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OCS Report  
BSEE 2012-01

# **Investigation of Fatal Fall West Cameron Block 643, Platform A Lease OCS-G 02241 18 April 2011**

**Gulf of Mexico OCS Region**



**U.S. Department of the Interior  
Bureau of Safety and Environmental Enforcement  
Gulf of Mexico OCS Regional Office**

**New Orleans  
April 2012**

**Investigation of Fatal Fall  
West Cameron Block 643, Platform A  
Lease OCS-G 02241  
18 April 2011**

**Gulf of Mexico Region**

Jack Williams – Chairman  
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## **Executive Summary**

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A fatal accident occurred on 18 April 2011 at approximately *0330 hours* on WC 643 “A” Platform, located in West Cameron Block 643, OCS-G 02241, operated by Hilcorp Energy Corporation GOM, LLC. The accident occurred during work to plug and abandon (P&A) the wells and decommission the platform, primarily conducted by Alliance Oilfield Services, Inc., contracted by the operator.

Plug and abandonment of Well A-2 was underway on the main deck of the platform using a power swivel skid, casing jack, and crane. At *0330 hours*, the power swivel was being moved by the crane from atop the well. A roustabout who was acting as a rigger to help control the load, stepped or was dragged by the moving load, into the opening in the deck exposed by the lift of the power swivel. The subsequent 30-ft fall resulted in the fatality. Night medevac callout was delayed due to confusion in emergency planning.

An investigation by BSEE personnel concluded the following issues contributed to the accident.

- The supervisor and company man on site did not have an emergency plan with medevac procedure and contact information readily available.
- The accident occurred shortly after shift change at night, and the pre-shift job safety analysis (JSA) meeting did not address the opening in the main deck covered by the power swivel. The JSA meeting was not attended by all parties including the roustabout, and no signed, unique JSA form was created.
- The pre-lift “tool-box” meeting did not discuss the existence of the opening beneath the power swivel, and no fall protection was provided as required by company policies, BSEE, and USCG.
- The power swivel skid was equipped with two three-foot long “tag lines,” the length of which required the riggers to be in proximity to the load. The tag lines were attached to the power swivel in such a way that they would drag across the deck opening as the skid was moved.
- Other plug and abandonment equipment on the platform was positioned poorly and interfered with the crane lift and move operation.
  - A rudimentary, inherently dangerous, “pipe rack area” allowed the box ends of 15 joints of work string to protrude over the skid, requiring riggers to be in proximity to maneuver the load to keep from hitting the pipe.
  - The temporarily stored casing jack interfered with the crane operator’s vision of the lift.
  - The lighting may have been inadequate for a night operation.

- Management and on-site supervision failed to address safety hazards and equipment deficiencies in planning, and made operational errors that contributed to the cause of the accident. There was no clearly designated, direct supervision of the lift probably because of multiple responsibilities assigned to the supervisor.

BSEE recommends the following to operators conducting P&A/platform decommission operations.

- Medical evacuation procedures and contact should be prominently displayed and all crew members should be acquainted with that information and the procedures.
- P&A/Platform decommissioning operations should have a comprehensive safety evaluation to review organization of multiple simultaneous tasks.
- A fully attended and comprehensive JSA that covers all the risks should be a requirement.
- Fall protection should be available and used in the presence of open holes, or holes that will be opened.
- A lift should be evaluated for all risks, and the appropriate tag lines, and use of tag lines, should be reviewed.
- Management and supervisors of plug and abandonment and platform decommissioning operations should insure the work space organization, availability of necessary equipment, proper positioning of equipment, and the conduct of operations, be fully and constantly reviewed for safety hazards before and during operations.
- When conducting P&A/platform decommissioning, management should assign enough supervision to allow direct oversight of operations.

## **Introduction**

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### **Authority**

A fatal accident (the Accident) occurred on 18 April 2011 at approximately *0330 hours* (hrs) on Lease OCS-G 02241 (the Lease), Platform “A” (the Platform), located in West Cameron Block 643, operated by Hilcorp Energy Corporation GOM, LLC, (the Operator). The Accident occurred during operations to plug and abandon (P&A) WC-643, Well No. 2 (the Well). The P&A operations were being conducted on the Platform by Alliance Oilfield Services, Inc. (Alliance, or the Contractor) contracted by the Operator.

Pursuant to 43 U.S.C. 1348 (d) (1) and (2) and (f) [Outer Continental Shelf (OCS) Lands Act, as amended] and Department of the Interior regulations 30 CFR 250, the Bureau of Safety and Environmental Enforcement, formerly Bureau of Ocean Energy, Management, Regulation, and Enforcement (BOEMRE), formerly the Minerals Management Service (MMS), is required to investigate and prepare a public report of this accident. By memorandum dated 20 April 2011 personnel were named to the investigative panel (the Panel), to include the following:

Jack Williams, Chairman – Petroleum Engineer/Accident Investigator, Office of Safety Management,  
GOM OCS Region;

Glynn Breaux – Petroleum Engineer/Chief, Office of Safety Management, GOM OCS Region;

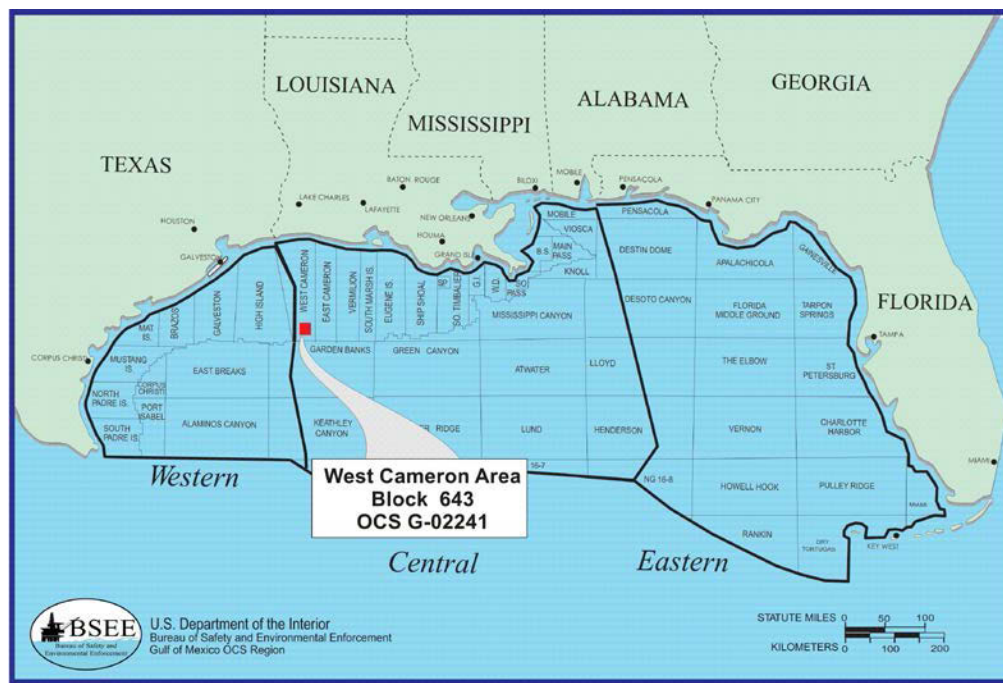
Bill Olive – District Inspector, Lake Charles District, Field Operations OCS Region;

Jason Mathews\* – Petroleum Engineer, Office of Safety Management, GOM OCS Region.

*\*Assigned to Panel at later date*

## Background

Lease OCS-G 02241 (the Lease) covers approximately 5000 acres and is located in West Cameron Block 643, Gulf of Mexico, off the Louisiana Coast (*see figure 1*). The Lease was purchased in 1973 by equal interest owners Texaco, Inc. and Tenneco Oil Corporation, each 50 percent working interest (WI), for \$43 million, Tenneco acting as Operator.



**Figure 1 – Location of Lease OCS-G 02241, West Cameron Area Block 643, “A” Platform**

In September, 1988, Chevron acquired Tenneco’s 50 percent WI and became operator until 1992 when Texaco assumed operatorship. Texaco became 100 percent WI owner in 1994 and operated the Lease until Chevron took over operatorship in 2002. Hilcorp Energy GOM, LLC, subsequently acquired 100 percent WI ownership in 2008 and became operator of record at that time. According to records, the Lease expired in June 2010, requiring P&A of the wells, and removal of the Platform.

The Platform is an 8-pile, 24 slot structure installed in 1975 (*see figure 2*). It is located approximately 128 miles from shore in 375-foot (ft) water depth. Sixteen slots on the Platform were used for drilling and last production was recorded in 2008. The Platform has three primary decks, main, production, and



wellhead or cellar deck, with most of the activity for the P&A operation confined to the main (top) deck. P&A operations on the production and cellar decks were primarily limited to assist the removal of the cut casing.



**Figure 2 – West Cameron, Block 643, Platform A**

The main deck is approximately 120-ft x 80-ft, a portion occupied by the living quarters. The portion of the main deck available to conduct the P&A operations was approximately 60-ft x 90-ft, which included space necessary to store, or temporarily store, various skid-mounted equipment (*see figure 3 for schematic of main deck*).

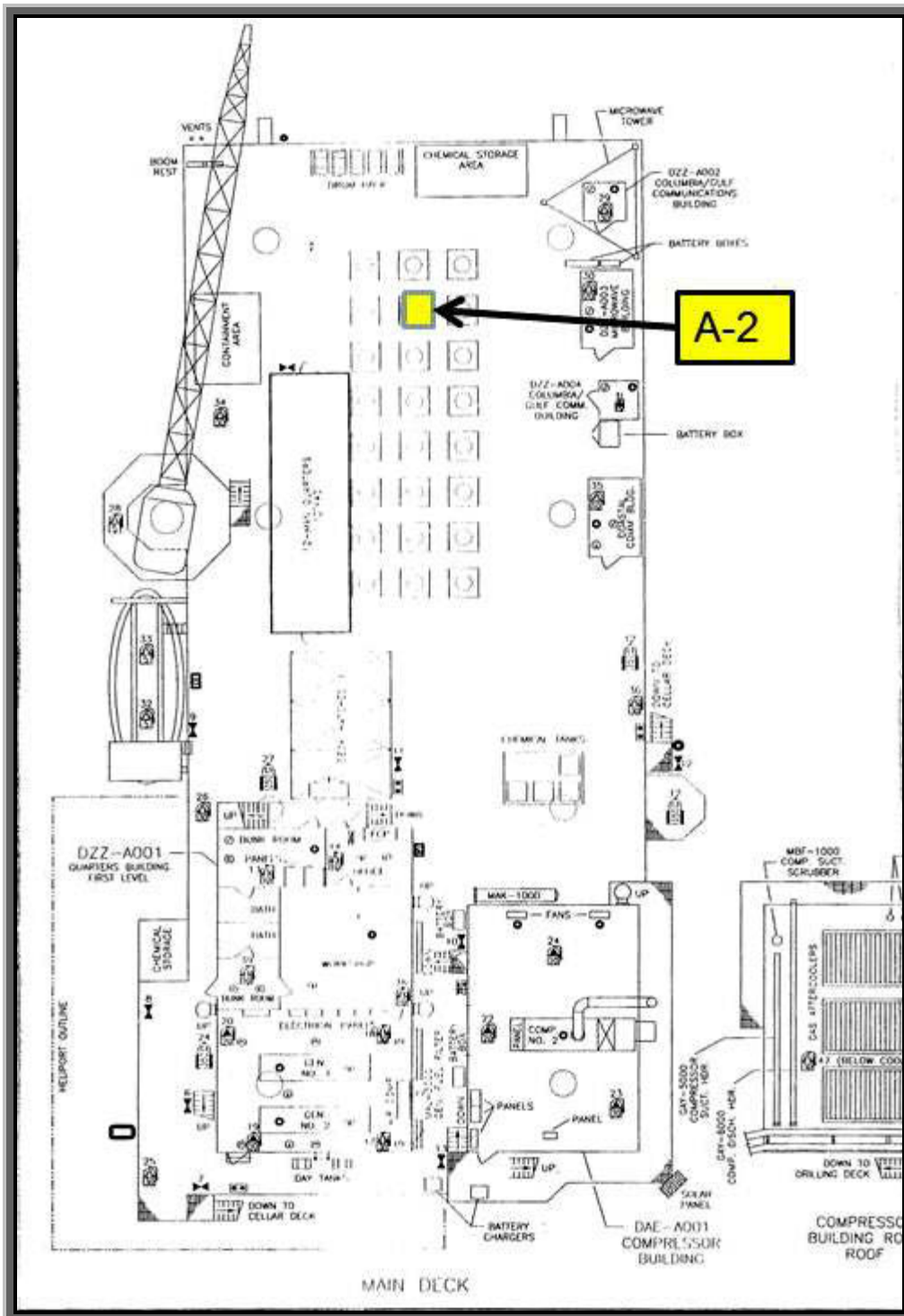


Figure 3 – Generalized schematic of main deck

## **Procedures**

*18 April 2011* - BOEMRE Lake Charles District office was notified of the accident by Operator.

