liquid. Two levels of protection are provided against potential hazards and the system is designed to be "failsafe". This integrated detection and protection system senses and activates appropriate shutdown devices as a first level. The second level of protection is provided by pressure relief valves. Addition spill protection is provided by containment and operator intervention as a means of responding to an undesirable event. This safety control scheme is considered sufficient and adequate for the safe operation of the production facility. This evaluation is based on the hazards analysis studies that have been conducted for Ft. Apache.

Audit analysis of available record data in conjunction with visual examinations determined that time-based inspection interval requirements are not being met in accordance with API 510 guidelines. Records indicate that the following pressure vessels are in need of visual internal inspections: Waste Water Vessel V-1, Heater Treater #2, FWKO #5, Wet Gas Scrubber V-6, Fuel Gas Scrubber V-9, Blanket Gas Scrubber V-10, VRU Suction Scrubber V-11 and PSV Blowdown Vessel V-13. (EFI - 3.04 & .11 thru .17) In addition, no internal inspection records (UT) were provided for the following vessels: Gas Eliminator L2-V1, Drain Pot DP-1, City Gas Condensate Pot, Condensate Pots V-11A & B, Instrument Gas Scrubber V-12 and Air Sparger Scrubber V-19. (EFI - 3.20) These vessels require a systematic plan or schedule for internal inspections. The inspections are needed to maintain these vessels in accordance with API/ASME vessel codes.

2.4.5 Relief System: The piping for the relief vent system at Ft. Apache was evaluated for condition, maintenance, and functionality. In the case of an undesirable event, such as a release of process vapors, the released gas is directed to a safe location by means of the vent system. The relief system is designed with a PSV blow down vessel V-13 and flame arrestor. The blow down scrubber prevents liquids from venting to atmosphere and is located within the spill containment area.

Isolation valves on the relief system are provided for maintenance purposes. During normal operations, these valves are open, and can be used to isolate a relief valve for inspection and/or repair while the facility is operating. Due to the critical nature of this safety system, these isolation valves should be locked or car sealed in the open position. The inspection found these valves to be properly car sealed or locked opened.

Flame arresters are normally used in vent systems to reduce the danger of combustion within the vent from an external source. According to manufacturer recommendations, flame arrestors should be checked at least annually to see if the elements are clean. The audit noted the condition of blow down vessel V-13 flame arrestor was unknown. (EFI - 3.21)

The maintenance and servicing intervals for all pressure safety valves (PSVs) on the pressure vessels were examined and found to comply with applicable regulations and recommended standards, as well as, record keeping within a preventive maintenance system, MRMD 2132 (g)(3)(D) and 2175 (b)(5)(B), API RP 576 and Cal OSHA 6551. An outside contractor inspects PSVs on all pressure vessels throughout the facility. The frequency is every six months regardless of the service of the relief valve. Service records were in order with no action items identified.

2.4.6 Instrumentation, Alarm, and Paging: The process control system uses a combination of pneumatic, hydraulic and electrical instruments and controls. It includes the use of computers, programmable logic controllers (PLC's) and relay logic to control and interface with valves, solenoids and pump controllers. Alarms are produced by level, temperature, pressure and flow sensors advising operators of process conditions. General Alarms annunciate at the main control board.

Two PCs located in the control room provide operator interface to the process control system. The PCs are linked via Modbus+ to a Modicon PLC, which runs the Wonderware software package. A second Allen Bradley PLC is also located in the facility. There is no means to backup the Allen Bradley PLC or make changes do to the age of the equipment. DCOR is anticipating replacing the PLCs in the near future.

Programming for the PLC is resident on the PLC. In the event of a PLC processor failure, programming is available for upload from the PCs in the office. No formal procedure to track changes or backups of the logic was available. Programming backup frequency was not determined.

The Modicon PLC located in the control board CP-1 in the control room effectively monitors and controls operations at the facility. Control and monitoring from the offshore platforms is provided through the spread spectrum radio system from the remote terminal unit (RTU) on platform Esther to an RTU located at the first street, Seal Beach facility.