*18 April 2011* - Operator and Contractor representatives visited the Platform, gathered initial data, photographed the site, took written statements, and forwarded all materials to BOEMRE.

*20 April 2011* - BOEMRE Regional Director letter assigned Panel members to investigate the Accident.

*22 April 2011* - Panel members visited the Platform for reenactment of the Accident, interviewed crew members, and reviewed written data on the Platform.

*26 April 2011* - Panel members interviewed key personnel present at the time of the Accident, and certain management, safety and regulatory personnel of Contractor and Operator.

*28 April 2011* - The initial Panel meeting was conducted to discuss investigation methodology. Relevant information was requested from Operator and Contractor, BOEMRE inspectors inspected the Platform.

*May 2011* - Requested data was received from Contractor, Operator.

*12 May 2011* - BOEMRE Panel members inspected the Platform operation and gathered additional information.

*May-June 2011* - Panel meetings were held to discuss preliminary conclusions, and additional data was requested.

*23 August 2011* - BOEMRE Panel member gathered additional data while on the Platform.

*1 June, 15 June, 5 July, 15 August, 30 August, 20 September, 13 October, 1 November* - BOEMRE/BSEE inspectors visited and inspected the Platform, providing additional information.

*November 2011* - All data was received by BSEE covering safety policies of Operator and Contractor.

The Panel members met several times throughout the investigation to conduct interviews, discuss and review the data and testimony, and draw necessary conclusions to prepare this report.

## **Findings**

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The fatally injured person (Roustabout) was an employee of Alliance. At the time of the Accident, the Roustabout was acting as a rigger, assisting guiding the crane movement of the power swivel (Power Swivel or “PS”) from above the well on the main deck to a storage location. When the crane lifted the PS and began moving it to one side, a wellbore access opening (hole) in the Platform main deck was exposed. As the Roustabout attempted to help physically control the swing of the PS, he stepped or was pulled into the exposed hole in the deck and fell approximately 30 feet, resulting in the fatality

### **Plan of Operations**

For the required multiple P&A operation, the Operator did not plan to use a conventional platform drilling or workover rig. Instead, the Operator employed the Contractor to conduct the P&As using skid-mounted equipment packages that in conjunction with the Platform crane, would provide adequate capabilities for the job requirements.

The Operator submitted Application for Permit to Modify (APM) for the P&A of the wells on the Platform complete with prognosis of operation for each well. Each well P&A was submitted separately as required. The scope of the total operation, including simultaneous operations on multiple wells, is not required to be separately reviewed by the BSEE.

The general plan for P&A of each well, including Well A-2, was as follows:

1. clear the tubing of plugs or obstructions using wireline;
2. establish pump-in rate down the tubing;
3. pump cement down tubing to seal the perforations;
4. remove the wellhead, cut and pull the tubing;
5. set plugs in the casing as described in the APM;
6. cut the casing below the mud line;
7. pull the casing.

The specific final objective for P&A'ing the Well was illustrated in the APM submitted for approval to BOEMRE by Hilcorp (see figures 4, 5).

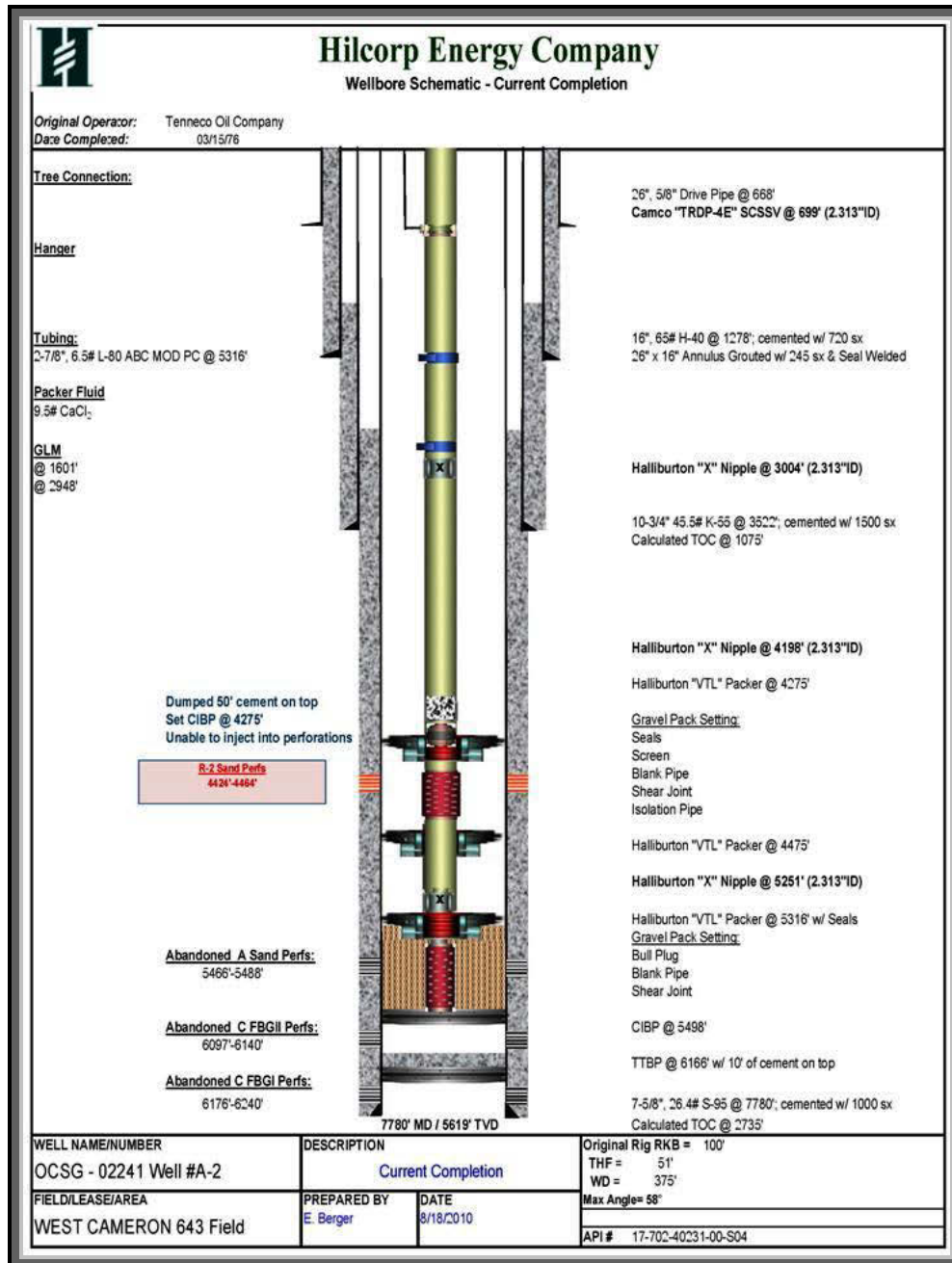


Figure 4 – Pre-abandonment wellbore schematic submitted in APM

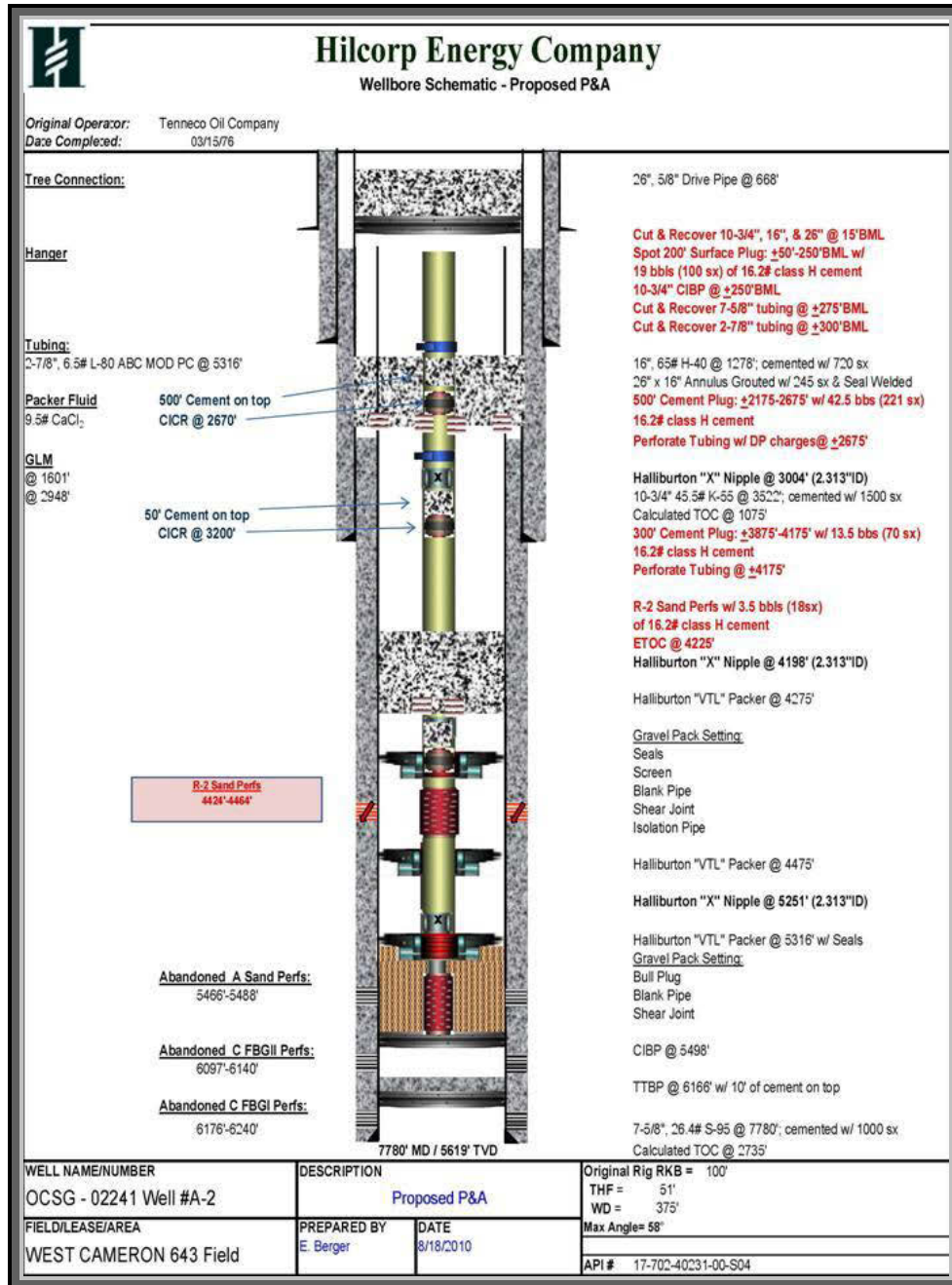


Figure 5 – Proposed wellbore schematic for abandonment

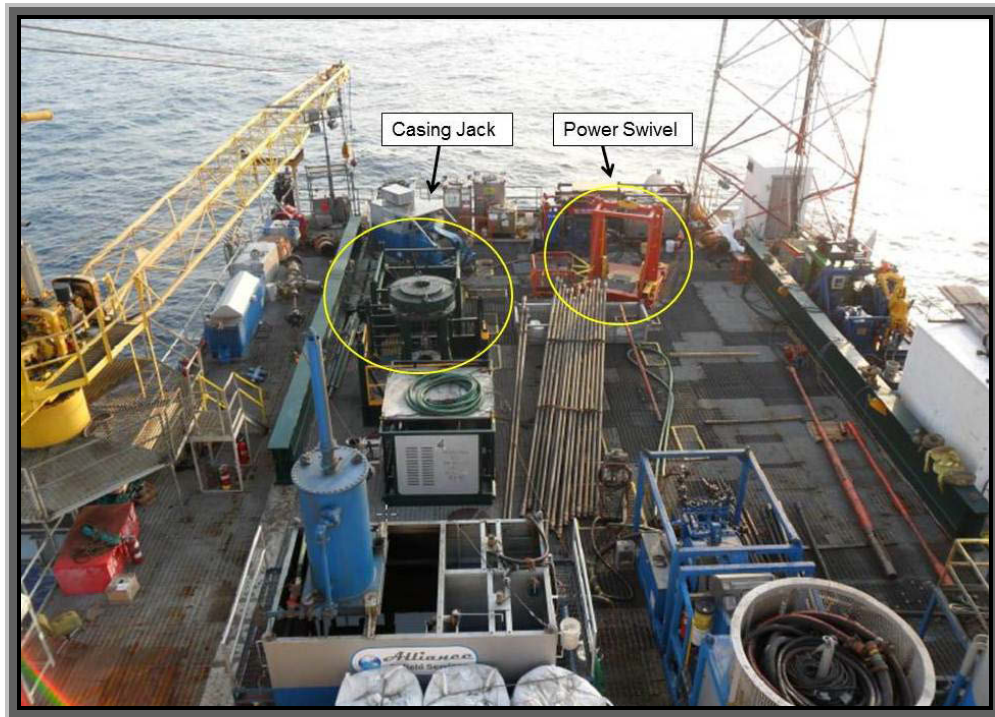
The operation to P&A each well on the Platform required interaction of well-kill, pressure and integrity testing, use of both “slick” and electric wireline, various pumping events, cementing, possible use of coil tubing, removal of christmas trees and wellheads, cutting casing and tubing (jet cutting and/or rotary cutting as required), pulling casing and tubing, fishing, etc. The operation was complex in that multiple



events on multiple wells were to be conducted concurrently. In the two weeks prior to the Accident, operations had been conducted on 10 different wells, with as many as three wells being worked on simultaneously. Removal/replacement of grating, moves of equipment occurred on almost every shift.

Key equipment to be used to complete the planned P&As, including that for the Well, were two skid mounted devices and the 20,000 pound pull-rated crane to substitute for the capabilities that would normally be provided by a conventional rig. A casing jack (CJ) provided the ability to pull a work string, tubing, and casing when the use of the crane could not accomplish the task. The power swivel (PS) provided the ability to trip and rotate a work string, pipe, or casing (*see figure 6*).

Each of these skid mounted devices weighed approximately 8,000 – 10,000 pounds (lbs) and by coordinating their sequential employment with the capability of the Platform's crane, all necessary activities to complete the P&As could be accomplished, according to Operator and Contractor.



**Figure 6 – Power swivel (PS) and casing jack assembly (CJ) on main deck**

An operation as complex as the series of P&A's also requires a number of subcontracting specialist companies that are called out for various lengths of time with their equipment, to perform certain

operations. When their specific operation is completed, the personnel are commonly returned to shore base, but often the equipment is kept on site until again required, especially if numerous short-duration jobs are anticipated. Retention and storage space for the equipment of multiple sub-contractors can result in a crowded deck, with space to conduct primary operations being restricted (*see figure 8, p. 18*).

Equipment positioned on the Platform main deck but not in use at the time of the Accident, included a wireline unit, tongs w/power pack, pumps, trip tanks and gas busters, control panels, cement blenders, generators, fuel tanks, hose reels, and other storage baskets and equipment (*see figure 8, p. 18*).

The P&A procedures proposed by Operator for individual wells on the Platform were approved by BOEMRE, and operations to P&A those wells began on 19 February 2011.

### **Personnel on Platform**

Nineteen personnel were on board the Platform at the time of the accident including 8 from Alliance, 1 from Avente, 1 from PHI, 2 from Sonoco, 3 from Energy Fishing, 4 from Sparrows Offshore Group, LTD (Sparrows).

The “night shift” on duty (tower) when the accident occurred consisted of the Supervisor (Alliance), the Flagman (Alliance), the Pumper (Alliance), the Roustabout (Alliance), the Crane Operator (under contract from Sparrows). The Company Man (Avente – contracted by Hilcorp) was on call.

### **Timeline to Accident**

Contractor was conducting operations on a 24 hour continuous basis using two 12 hour shifts. Each shift had a four man crew with shift change scheduled at *1200 hours* (hrs) (day shift) and *2400 hrs* (night shift). Contractor had two supervisors on the Platform who alternated managing, planning and supervising the activities, changing tower at *1200 hrs* and *2400 hrs*. Operator was represented by one “Company Man,” contracted from a third company (Avente), who primarily communicated progress and ensured the operations were conducted according to the approved APM.



Activity of the work crews was primarily overseen by Contractor supervision. No “bridging document” between Operator and Contractor, indicating the operating procedure, existed at the time of the accident. Statements were given to Panel members that the Operator relied on Contractor’s operational and safety policies. One Alliance supervisor was on tower each shift charged with multiple administrative, technical, and direct supervisory responsibilities.

In the two weeks prior to the Accident, operations had been conducted on 10 different wells, with as many as three wells being worked on simultaneously. These tasks included pumping/well kill, various wireline operations, wellhead, tree, and tubing/casing removal. Removal/replacement of deck grating and moves of major pieces of equipment occurred on almost every shift.

*4/16/2011.* Operations to finish the P&A of well A-10 were underway with the PS positioned to cut well A-10 casing. High winds forced a shut down of use of the crane for several hours. When the winds abated, the casing was cut while operations on other wells continued. The PS was rigged down and the CJ installed to pull the cut casing from well A-10.

*4/17/2011.* Using the CJ and crane, the cut casing on A-10 was pulled and loaded onto a work boat. Following the completion of operations on A-10, the work string was pulled and laid down on the “pipe rack.” The crew prepared to begin operations on Well A-2.

*2300 hrs* – The day shift crew moved the PS atop A-2, rigged up, and tripped in the hole with a rotary cutter to cut the 10 ¾-in casing. They completed cutting the 10 ¾-in and observed the casing to “drop” indicating the cut was successful. After repairing the crane’s rear main seal, the day shift began pulling out of the hole (POH) with the work string and cutter.

*2400 hrs* – At the time of the shift change, three joints of the work string remained to be POH. According to statements, both shift crews met at *2400 hrs* to go over progress and review the work plan for the next shift. At this meeting, statements indicated that several operational issues were discussed between shift members, but there was no discussion of the mechanics of moving the PS or the geography of the Platform including the hole beneath the PS.

4/18/2011. 0015 hrs – The night shift Supervisor and/or Company Man held a “job safety analysis” (JSA) meeting which included a discussion of the movement of the PS, according to statements. However, no JSA meeting form was generated nor signed by the participants for the purpose of the PS lift. Statements were received that the Crane Operator and Rigger were present with the Supervisor, but the Roustabout and Pumper were not present. The hole beneath the PS was not discussed.

0015-0250 hrs – The night shift continued POH and laying the joints down on the improvised pipe rack (*see figure 8, p. 18*).

0250-0325 hrs – After finishing pulling and laying down the work string, it was discovered that the crane needed additional repairs, which operation required about 45 minutes. Preparation was made to lift and remove the PS from atop the A-2 Well to allow positioning of the CJ to pull the cut casing.

0325-0330 hrs – The Crane Operator, Flagman, Roustabout, and Pumper attended a “tail-gate” meeting in the office, led by the Supervisor, to discuss moving the PS. However, the opening beneath the PS and the fall hazard it presented was not discussed at this meeting, which instead focused primarily on pinch points and other hazards. No unique JSA or safety meeting form was generated or signed by the participants.

Following the meeting the Supervisor remained in the office to calculate lift weights for casing, while the night shift crew and the Crane Operator went to the main deck and began operations to move the PS. No evidence was received by the Panel that the Supervisor visited and surveyed the main deck work site during his hitch, prior to the lift.

The Flagman was signaling the Crane Operator and was positioned on the far side of the PS, in the path of the direction of planned movement. The Pumper began moving hydraulic hoses out of the way of the lift from behind the Flagman. The Roustabout was positioned next to the PS on the crane-side of the PS, opposite from the direction of movement (*see figure 7*). None of the personnel were wearing fall protection gear.



**Figure 7 – Location of night shift crew at start of lift**

Following the signals of the Flagman, the Crane Operator first lifted the load about a foot, then stopped to allow the load to stabilize as the load shifted laterally when lifted. The load was then raised to a height of about 2 feet off the Platform deck. Statements were received that the load swayed when lifted to this height. When it stabilized the Flagman signaled the Crane Operator to begin to move the load laterally. At that moment, the Crane Operator called that the Roustabout had disappeared and apparently had fallen into the hole.

Immediately, the Crane Operator ran to the office and informed the Supervisor of the Accident and then woke and informed the day shift personnel including the Company Man. The Pumper ran to the cellar deck to check on the Roustabout while the Flagman watched the hole in the main deck. The Pumper found that the Roustabout had fallen through the openings on the main and production decks and was lying on the cellar deck severely injured, but responsive.

Within approximately five minutes, a first-responder trained member of the day shift arrived on the cellar deck to assist the injured Roustabout. He and three other crewmen bandaged the wounds and according

to statements, stabilized the Roustabout, and transported him by stretcher to the main deck. Bleeding was contained and oxygen was administered. No paramedic trained personnel were available on the Platform.

### **Emergency Reaction to the Accident**

In the office, the Supervisor and the Company Man first attempted to mobilize a field helicopter already onsite to evacuate the injured Roustabout. The pilot informed him that the field helicopter could not fly at night, was not equipped to handle injured personnel, and thus could not assist. The Company Man then called the contract helicopter company base in Intercoastal City for a medevac flight. After some delay they were told to call the office in Lake Charles. The Lake Charles office stated that they did not have a night flight available and transferred the call to Acadiana Ambulance Service, a regional helicopter offshore medevac company.

After a further delay, Acadiana Ambulance was able to get a flight en route about *0500 hrs*, but it required refueling and had to deviate to two separate platforms to find fuel. The medical evacuation helicopter arrived at the Platform at approximately *0605 hrs* and the medical responders took over life support for the injured Roustabout at that time. At *0647 hrs* the helicopter departed with the Roustabout to Lafayette General Hospital in Lafayette, Louisiana, where he was pronounced deceased. According to written statements, the Roustabout had ceased to breathe and his heartbeat had become undetectable at approximately *0555 hrs*, though the crew on the Platform continued life sustaining first aid operations until relieved by the medical responders.