2.4.7 Emergency Shutdown System (ESD): Safety control systems are required to be a combination of devices arranged to safely affect facility shutdown. Electrical safety control systems are normally operated energized and fail-safe. Failure of external power to a safety control circuit requires an audible or visual alarm to be initiated or operation of equipment in a fail-safe condition.

Ft. Apache is equipped with both manual and automatic ESD safeguards. Manual ESD's stations are located on the main control panel and at the North and South gates of the facility. They are clearly identified in case of an emergency. The stations are hard wired to the control panel CP-1 in the control room. In addition, the flame detection system will activate an ESD automatically if flames are detected. Relays in panel CP-1 are fail-safe type. System is reset from a button on the control panel.

Manual ESD stations and fire eye flame detectors that automatically activate the ESD are tested monthly as required by CSLC regulations to verify proper operation and alarm annunciation. Test records are maintained at the facility and this history indicates the system remains in good working order. The condition of this system was deemed acceptable.

2.4.8 Combustible Gas and H<sub>2</sub>S Detection: Ft. Apache does not have fixed gas lower explosive limit (LEL) detectors nor is it required to have H<sub>2</sub>S detectors because H<sub>2</sub>S levels in the gas stream are negligible.

2.4.9 Fire Detection Systems: The fire and smoke detection systems at Ft. Apache are designed to detect fires in their earliest stages and alert personnel to the existence of a fire. All fire alarms are broadcast over the facility address system, and hard wired to the control room alarm panel. Process areas where there is a potential for

a flammable liquid spill are monitored using numerous techniques. These methods include:

- Personal observation and surveillance
- Process monitoring equipment that would indicate that a spill or leak has occurred
- UV/IR detectors to continuously monitor the areas where facilities operations are unattended
- Fusible heat sensing detectors, which respond when it's operating element becomes heated to a predetermined level

This fire system is comprised of ultraviolet / infrared fire eye flame and fusible heat sensing detectors that will activate the deluge system and result in a shutdown of the facility. Fire-eye type UV detectors are provided around the Heater Treaters. Fire-eye detectors are located on the periphery facing into the monitored area. This was done to reduce nuisance alarms caused by foreign sources (i.e. distant welding, flash photography, etc.) external to the facility. At the time of the inspection, the fire-eyes were bypassed because of maintenance on one Heater Treater. Fire-eye signals are returned to the Fire Detection Modules in the control room panel CP-1. Fire detectors are tested monthly and records are maintained. In addition, facility personnel who observe a fire or an alarm may also manually initiate fire suppression before automatic sensing devices activate the fixed fire suppression deluge system.

Stand-alone smoke detectors are also employed as required on the ceilings of the control room and office trailer for early detection. However, these detectors were not tested during the inspection and test records were not available.

Facility operators visually check fire suppression equipment monthly and an outside contractor conducts required inspections and testing that are more detailed semiannually. DCOR maintains the required test/inspection records and if needed are readily available. The condition of the firefighting equipment appears satisfactory based on contractor servicing and records. DCOR also ensures that all personnel responsible for the use and operation of the fire protection equipment are trained in the use of that equipment. Refresher training for operating personnel is conducted annually.

2.4.10 Fire Suppression: The fire suppression system consists of a main electric driven firewater pump system, hose stations, portable fire extinguishers, and two stationary monitors. A four-inch city water main supplies suction to the firewater pump. The fire pump is a 250-gallon per minute at 65-psi (rated pressure) centrifugal pump, driven by a 15 horsepower (HP) electric motor. It is located between the control building and the front entry gate and fed by the normal power system from MCC-1 at 480 volts. The electric firewater pump provides the sole source for onsite fire suppression. The Ft. Apache facility relies on the local fire department for backup fire protection. Present installation is not in accordance with California Electrical Code (CEC) 695.3 power source requirements.

The firewater main supplies an open head deluge system, and hose stations that provide protection to the Heater Treaters and LACT unit. This system can be operated manually and can be started automatically by the fusible heat sensing detectors. Testing of the primary firewater pump is performed weekly and the automatic spray systems are tested monthly as required by CSLC regulations. All fire protection equipment appeared to be properly maintained, and periodic inspections and tests had been done in accordance with both standard practice and equipment manufacturer's recommendations. Water-based fire protection systems are also being inspected, tested, and maintained in accordance with NFPA 25 (Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems). The deluge system control and bypass switches and status lights are located on the main control panel.

2.4.11 Spill Containment: The secondary containment volumes are adequate for meeting the spill control and containment (SPCC) regulations. This system coupled with routine visual inspections, by operating personnel; reduce the potential of a major spill from occurring. The containment volumes provided by the spill containment walls were carefully reviewed. The assessment found that containment for the tanks and vessels are adequately sized. The containment volumes provided will contain more than the volume of the largest tank plus the recommended allowance for precipitation while excluding the volumes occupied by other tanks.

2.4.12 Spill Response: Oil spill response equipment is stored in an emergency shed located next to the Supervisors office. The shed is stocked with a variety of pollution control equipment that exceeds minimum equipment requirements. The inventory consists of spill booms and absorbent pads. The cleanup materials and equipment appeared to be in good condition. Facility personnel are the primary responders in the event of a spill and should be prepared to effectively cleanup small to moderate oil spills using the on-site response equipment and materials. For larger spills outside contractors will respond if called on.

2.4.13 Mechanical Lockout – Tagout, Safety, and Personal Protective Equipment (PPE): DCOR has a written workplace safety program that is used for identifying, evaluating, analyzing, and controlling workplace safety and health hazards. This program has systematic policies, procedures, and practices, which are fundamental to creating and maintaining a safe and healthy working environment. DCOR also considers the prevention of occupational injury and illness to be of such consequence that it is given precedence over production.

Personal protective equipment (PPE) is used to reduce employee exposure to hazards when engineering and administrative controls are not feasible or effective in reducing these exposures to acceptable levels. An assessment of their policy found that the company regularly evaluates the workplace to determine if hazards are present that require the use of PPE. Hazards are then communicated to the employees, appropriate PPE is selected, and workers are trained in its use. Employees were

observed using appropriate PPE as required by company policy or where known hazards exist.

DCOR has a written policy, training and refresher-training program to ensure operating personnel are proficient in lockout / tagout procedures. DCOR also requires that all mechanics, electricians and maintenance personnel who are called out to perform scheduled work are to provide individually keyed locks according to lockout / tagout procedures. Production operators are provided with group locks, which are individually keyed for routine operations.

2.4.14 Compressed Air System: The system consists of two motor driven reciprocating air compressors (A & B) and an air receiver V-501 that supplies the facility. An air dryer is located on the discharge of the receiver to remove moisture from the air. The system is designed so that one compressor is used continuously to provide instrument and tool air to both systems throughout the facility while the other compressor is maintained in standby. The compressed air pressure is regulated down for instrument and control usage. The compressors are rotated periodically to ensure reliability and improve longevity. No discrepancies were noted.

2.4.15 Pump Units, Wellhead Equip. and Well Safety Systems: Ft. Apache is a land based process facility, which receives produced fluids from Platform Eva. There is no oil production or water injection wells located on site.

2.4.16 Cranes: There are no fixed cranes at the Ft. Apache facility. All crane related work is done by outside contractors.

2.4.17 Electrical Power Distribution Systems: Utility service is supplied from an Edison pole line, a service drop consisting of pole line disconnects and three 4160-480V single-phase transformers on a pole line structure adjacent to the facility. Electric service is provided under the terms of an I6 contract which includes provisions for interruption of service, with a 30-minute prior notification.

The Edison supplied transformers provide 480 volt, three-phase, three-wire power to Ft. Apache via parallel runs of 3-1/C #750kcmil 600V cable routed in conduit to the main Service Switchboard (MS-1). This switchboard lineup includes a service entrance section consisting of a Utility metering compartment and one main 1000 amp frame / 800 amp trip breaker, to supply power to the 480V motor control center lineup (MCC-1) in the main control house.

The normal power system capacity appears to be adequate based on present usage. Electrical system utility short circuit data was not available to confirm equipment withstand rating. The application of overcurrent devices with respect to equipment ratings is generally satisfactory.

The power system installation, in general, appears to be adequate. However, access to the Air Sparger controller located in the room adjacent to the control room is blocked by a coat rack and by stored materials in front of the equipment.