Statements were received that the procedure for medical evacuation, night flights, phone numbers of the medical evacuation companies, were not immediately available on the Platform to either the Company Man or the Supervisors.

### **Crew Qualifications**

The Company Man was an employee of Avente, contracted to Hilcorp to represent their interest during the P&A operation. He has 23 years various oil field experience including 12 years experience in P&A

work. He stated he had supervised P&A operations on over 20 wells, including five kill operations and 12 that required cutting and pulling casing.

The Alliance Supervisor had 14 years offshore experience including seven years of plug and abandonment. According to Alliance records and statements by Alliance management, he had the requisite technical training and experience for his job position. Though he had not attended a specific fall protection course, he had formal rigging safety, Safe Gulf, etc., training.

The Pumper had nine years offshore experience and had been through the required and recommended training including rigging safety, crane operator, and Safe Gulf. Though he had been working for Alliance for two months, this two week hitch was his first for Alliance. He had not attended a dedicated fall protection school.

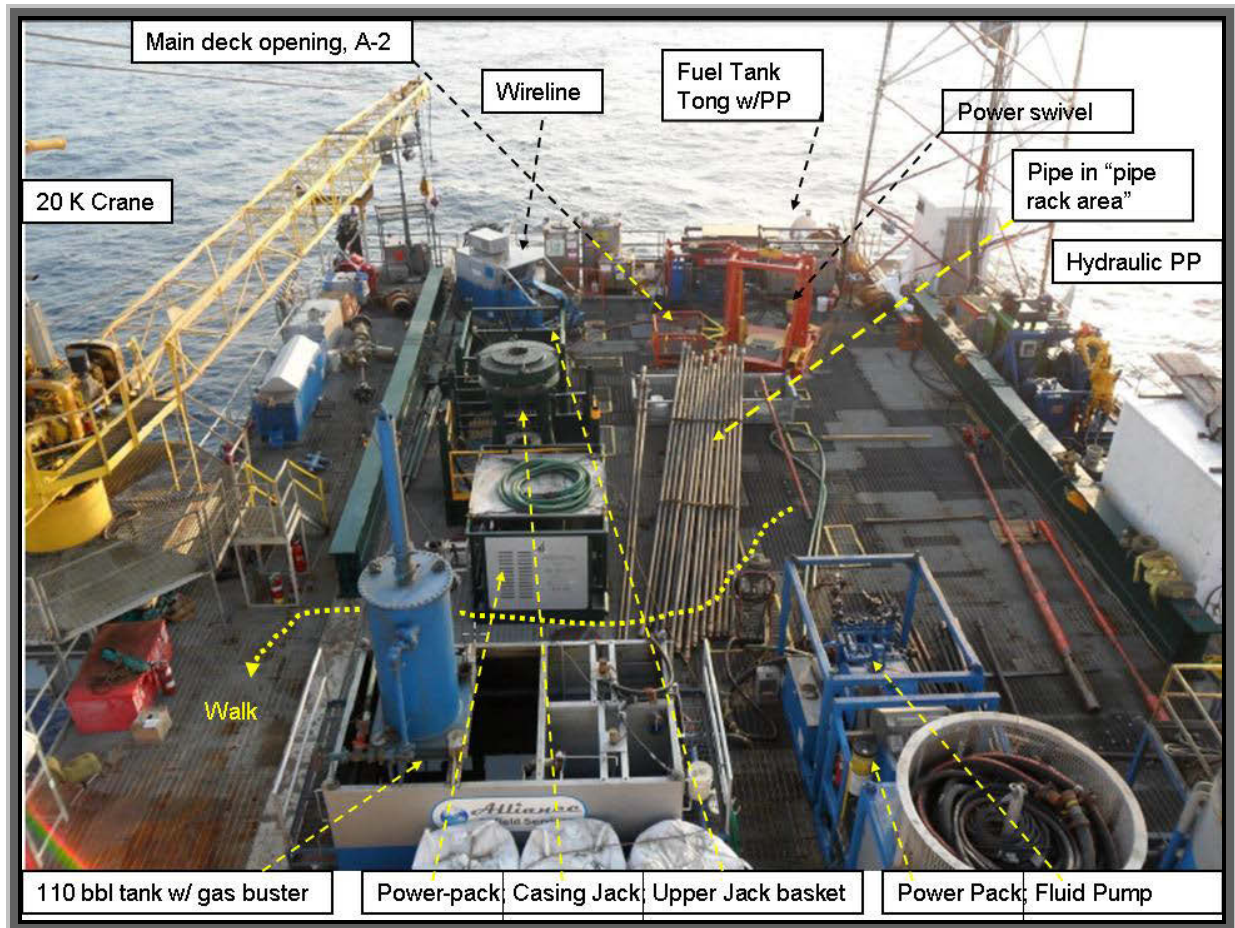
The Flagman, acting as one of the riggers, had two years of experience offshore and had been working for Alliance doing P&A and rigger work for 6 months. Previously he had worked for Extreme Energy. His formal training included rigging safety, Safe Gulf, medic/first aid/CPR. He had not attended a dedicated fall protection school.

The Roustabout who was acting as one of the riggers, had two years offshore experience but only two months with Alliance. He had formal training including rigging safety, Safe Gulf, offshore safety, and had attended a 8-hr user fall protection class.

The Crane Operator worked for Sparrows, contracted by Operator/Contractor. He had seven years experience in the offshore industry, but for most of that time he had been a crane repairman and mechanic. He had been a crane operator for five months, with the requisite training and certification required for the operation according to Sparrows records. He stated that being new to the position of crane operator, and on this job site, he tended to rely on the experience of the Flagman and the Supervisor when planning lifts.

## Platform Geography

The BOEMRE/BSEE inspections, multiple pictures, and the subsequent reenactment of the Accident allow a reasonably precise understanding of the physical environment on the Platform at the time of the Accident (*see figure 8*).



**Figure 8 –Equipment on main deck at time of Accident.**

Pictures taken the morning of the Accident show the location of the number of incidental equipment skids, various pieces of pipe, casing, baskets, hoses, etc., on the main deck (*see figure 8*). Of note are the general restriction on man access-egress routes, and the limited work space on the main deck.



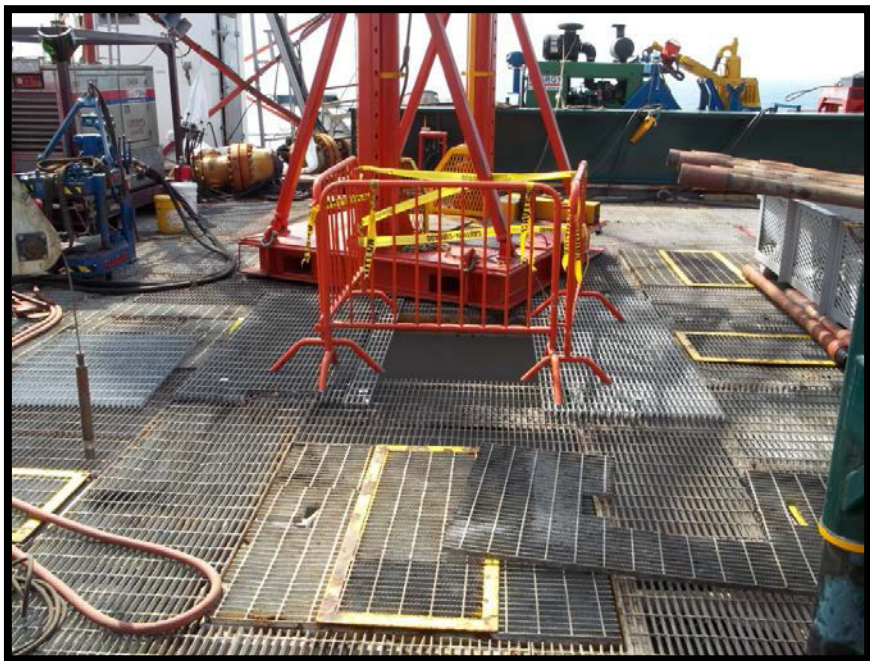
Certain elements of the physical geography present when the Accident occurred require additional discussion and description. These elements include the following:

- location of the Power Swivel and the openings (holes) in the main and production decks;
- the frayed 3-ft “tag lines” attached to two corners of the PS skid;
- the position and nature of the make-shift “pipe rack,” and the extension of the laid down work string over the PS skid and toward the living quarters;
- the 110 barrel (bbl) tank and gas buster which limited the area designated as the “pipe rack;”
- the positioning of several specific pieces of equipment, including the CJ upper jack basket stand which partially blocked the view of the work area from the crane;
- lighting of the platform during the night shift, and view of Accident site from the crane.

*Position of PS skid, holes in the decking*

Prior to the Accident, the PS skid was positioned over the Well, fully covering an opening in the main deck that allowed access to the Well. This opening, or hole, had been created by removing deck grating. The access hole in the main deck observed by BOEMRE inspectors on 22 April was approximately 3-ft x 4.25-ft, the apparent original opening of approximately 7-ft x 4-ft being reduced in size by the addition of two sections of loose grating (see figure 9).

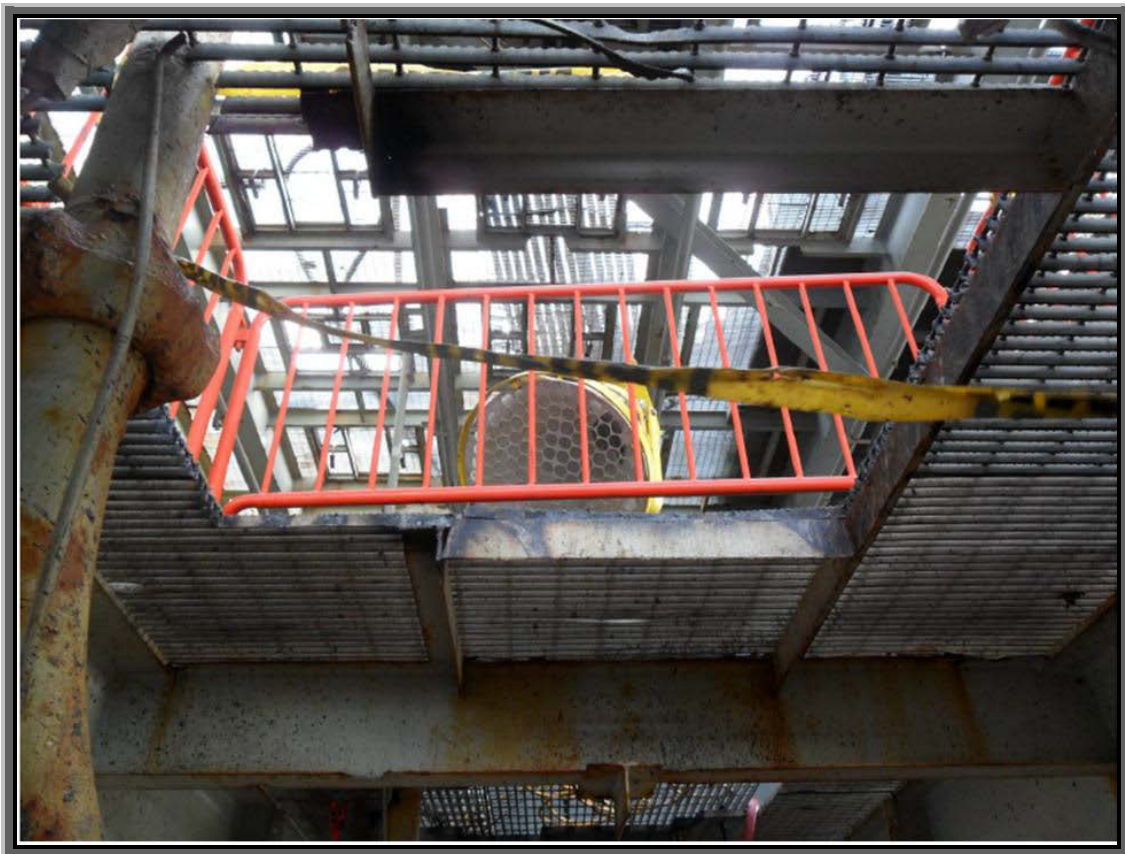
Prior to the accident, this hole in the main deck was reported to be entirely covered by the skid base of the PS. The PS had been positioned over the hole by the day shift and



**Figure 9 – Main deck opening (hole) and barricades, morning, 18 April**

the existence, dimensions, and hazards of the hole were not discussed in the shift-change JSA meeting or in the pre-lift tool box safety meeting by the night shift, according to written statements. It is not clear if the Supervisor of the night shift inspected the work site prior to the lift.