2.4.18 Emergency Generator: No backup generator is provided for the facility. In the event of a power failure, the facility is designed to shutdown in a safe manner. Critical system control, alarms and communication are powered from the UPS in the control room. The UPS provides 120-volt single-phase power. The Tripp-Lite UPS unit feeds power strips behind and above the control panel to maintain power for the emergency systems listed below:

- Control Room computers and equipment
- General Alarm and Shutdown systems
- Modicon PLCs and I/Os for process control and monitoring
- Communications system
- Fire eyes

UPS power is provided from a 1050-VA (705-watt) unit in the main control room. The Tripp-Lite Omni Smart 1050 UPS is a packaged unit complete with batteries.

Battery capacity was not be determined during the inspection. Full load battery capacity should be in excess of 4 hours. The UPS has expandable battery capability to extend runtimes. DCOR should confirm existing battery capacity and determine if additional battery capacity is needed to meet the 4-hour requirement. An extended power outage would drain the UPS batteries requiring a shutdown of the facility.

2.4.19 Grounding (System and Equipment): CEC Article 250 provides the rules for power system grounding and bonding. The requirements for grounding are established to prevent or reduce the possibility of personnel injury due to shock hazards resulting from elevated touch potential because of improper grounding. The rules of grounding also contribute to reduction of equipment damage. Three specific types of grounding are required at the facilities; power system grounding, safety or equipment grounding, and static grounding.

Article 501-16, Bonding in Class I areas, states that all non current carrying metal parts and enclosures associated with electrical components shall be connected together, bonded, and be continuous between the Class I area equipment and the supply system ground. Bonding shall provide reliable grounding continuity from the load back to the power transformer grounding. The best way to achieve this is to include properly sized equipment grounding conductors with each set of power conductors from the source of power to each of the equipment grounding points and include bonding jumpers at points of discontinuity along the route. Equipment grounding conductors are not installed on all circuits and bonding is achieved through continuity of raceways and fittings. Equipment bonding conductors to major equipment; transformers, switchgear and the like, were installed and appeared adequate.

CEC 501-16(b) requires that all liquid tight conduit used in a hazardous area be supplemented with either an internal or external ground bonding jumper. External ground jumpers have been added to all liquidtight conduits to motors and instruments within classified areas.

2.4.20 Wiring Methods and Enclosures: The overall condition of electrical equipment can be rated as good. Several locations were noted where conduit supports were missing or inadequate and holes or covers were missing or loose on some equipment enclosures.

2.4.21 Electrical Lockout - Tagout and Safety Procedures: Safety Standards (procedures) Documentation for the lockout/tagout/blockout program was reviewed and the document appears to be adequate and complete.

Arc flash hazard labels have been installed on the main breaker and utility metering compartment, motor control center, combination starters, and panelboards within the facility. The labels indicate: flash hazard boundary, potential arc flash magnitude at working distance, approach limits, and Personal Protective Equipment (PPE) required in accordance with NFPA 70E requirements.

2.4.22 Communication Equipment: Communications systems are established to provide for normal and emergency operations. Systems used for emergency communication should have battery-operated supplies good for at least four hours continuous operation as required by API RP 14F. Communications equipment is located in the control room. Verizon phone service (Time-Warner is the service provider) is connected to a 10-base T hub located in the control room.

Communications to the platforms: A dedicated T1 line extends via Verizon to the Goldenwest facility in Huntington Beach. There the signal is routed through an Ethernet/FO converter. The fiber optic cable routes in the submersible power cable to Platform Eva. At Eva, the fiber optic cable is separated from the power cables at the main interrupter switchgear room and routed through a FO/Ethernet converter to the platform Ethernet. A spread spectrum radio system links the telecom system at Eva to platforms Esther and Edith. Communications equipment on Esther is powered through the UPS unit.

Ft. Apache is not manned full time. Remote monitoring and control of Ft. Apache during off hours is provided from Platform EVA, which is manned a full 24 hours. Loss of the Verizon signal results in loss of control of Ft. Apache from Platform Eva.

A VHF-FM radio base station in the control room provides radio communication with the crew boat. This system and the other installed systems are also backed up by cellular phone.