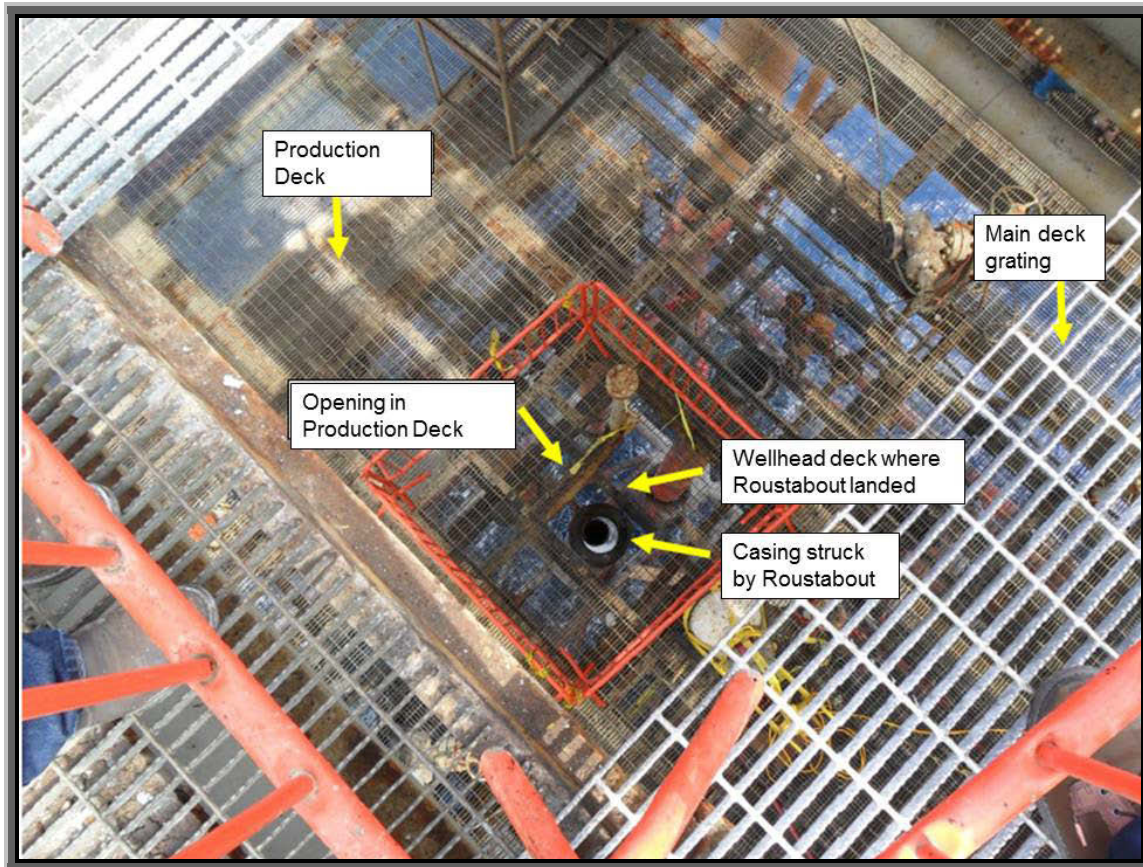
The production deck, located approximately 14-ft below the main deck, also had an opening created by removing grating. This hole was approximately 6-ft x 6-ft and according to statements, access to the opening from the production deck was entirely protected by barricades at the time of the accident (*see figure 10*).



***Figure 10 – Hole in production deck, Roustabout passed through this hole during fall***

Approximately 15-ft below the production deck was the cellar or wellhead deck through which the stub of the Well protruded. Witness accounts and physical evidence indicates the Roustabout fell through the opening in the main deck, continued through the hole in the production deck and impacted the casing stub on the wellhead deck (*see figure 11*).

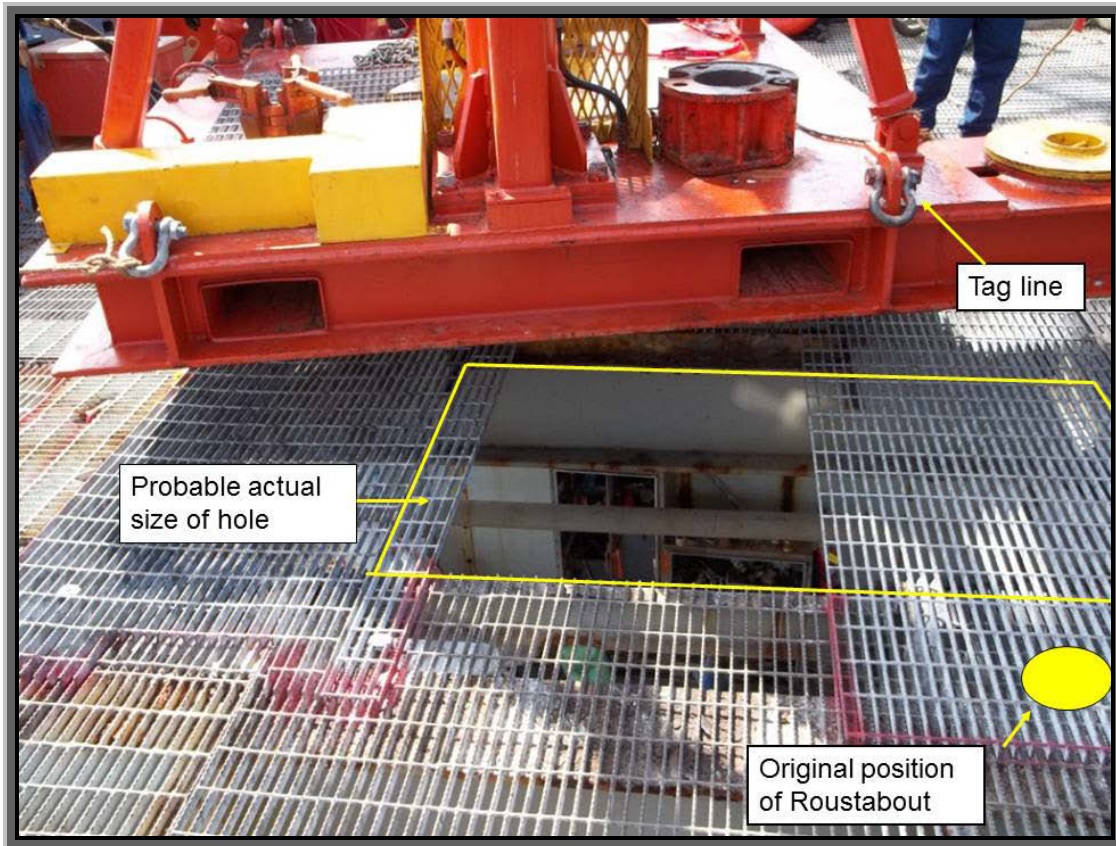




**Figure 11 – View through holes in main and production deck, fall path**

When the initial inspection of the scene was conducted post-accident on the morning of 18 April, the access opening in the main deck was found to be partially covered by new pieces of grating that reduced the original hole size to approximately 3-ft x 4.25-ft. The hole had been partially barricaded and the legs of the barricades were sitting on the new pieces of grating. The PS was on the main deck immediately adjacent to the hole.

From statements by the Supervisor, the main deck opening had been barricaded immediately after the Accident. Statements from several of the crew and management were given that the reduced hole size 3-ft x 4.25-ft, was what existed at the time of the Accident. However, other statements were given that the hole at the time of the Accident was actually the larger 4-ft x 7-ft, and that the sections of new grating had been added to provide a base for the barricades. A statement was made that the number of barricades available on the Platform was limited, requiring reduction in the perimeter of the main deck hole to be covered by the barricades, hence the post-Accident added grating (*see figure 12*).



**Figure 12 – Probable size of hole in main deck beneath power swivel**

#### *Tag Lines and positioning of the Roustabout*

When photographed and examined four hours after the Accident, the PS skid was found to have two, 3-ft long pieces of rope with frayed ends, attached to opposite corners and used as tag lines to control the load. During the reenactment four days after the Accident, statements initially were made that the tag lines had been longer, 5-ft, when the Accident occurred, but that they “*had been cut when the PS was set down unexpectedly.*” These explanations were not repeated in subsequent interviews, nor were explanations offered how this “cutting” of the tag lines could occur (*see figures 13, 14*).





*Figure 13 – Original tag lines on power swivel, Roustabout corner*



*Figure 14 – Original tag lines on power swivel, Flagman corner*

*Pipe Rack: Pipe position*

The Panel members observed approximately 15 joints of 3½-in pipe laid down in the “pipe rack,” each joint being approximately 30-ft long. The “pipe rack” was in fact a “pipe rack area.” This “rack area” consisted of a 12-ft x 6-ft (approximate measure) equipment basket acting as a prop for the joints of the work string, located approximately 2-ft from the base of the PS skid as it was positioned over the Well.

As individual joints of pipe from the work string were broken out, they were laid down across the equipment basket, box end toward the PS, pin end resting on the grating of the deck. There was no actual pipe rack skid. There were no stops on either side of the row of pipe to prevent joints from being rolled off the basket sideways, other than the approximately 2-in high pad-eyes on the ends of the equipment basket prop. There were no other side guards in the pipe rack area that would prevent the pipe from shifting laterally.

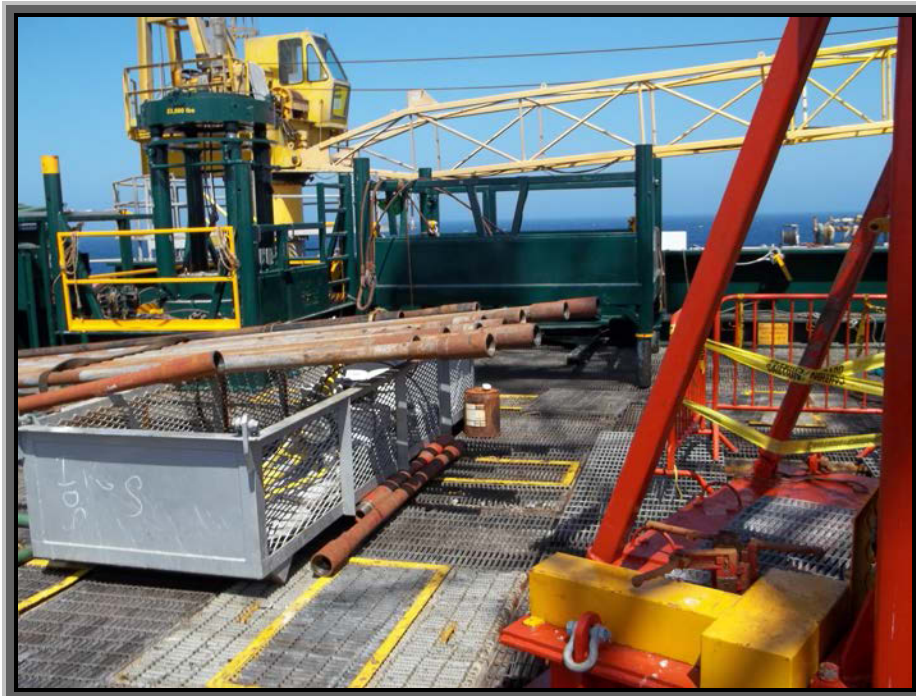
This “rack area” was restricted in that a large tank was positioned approximately 40-ft behind the rack. As each joint of the work string was approximately 30-ft long, a space had been left between the tank and the end of the “racked” work string. According to visual observation, this space allowed a path for walking between the end of the racked pipe and the tank. Because of the positioning of various equipment including a wireline unit, the other route to the living quarters for those working on the main deck required a detour beneath the crane (*see figure 8, p. 18*).

There was no “stop” at the end of the work string pipe lay-down area to prevent the laid down pipe from shifting lengthwise, contacting the tank. Apparently, each joint was “tailed” into position when being laid down. The “rack area” was further constricted by the location of a power control panel, hoses, and other equipment apparently associated with a skid-mounted pump that was situated about 25-ft behind the basket prop for the pipe. The positioning of this device required the pipe to be slightly angled on the basket-prop rather than being laid down at right angles.

The box end of the pipe in the “pipe rack” extended beyond the edge of the storage box-prop and overhung the base of the PS skid when it was emplaced over the hole in the main deck. This overhang of the racked pipe required the lift of the PS by the crane to be closely monitored and manually controlled to keep the PS skid from hitting the racked pipe (*see figures 15-18*).



*Figure 15 – Pipe in “pipe rack” overhanging PS skid*



*Figure 16 – End of pipe in rack overhanging hole in main deck*





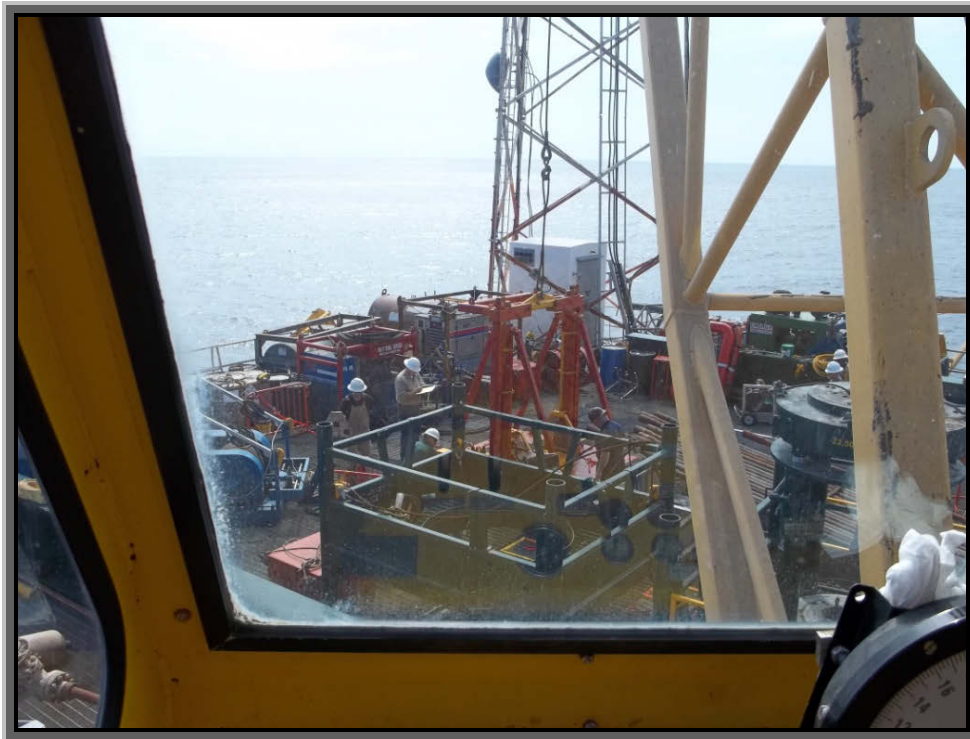
*Figure 17 – “Pipe rack” and equipment on main deck*



*Figure 18 – End of “pipe rack:” walk path between pipe and tank*

### *Position of Crane, Line-of-sight*

The storage position for the upper casing jack basket (UJB) on the Platform was directly between the crane control cabin and the A-2 Well work site. (See figure 19.)



**Figure 19 – View from crane**

From the crane cabin, the view of the lift site was restricted by the positioning of the UJB. The Flagman was positioned in clear sight on the far side of the PS. However, the Crane Operator's view of the Roustabout was partially hidden by the UJB. Neither the base of the PS nor the hole beneath the PS were entirely visible from the crane console.

### *Lighting*

Lighting for the night work was primarily provided by at least six halogen lamps, four located on a stand on the NE corner of the platform, and others on the living quarters. From statements, the Supervisor believed the light provided by these lamps was adequate to safely illuminate the work area.

However, the lights were apparently not located in a 360-degree circle, but rather concentrated in two areas, directed from the stand in the northeast corner and from the west atop the living quarters. A night photo taken with just the lights on the living quarters indicates the illumination available from those lights without the addition of the four lamps on the stand. From observation in other venues, the primarily directional source of the lighting could create a significant shadowing effect across the main work deck.



*Figure 20 – View at night with only living quarters lights*

## **Reenactment**

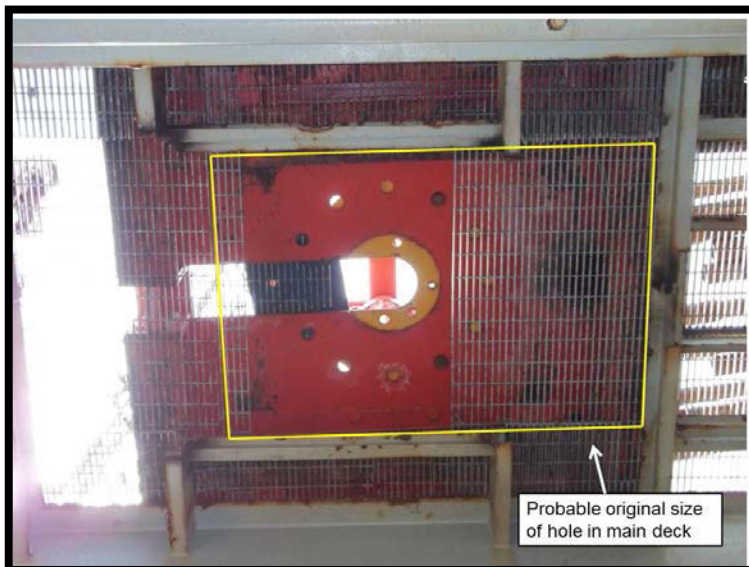
On 22 April 2011, two Panel members witnessed a reenactment of circumstances of the Accident, conducted on the Platform. Night shift crew members were present for the reenactment including the Company Man, Supervisor, Crane Operator, and Flagman.



Before beginning the physical reenactment, the Supervisor stated that he needed to hold a JSA briefing to include the Panel members. This consisted of a brief description of what was going to be done, and signatures of the Panel members on a JSA form. No discussion of hazards, role of each individual in the operation, crane procedures, lift objectives etc., was undertaken in this JSA meeting. The crew was not present though the Supervisor stated that they had already been briefed.

The physical environment of the reenactment lift differed from what existed at the time of the actual events in the following ways:

- the reenactment was conducted in daylight hours;
- the extra grating panels placed to restrict the size of the open hole were kept in position;
- the uneven surfaces created by the extra grating was newly marked with red paint;
- two riggers wearing fall protection were positioned well away from the PS, and provided with 15-ft to 20-ft long rope tag lines from different diagonal corners from those used in the lift;
- the area around the PS was cleaned up and reorganized to remove the loose pieces of grating; hoses, etc. that were present when the Accident occurred (*see figure 9, p. 19*);
- the Supervisor was present on the main deck when the lift was planned and made.



**Figure 21 – From below; PS over main deck Well access hole**

At the start of the reenactment, the PS was placed back into the original position. Photos were taken of the PS in its original position noting the relationship of the skid to the pipe rack. Photos were also taken of the PS in its original position from beneath the main deck to confirm the PS skid would have completely covered the opening in the deck when the Accident occurred (*see figure 21*).

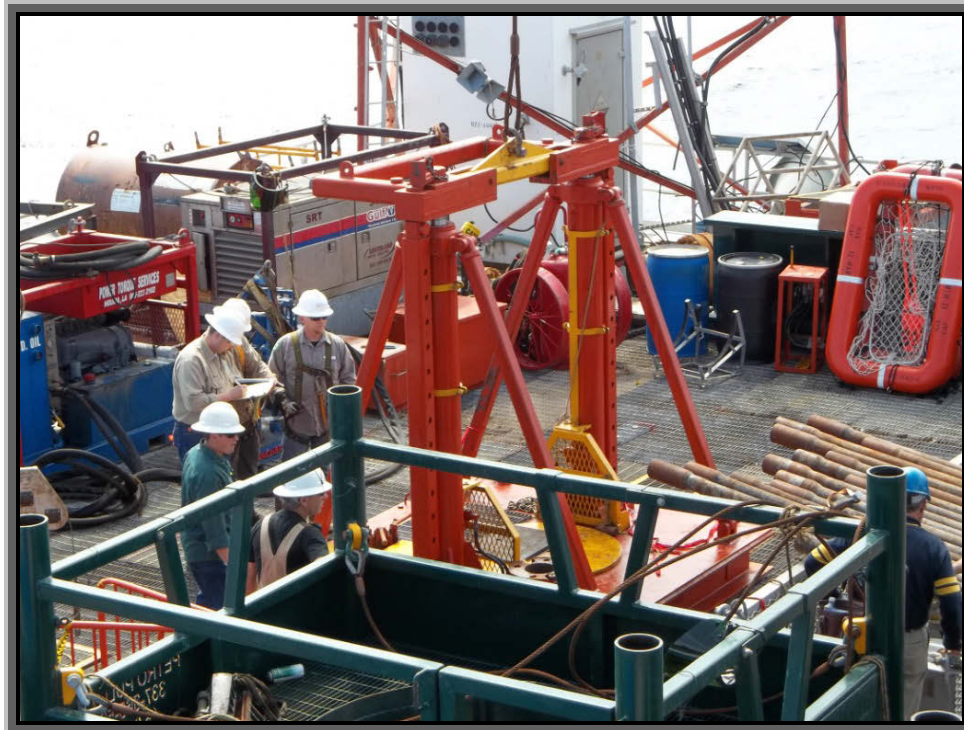
Next, a simulated pre-lift “tool box” meeting was held to discuss the move. The two riggers wearing fall protection were provided with 20-ft rope tag lines attached to the opposite corners from those that had the original 3-ft tag lines. The length of the tag lines and their connection to the PS skid allowed the riggers to completely avoid the opening in the deck (*see figure 22*).



*Figure 22 – 20-foot tag lines utilized during reenactment*

The Rigger signaled the Crane Operator who raised the load about a foot. Upon being signaled to boom up, the Crane Operator raised the load again about two feet and almost impacted the extended racked work string box ends laid in the “pipe rack area” (*see figure 29, p. 33*). With the help of the riggers on the tag lines, the load was maneuvered outside the racked pipe, and boomed down toward the intended storage area. It was then lowered back to the deck without incident.

The chronologic sequence of the reenactment pictures illustrates the immediate issues involved in the lift leading up to the Accident (*see figures 23-31, pp. 31-34*).