2.4.23 Lighting: Ft. Apache does not have an assigned nighttime operator for the facility so DCOR has implemented a "good neighbor" policy that entails turning off some



non-essential process area lighting that could be a nuisance to nearby residences. This was done to reduce the number of complaints regarding lease lighting. It appears there is sufficient lighting available to conduct safe operations throughout the facility when needed. Mounted incandescent fixtures and high-pressure sodium vapor fixtures provide primary area lighting. Emergency control room lighting consists of fixed lighting units with approximately 90 minutes of backup illumination.

## **2.5 Preventive Maintenance and Mechanical Reliability:**

This section gives a general evaluation of the company's activities to ensure that mechanical equipment is designed, fabricated, procured, installed, operated and maintained in a manner appropriate for its intended application.

DCOR utilizes a computer based maintenance program (Mainsaver) to capture all maintenance activities and repairs. This system has the ability to plan, schedule, manage inventory control, and record maintenance activities. However, the maintenance module is not being used to its full potential. A lack of established frequency, extent of inspections and missing equipment histories indicate there is room for improvement in this area.

# ***Administrative Factors***

### **3.0 ADMINISTRATIVE AUDIT**

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#### **3.1 Goals and Methodology:**

The goal of the Administrative Audit (ADM) team was to verify the availability of procedures, contingency plans, and records required by Federal, State and local authorities as well as adherence to good engineering practices. Specific compliance requirements with applicable safety standards were confirmed within the content of the following manuals:

- Standard Operating Procedures (SOP)
- Spill Prevention, Control and Countermeasures (SPCC)
- Oil Spill Response Plan (OSRP)
- Business Emergency Plan (BEP)

A review of company policies and records was also conducted, as well as observing the application of these policies and procedures in the field.

#### **3.2 Operations Manual:**

Ft. Apache has an Operations Manual as well as Standard Operating Procedures (SOPs). DCOR's SOPs are written in a concise, step-by-step, easy-to-read format. The information within the manual is clear and not overly complicated. The SOPs were consistent with the process safety information and written with sufficient detail so that employees can reproduce the procedure(s) unsupervised. The SOPs address steps for each of the following:

- Operating Phases
- Operating Limits
- Safety and Health Considerations
- Safety Systems and their Functions

SOPs are systematically reviewed on a yearly basis to ensure that the policies and procedures are current and appropriate. A review date is added to the SOPs and any revised SOP or no longer followed process is withdrawn from the manual. Hard copies of the SOPs are readily accessible for reference in Ft. Apache work areas.

#### **3.3 Spill Response Plans:**

DCOR has an extensive Oil Spill Response Plan (OSRP) that fulfills the requirements of the California Department of Fish and Game, Office of Spill Prevention and Response (OSPR) regulations, CCR Title 14, reg 817. This plan is coordinated with the Federal Spill Prevention, Control, and Countermeasures Plan (SPCC) requirements that are contained in the EPA regulations, Title 40 CFR 112.

DCOR's OSRP provides spill responders with detailed information needed to prevent or minimize the overall impacts of an oil spill at Ft. Apache. It identifies the procedures and resources needed to implement the plan, specifies priorities for protection of the environment and clean up, and contains all the relevant information needed to respond to a spill in a clear, concise and easy-to-use format. The plan also contains strategies for sampling, monitoring, training, conducting exercises, and plan reviews. However, the plan contained several out-of-date drawings from a prior facility owner. Several minor action items were issued because of this oversight.

The SPCC Plan is well thought out and approved by DCOR's management. The plan puts into place existing containment and other countermeasures to prevent oil from reaching navigable water. The SPCC Plan also appears to conform to the oil spill prevention and containment procedures established for onshore oil processing facilities. In addition, inspections, evaluations, and testing of facility equipment by DCOR personnel has improved their discharge prevention strategy. However, since the SPCC rule is a performance-based regulation it relies on the use of good engineering practices, based on the professional judgment of a registered professional engineer (PE). While the plan includes a demonstration of management's approval, it has not been certified by a PE (40 CFR 112.3(d)). Because this certification is missing from DCOR's SPCC Plan, an action item was issued recommending review by a PE. A copy of the entire SPCC Plan is maintained at the facility and is available for on-site review and inspection during normal business hours.