*Figure 23 – Reenactment: initial position of PS (crane view)*



*Figure 24 – Reenactment: initial position of PS – Roustabout side*

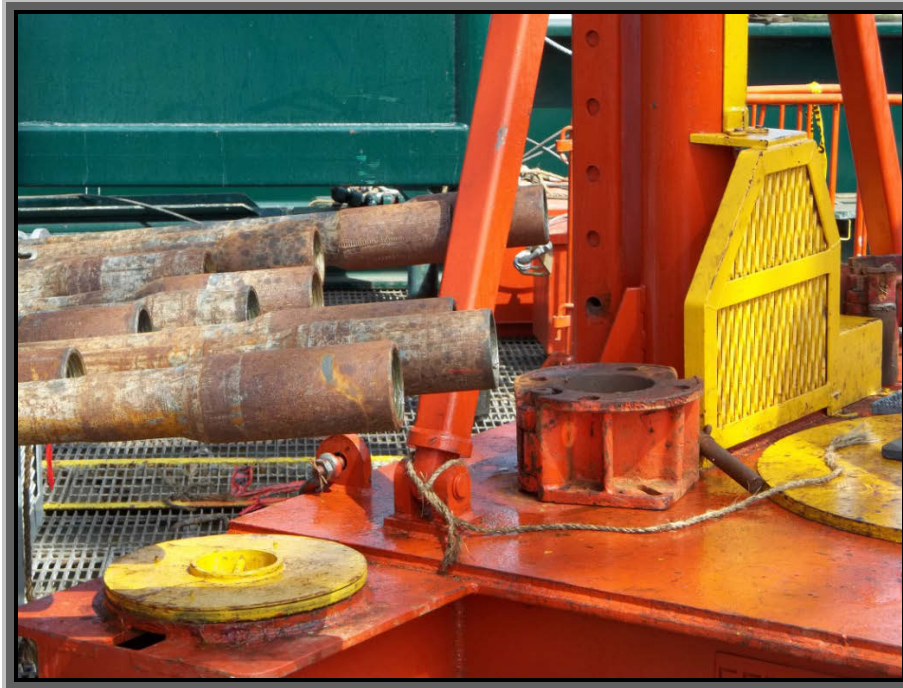




*Figure 25 – Reenactment: initial position of PS & “pipe rack,” Flagman side*



*Figure 26 – Reenactment: preparing to lift PS*



*Figure 27 – Reenactment: PS & “pipe rack” obstruction during lift*

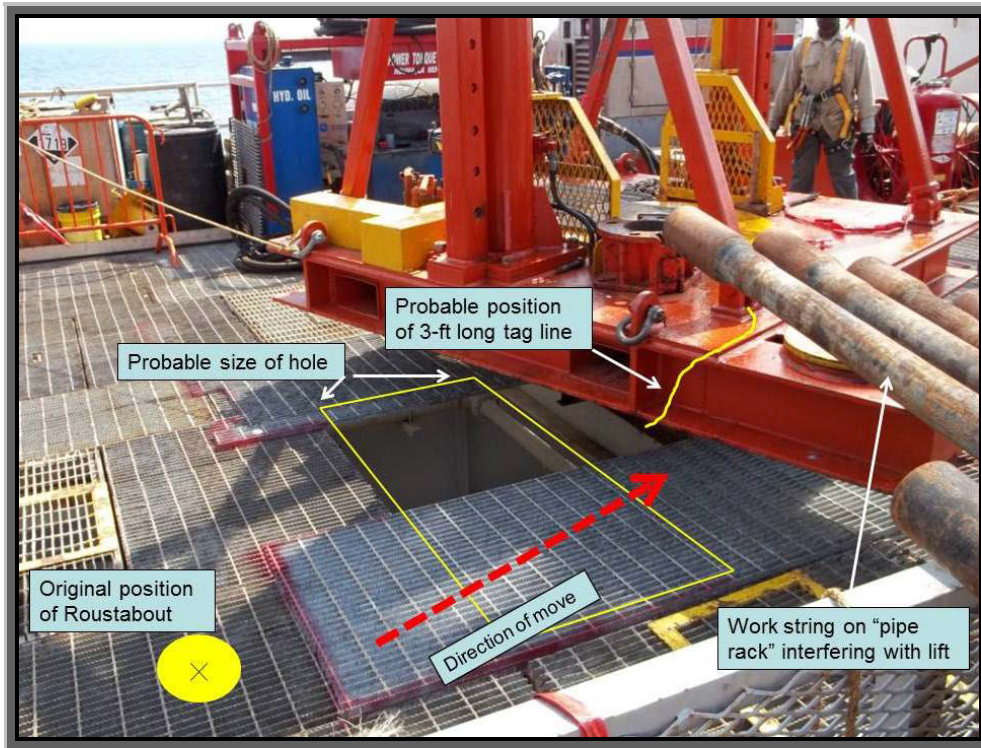


*Figure 28 – Reenactment: PS & “pipe rack” obstruction during lift (two)*

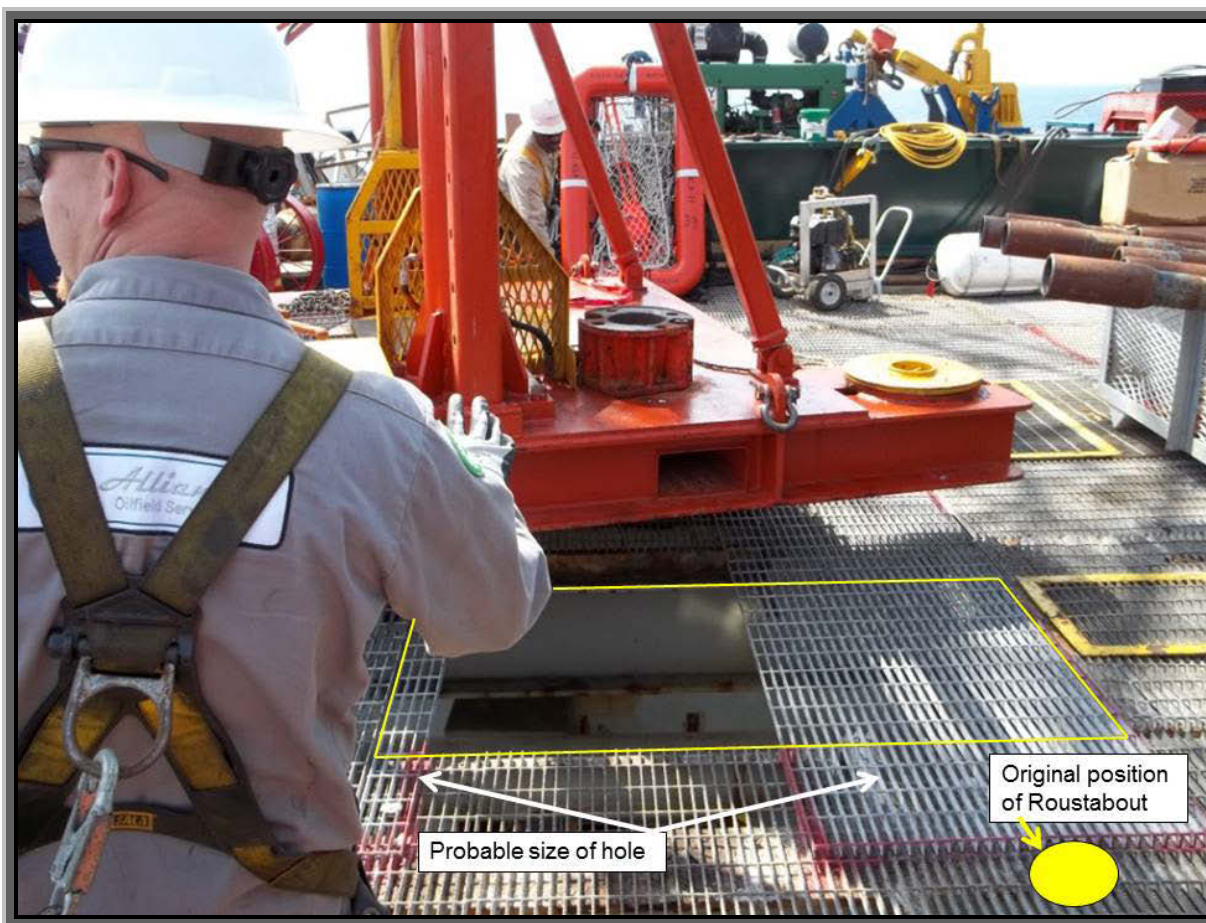




*Figure 29 – Reenactment: PS & “pipe rack” obstruction during lift (three)*



*Figure 30 – Reenactment: maneuvering PS and exposing open hole*



**Figure 31 – Reenactment: maneuvering PS and exposing open hole (two)**

Following the reenactment, Panel members were able to discuss the Accident with the Supervisor, Flagman, Crane Operator and others. Of note was the fact that the Supervisor and the Alliance safety officer who accompanied the Panel Members, both stated the primary reason for the Accident was that the Roustabout was distracted by concern for a family issue at home.

This same story that the accident was caused by a lack of concentration by a distracted Roustabout, was repeated in the initial report to BOEMRE, in interviews by Supervisor, Company Man, and by management of Alliance, and was written into the accident investigation report by Contractor and Operator. The only reason given in statements for this conclusion was that the Roustabout had spoken of it at breakfast and had tried to rearrange his shift to accommodate the family issue.



## Review of Standards for Accident Investigation

Because of statements and written reports by Contractor and Operator personnel essentially putting the causal factor for the fatality on the Roustabout's "distraction," it is necessary to briefly review the most widely applied standards of accident investigation.

Safety engineering, safety analysis, and accident investigation are recognized fields of scientific inquiry. Several well defined methodologies are widely used in accident investigations including those accidents that involve great technical complexity, such as major airline incidents, explosions in refineries etc. A key element in most such investigative methods requires looking for "root cause" in order to accurately identify the hazards that contributed to the event.

The principle of searching for a "root cause" was first published by Pope and Cresswell, "*Safety Programs Management*," in the August, 1965 issue of the *Journal of the American Society of Safety Engineers*. Searching for the root cause of an accident is now the basis for modern accident investigation and several systematized methodologies have been widely taught and used by investigators world-wide. These systems mostly emphasize an underlying theme that "*an unsafe act, an unsafe condition, and an accident ... symptoms of something wrong in the management system.*"\*

One example of accident investigation methodology, and one of the first to be systematized and widely used, is TapRoot®. From TapRoot® course literature, the following quote describes one common, but erroneous, identification of causal factors. The literature notes that this erroneous "solution" is often a default position adopted by untrained accident investigators:

*"The Blame Vision - ... These managers see problems as obviously the fault of the person doing the work... This vision may have started with the legal system's adversarial insistence on finding the 'guilty' party... however... it often just blames those that are... unlucky."\*\**

\**Dan Petersen, Techniques of Safety Management, A Systems Approach; American Society of Safety Engineers; 2010, p. 31.*

\*\**Mark Paradies and Linda Unger, TapRoot®: The System for Root Cause Analysis, Problem Investigation, and Proactive Improvement; Systems Improvements, Inc., 2000; p. 3.*

## **Requirements for working around open holes**

All of the following open hole protection requirements were in place at the time of the incident.

BSEE regulation, 30 CFR 250.107, states, *“Operator must perform all operations in a safe and workmanlike manner. Operator must maintain all equipment and work areas in a safe condition.”*

USCG regulation, 33 CFR 142.87, states *“Openings in decks accessible to personnel must be covered, guarded, or otherwise made inaccessible when not in use. The manner of blockage shall prevent a person's foot or body from inadvertently passing through the opening.”*

Hilcorp's Safety Program: Policy and Procedures (Section III – Work Area Safety) states: *“Holes in the ground, grating or walking surfaces shall be guarded to prevent stepping or falling into or through them.”*

Alliance's QHSE Manual: HSE 121-00 – Fall Protection Program states: *“Employees are to ensure that all open areas - whether left by the company's employees or if already present upon arrival – be barricaded and protected in such a manner that no individual will accidentally fall through the opening. Whenever physical barriers are not practical, an employee shall be stationed a few feet away from the opening, in plain view of all who approach from either direction, for the sole purpose of diverting persons away from the hazard area.”*

The aforementioned document also provides a list of fall hazards which exceed six (6) feet in height. One of the items listed was – open decks or holes.