The Business Emergency Plan (BEP) is recent and approved by the Huntington Beach Fire Department. This document appears to meet the Hazardous Materials Disclosure Program requirements of the city. However, a few inaccuracies were found relating to MSDS information. Chemicals are being referenced in the BEP that are no longer in use at the facility. Since this basic information can be invaluable in an emergency. An action item was issued recommending old MSDS Sheets be removed and the list of hazardous chemicals used at the facility be updated.

The focus of DCOR's Emergency Response Plan (ERP) is to facilitate and organize management and employee actions during workplace emergencies. The ERP appeared to be well developed with roles and responsibilities properly defined in the document. No deficiencies were noted.

### **3.4 Additional Documents, Plans and Records:**

DCOR has a number of other regulatory agency required documents, plans, and records that are available at the Ft. Apache operating location. Some of these policies include an injury and illness policy, Environmental Health and Safety (EHS) manual, and hazardous materials response plans just to mention a few.

The EHS Manual appeared to be a well developed and is indicative of a sound safety culture and management within the company. The Manual defines DCOR's policies in regards to environmental issues, as well as personnel health and safety

policies. It also addresses safety orientation training that is required for contractors and visitors. The EHS Manual also defines policies and procedures for operating tasks such as lock-out/tag-out (LO/TO) and confined space entry. All training is documented and records are kept on location.

DCOR's has a written Management of Change (MOC) policy that addresses facility as well as operational changes. Any change to the facility, documentation, personnel or operations is captured by this process. This management system ensures that the safety, health and environmental risks arising from these changes are evaluated, managed and controlled. Maintenance records show that this management system was used during recent wastewater tank repairs.

### **3.5 Training, Drills and Applications:**

DCOR's training records are accurate and current. The company has a comprehensive ongoing education program that includes refresher and mandatory training for its personnel. A sample of the training provided includes classes on, confined space entry, DOT pipeline operations, oil spill drills, hazard communication, HAZWOPER, hot work permitting, H<sub>2</sub>S, and lock-out/tag-out. This program also includes mandatory training as required by OSHA and the Office of Oil Spill Prevention and Response (OSPR). In addition, employees are retrained when there is a change to the layout or design of the facility, when new equipment, hazardous materials, or processes are introduced that affect evacuation routes, or when new types of hazards are introduced that require special actions.

Spill drills are conducted per schedule and the results are reviewed by management. Evacuation, and other safety and environmental training, drills, and exercises have also been instituted and documented. Both monthly and morning safety meetings are conducted as scheduled. General and topic specific monthly and weekly safety meetings, training, and pre-job safety meetings are recorded and records of the meetings are maintained.

# ***Human Factors***

## **4.0 HUMAN FACTORS AUDIT:**

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### **4.1 Goals of the Human Factors Audit:**

The primary goal of the Human Factors Team is to evaluate the operating company's human and organizational factors by using the Safety Assessment of Management Systems (SAMS) interview process. The SAMS is planned to be conducted following audits of the three state lease facilities. Results of this team's work will be considered confidential between CSLC, and DCOR and will be contained in a separate report.

SAMS was developed under the sponsorship of government agencies and oil companies from the United States, Canada, and the United Kingdom to assess organizational factors, enabling companies to reduce organizational errors, reduce the risk of environmental accidents, and increase safety. The assessment was divided into nine major categories to examine the following areas (The number of sub-categories or areas of assessment for each category are included in parentheses.):

- Management and Organizational Issues (9),
- Hazards Analysis (9),
- Management of Change (8),
- Operating Procedures (7),
- Safe Work Practices (5),
- Training and Selection (14),
- Mechanical Integrity (12),
- Emergency Response (8), and
- Investigation and Audit (9).

Assessment of each of the sub-categories is derived from one main question with a number of associated and detailed questions to help better define the issues.

The SAMS process is not intended to generate a list of action items. Its purpose is to provide the company with a confidential assessment of where it stands in developing and implementing its safety culture and a benchmark for future assessments.

### **4.2 Human Factors Audit Methodology:**

The CSLC Mineral Resources Management Division will schedule the SAMS interviews with DCOR staff and sub-contractors after completion of the other DCOR State leases. The assessors will evaluate the responses based on SAMS guidelines and develop a separate confidential report. The MRMD staff will provide the confidential report accompanied by a formal presentation that summarizes the report to DCOR management.

# ***Appendices***



## **TEAM MEMBERS**

### **EQUIPMENT FUNCTIONALITY AND INTEGRITY TEAM**

CSLC – MRMD	Mark Steinhilber Dave Rodriguez Steve Staker
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DCOR	Mike Finch Rob Hurley Angelo Nicotera Matt Civitelli Tina Wiegman Dan Armendariz Robert Johnson
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### **TECHNICAL TEAM**

CSLC – MRMD	Mark Steinhilber Dave Rodriguez Steve Staker
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DCOR	Mike Finch Rob Hurley Tina Wiegman Angelo Nicotera Matt Civitelli Dan Armendariz Robert Johnson
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### **ADMINISTRATIVE TEAM**

CSLC – MRMD	Mark Steinhilber David Rodriguez Steve Staker
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DCOR	Mike Finch Rob Hurley Angelo Nicotera Matt Civitelli Dan Armendariz Robert Johnson
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### **ELECTRICAL TEAM**

Power Engineering Services (PES)	Doug Effenberger Larry Collins
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DCOR	Dennis Conley Emily Conley
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## ACRONYMS

ADM	Administration
ANSI	American National Standards Institute
API	American Petroleum Institute
BAT	Best Achievable Technology
CEC	California Electrical Code
CFC	California Fire Code
CSLC	California State Lands Commission
EFI	Equipment Functionality and Integrity
ELC	Electrical
ESD	Emergency Shutdown
ESP	Electric Submersible Pump
FSL	Flow Safety Low
FSV	Flow Safety Valve
HF	Human Factor
H <sub>2</sub> S	Hydrogen Sulfide
kVA	KiloVolt Amperes
kW	Kilowatts
LACT	Lease Automatic Custody Transfer
MOC	Management of Change
MRMD	Mineral Resources Management Division
NEC	National Electrical Code
NFPA	National Fire Protection Association
OSHA	California Occupational Safety & Health Administration
OSPR	Office of Spill Prevention and Response
P&ID	Piping and Instrumentation Diagrams
PHA	Process Hazard Analysis
PM	Preventative Maintenance
PPE	Personal Protective Equipment
PRC	Public Resources Code
PSH	Pressure Safety High
PSHL	Pressure Safety High-Low
Psi	Pounds per Square Inch
PSL	Pressure Safety Low
PSM	Process Safety Management
PSV	Pressure Safety Valve
RP	Recommended Practice
SAFE	Safety Analysis Function Evaluation
SAC	Safety Analysis Checklist
SAMS	Safety Assessment of Management Systems
SCADA	Supervisory Control and Data Acquisition
SCBA	Self Contained Breathing Apparatus
SCE	Southern California Edison
SSV	Surface Safety Valve
TEC	Technical
UBC	Uniform Building Code
UFC	Uniform Fire Code
VSD	Variable Speed Drive

## REFERENCES

### GOVERNMENT CODES, RULES, AND REGULATIONS

- Cal OSHA            California Occupational Health and Safety
- 3215            *Means of Egress*
  - 3222            *Arrangement and Distance to Exits*
  - 3225            *Maintenance and Access to Exits*
  - 3308            *Hot Pipes and Hot Surfaces*
  - 3340            *Accident Prevention Signs*
  - 5189            *Process Safety Management of Acutely Hazardous Materials*
  - 6533            *Pipe Lines, Fittings, and Valves*
  - 6551            *Vessels, Boilers and Pressure Relief Devices*
  - 6556            *Identification of Wells and Equipment*
- CCR                California Code of Regulations
- 1722.1.1        *Well and Operator Identification*
  - 1774            *Oil Field Facilities and Equipment Maintenance*
  - 1900-2954       *California State Lands Commission, Mineral Resources Management Division Regulations*
- CFR                Code of Federal Regulations
- 29 CFR         *Part 1910.119 Process Safety management of Highly Hazardous Chemicals*
  - 30 CFR         *Part 250 Oil and Gas Sulphur Regulations in the Outer Continental Shelf*
  - 33 CFR         *Chapter I, Subchapter N Artificial Islands and Fixed Structures on the Outer Continental Shelf*
  - 40 CFR         *Part 112, Chapter I, Subchapter D Oil Pollution Prevention*
  - 49 CFR         *Part 192, Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standard*
  - 49 CFR         *Part 195, Transportation of Liquids by Pipeline*

### INDUSTRY CODES, STANDARDS, AND RECOMMENDED PRACTICES

- ANSI   American National Standards Institute
- B31.3           *Petroleum Refinery Piping*
  - B31.4           *Liquid petroleum Transportation Piping Systems*
  - B31.8           *Gas Transmission and Distribution Piping Systems*
  - Y32.11         *Graphical Symbols for Process Flow Diagrams*
- API    American Petroleum Institute
- RP 14B         *Design, Installation and Operation of Sub-Surface Safety Valve Systems*

- RP 14C *Analysis, Design, Installation, and Testing of Basic Surface Safety Systems for Offshore Production Platforms*
- RP 14E *Design and Installation of Offshore Production Platform Piping Systems*
- RP 14F *Design and Installation of Electrical Systems for Offshore Production Platforms*
- RP 14G *Fire Prevention and Control on Open Type Offshore Production Platforms*
- RP 14H *Use of Surface Safety Valves and Underwater Safety Valves Offshore*
- RP 14J *Design and Hazards Analysis for Offshore Production Facilities*
- RP 51 *Onshore Oil and Gas Production Practices for Protection of the Environment*
- RP 55 *Oil and Gas Producing and Gas Processing Plant Operations Involving Hydrogen Sulfide*
- RP 500 *Classification of Locations for Electrical Installations at Petroleum Facilities*
- RP 505 *Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1, and Zone 2*
- API 510 *Pressure Vessel Inspection Code: Maintenance Inspection, Rating, Repair, and Alteration*
- RP 520 *Design and Installation of Pressure Relieving Systems in Refineries, Parts I and II*
- RP 521 *Guide for Pressure-Relieving and Depressuring Systems*
- RP 540 *Electrical Installations in Petroleum Processing Plants*
- RP 550 *Manual on Installation of Refinery Instruments and Control Systems*
- RP 570 *Piping Inspection Code*
- RP 651 *Cathodic Protection of Aboveground Petroleum Storage Tanks*
- Spec 6A *Wellhead Equipment*
- Spec 6D *Pipeline Valves, End Closures, Connectors, and Swivels*
- Spec 12B *Specification for Bolted Tanks for Storage of Production Liquids*
- Spec 12J *Specification for Oil and Gas Separators*
- Spec 12R1 *Recommended Practice for Setting, Maintenance, Inspection, Operation, and Repair of Tanks in Production Service*
- Spec 14A *Subsurface Safety Valve Equipment*

ASME American Society of Mechanical Engineers

*Boiler and Pressure Vessel Code, Section VIII, "Pressure Vessels," Divisions 1 and 2*

ISA Instrument Society of America

- 55.1 *Instrument Symbols and Identification*
- 102-198X *Standard for Gas Detector Tube Units – Short Term Type for Toxic Gases and Vapors in Working Environments*
- S12.15 *Part I, Performance Requirements, Hydrogen Sulfide Gas Detectors*
- S12.15 *Part II, Installation, Operation, and maintenance of Hydrogen Sulfide Gas Detection Instruments*
- S12.13 *Part I, Performance Requirements, Combustible Gas Detectors*

S12.13	<i>Part II, Installation, Operation, and Maintenance of Combustible Gas Detection Instruments</i>
NACE	National Association of Corrosion Engineers
RPO169	<i>Control of External Corrosion on Underground or Submerged Metallic Piping Systems</i>
NFPA	National Fire Protection Agency
20	<i>Stationary Pumps for Fire Detection</i>
25	<i>Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems</i>
70	<i>National Electric Code</i>
704	<i>Identification of the Hazards of Materials for Emergency Response</i>
CEC	California Electric Code