## **JSAs**

At the time of the incident, BSEE regulations incorporated API RP 2D, 6<sup>th</sup> edition into its regulations; however, the 6<sup>th</sup> edition did not cover job safety analysis (JSA). The draft version of the 7<sup>th</sup> edition is proposing sections on lift planning and JSA's. The JSA process proposed in the 7<sup>th</sup> edition would identify

the hazards that may be encountered throughout the lifting operation or crane activity – one of the listed items is open holes. As drafted, the lift plan would require the following items to be addressed:

- a) person in charge (PIC) of operations, number of personnel required, their roles, and responsibilities;
- b) configuration/weight of load and lifting points;
- c) pick-up and set-down areas with any constraints such as space and stacking;
- d) equipment required and certification;
- e) step-by-step instructions;
- f) communication to be used;
- g) emergency and rescue plans;
- h) restrictions on lifting operations, e.g., weather, lighting, sea state;
- i) access and egress for slinging and un-slinging the load;
- j) simultaneous, conflicting or nearby operations;
- k) work control certificate (WCC) (if required);
- l) load integrity checks;
- m) an assessment of whether tag lines should be used, their hazards and limitations.

Hilcorp's Safety Program: Safety Responsibilities states. *“Each employee and contract employee is responsible for surveying work areas on a daily basis, staying alert for potential problem situations and keeping the supervisor aware of situations as they arise...Each employee and contract employee is responsible for following established procedures and safe work practices – performing tasks in a safe manner and refusing to perform a task when it cannot be accomplished in a safe manner.”*

Hilcorp's Safety Program: Contractor Safety states. *“Contractors will conduct scheduled safety meetings covering facility and job hazards, accidents and near misses, site-specific safety and health rules, and applicable procedures.”*

Hilcorp's Safety Program: Crane - This section does not require a JSA to be done prior to a lift; however, *“the crane operator shall not operate the crane until persons involved have been instructed as to the work to be performed.”* This section also required good housekeeping to be practiced in crane areas.

Alliance's QHSE Manual: HSE 104-00 - Safety Meetings states– Alliance requires *“a minimum one safety Meeting at the beginning of each job...”* and *“The Alliance Supervisor shall insure that safety*

*meetings are documented on the appropriate log form.*” Each form had a list of topics which were mandatory to discuss. All participating in these meetings had to sign the form or be listed by the meeting conductor.

Alliance required their safety meetings to be relevant to the job at hand, the specific task being performed, and/or preventative measures to mitigate hazards that have been identified on the work site.

Prior to the Accident, a tailgate meeting was used to review the power swivel removal. According to Alliance’s QHC manual, tailgate meetings are intended to recap fundamental safety concerns, as well as to address specific and immediate observations regarding a pending work process. Some of the discussion topics during the Tailgate Safety Meetings should include material types, hazards, and use of guards and other protective devices. Also, the Tailgate Safety Meetings should include hazard recognition and risk management.

The Sparrow’s JSA (one utilized by the crew) put the responsibility of moving the equipment onto the crane contractor – Sparrows. The Hazard identification section for the “moving equipment” portion of the form simply has slips, trips, falls, and rushing as items that could go wrong.

## **Tag lines**

By definition, a tag line is *“a rope of suitable strength, construction and length attached with an appropriate recognized bend or hitch to the load, used to control the load during lifting or positioning.”*

API RP 2D – 3.2.3, Moving the Load states, *“Appropriate tag or restraining lines should be used where necessary to control the load.”*

Hilcorp’s Safety Program: Crane - Section B states, *“taglines shall be used when it is necessary to control the load.”*

Alliance’s QHSE Manual: HSE 126-00 states, *“Unless their use creates an unsafe condition, tag lines shall be used when loads must traverse long distances or must otherwise be controlled. Manila rope may*

*be used for tag lines.*” The document also requires the people moving the load to plan and check the travel path to avoid personnel and obstructions.

## **Safety Management**

At the time of the incident, Hilcorp did not have a bridging document with Alliance to merge their safety management systems. The Hilcorp representative on the facility (Company Man) at the time of the incident was an employee of Avente, contracted by Hilcorp.

Hilcorp’s safety manual states that Hilcorp shall provide its employees a work environment as free of recognized hazards as is possible and practical. Control of potential safety and health hazards and their elimination is the primary objective of the Hilcorp safety program. The manual goes on to state, all supervisory personnel are accountable for safe, efficient work practices and procedures.

Hilcorp’s safety manual states that all *“employees shall do everything possible and necessary to eliminate accidents...The most important piece of safety equipment on any job is a well-trained employee who exercise common sense and good judgment, and who has a thorough, working knowledge of their job, capability and applicable safety guidelines.”*

According to the Hilcorp’s safety manual, all supervisory personnel are responsible for helping to provide a safe work place for subordinates and for the location’s safety program.

Hilcorp’s safety manual further stated that each employee and contract employee was responsible for maintaining high standards of housekeeping.

Hilcorp’s safety manual requires all contractors (Alliance) to abide by Hilcorp’s safety policies and procedures. All contractors are also responsible for alerting and training their employees and subcontractors concerning all health and safety hazards to which their employees or subcontractors may be exposed.

Within Alliance’s HSE Manual (QHSE-101-00), Alliance acknowledges that company management bears the ultimate responsibility for the prevention of accidents, occupational injuries, and environmental



damage. Management was also responsible for promoting steps to insure an incident free culture exists by implementing risk management systems to identify and mitigate all potential hazards and reducing them to the lowest possible factor.

Alliance's Management was responsible for requiring all employees to follow Alliance's written and established policies, procedures, best practices, or any identified risk reduction technique, in order to enhance success in achieving an operation that is incident free.

The Alliance manual states that each supervisor is considered to be an extension of management, and shall take the leadership role over all QHSE and discipline related matters related to the supervisor's assignment. The supervisors is also responsible for insuring that regular Safety Meetings and Job Safety Analysis are properly conducted and documented, and the event content is complete and relevant to the work activity. The Crane Operations BJSEA form had multiple job steps, and the first step was to perform a pre-job hazard assessment of the work area. This task, according to the form, was assigned to the Supervisor and crewmembers.

Alliance's QHSE Manual also states each employee is responsible for maintaining a clean and orderly work area. Within Alliance's Fall Protection Program (HSE121-00), they required each employee exposed to fall hazards be trained to recognize hazards of falling and the procedures to follow to minimize those hazards.

It should be noted that each section of Alliance's QHSE Manual has been signed off on by the President of the Company and co-signed by the QHSE Manager.

## **Conclusions**

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### **The Accident**

On April 18, 2011, at approximately *0330 hrs*, a P&A contract crew was preparing to continue operations to P&A Well No. 2 on the A-Platform by lifting the Power Swivel from the main deck and installing the Casing Jack to pull casing. Two workers, the Roustabout and Flagman, were close to the load when the crane lifted the 10,000 lb Power Swivel.

When the load was lifted, it exposed a 4-ft x 7-ft opening in the deck. As the load was moved, the Roustabout either attempted to stabilize the load using a 3-ft piece of rope tag line, or by physically holding the base of the load. As the load swung, the Roustabout was pulled forward until he fell through the opening in the deck, falling approximately 30-ft to the cellar-deck, striking the casing stub. The fall resulted in a fatal injury to the Roustabout.

### **Cause of Fatality**

(1) The opening in the deck created by the removal of the Power Swivel, was not “watched” or “barricaded” nor were the Roustabout or the other crew members on the deck equipped with fall protection gear as required by Operator and Contractor policies, BSEE regulations 30 CFR 250.107, and USCG regulations 33 CFR 142.87.

(2) The Roustabout and the Flagman were located in hazardous positions close to the moving load, and the Roustabout attempted to control the load manually.

(3) The load had only a 3-ft long tag-line, attached to the PS in an inherently dangerous location. Movement of the load caused the tag line to drag across the open hole.

(4) Planning for the operation was inadequate.

- The JSA meeting and tailgate meeting failed to identify or discuss the danger of the open hole.

- The JSA meeting and tailgate meeting did not create a specific JSA document for the operation as required per the Contractor’s QHSE manual.
- The Operator and the Contractor had established policies for working in proximity to open holes and for lifting operations that were not followed.
- The equipment layout on the main deck, especially the “pipe rack,” created hazardous work areas which is contradictory to the housekeeping requirements of the Operator’s and Contractor’s written policies, and BSEE regulations.

**(5) Supervision associated with this operation was inadequate.**

- The Company Man failed to conduct a comprehensive JSA meeting that discussed the positioning required when lifting the load. He failed to insure the opening was properly marked, watched, barricaded, or the riggers equipped with fall-protection in the presence of an open hole.
- The Supervisor failed to fully discuss the details of the operation during a direct conversation with the night shift, and failed to check that the procedure adopted by the Crane Operator and crew for lifting in the proximity of the open hole was proper. He failed to insure proper marking, watch, barricading or fall-protection was used.
- The Crane Operator failed to inform the Roustabout and Flagman of the required safe positioning during the lift, and failed to ensure they were properly equipped with fall protection.
- The Company Man, Supervisor, Crane Operator failed to review the need for tag lines to control the load, whether the tag lines provided were adequate, where the tag lines were attached, and the positioning of the Roustabout and Rigger.
- The Supervisor (s) and Company Man failed to organize the deck to remove obvious hazardous conditions, such as the “pipe rack.”

**(6) Management Failure:**

- Management of both Contractor and Operator are responsible for the on-site organizational confusion, failure of operational supervision to review, communicate, and identify potential hazards, the limited experience of key personnel, and lack of specific training in fall protection.

## **Probable Contributing Causes**

(7) Despite the certification of the Crane Operator, and rigger certification of the Roustabout and Flagman, the lack of appreciable experience in crane operations by the primary participants probably contributed to the improper positioning of the Roustabout and Flagman, the improper tag line lengths, and the location of the tag line attachment points.

(8) There was no clearly designated or direct supervisory oversight of the lift, probably because of multiple responsibilities assigned to the Supervisor.

## **Possible Contributing Causes**

(9) Due to the lift occurring at *0330 hrs*, the crew was operating in directional lighting which could generate shadows. The lighting possibly contributed to the Roustabout's failure to identify the presence of an open hole when it was exposed.

(10) The vision from the crane was partially blocked by equipment. This obstructed the view of the Crane Operator and possibly contributed to his inability to identify the size of the open hole and inform the Roustabout during the lift.

(11) Lack of specific operational safety oversight responsibilities assigned to the Hilcorp Company Man (Avente employee), and Hilcorp's apparent reliance on Alliance's safety policies, may have contributed to the incomplete *2400 hrs* shift-change JSA meeting; and is a possible contributing cause in the Accident.

(12) The Supervisor and Company Man did not have an emergency plan with medevac procedure and contact information readily available. This caused loss of time in mobilizing a medevac, and possibly critically delayed arrival of the Acadiana Ambulance medevac helicopter with trained medical personnel.



## **Conclusion Regarding Operator/Contractor Accident Report**

The Operator and Contractor accident reports that placed blame for the accident on the Roustabout for being distracted are based on no measurable evidence, and are specious and invalid according to widely accepted standards of accident investigations.

## Recommendations

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### Safety Alert

It is recommended that BSEE consider issuing Safety Alert (s) that alerts the operators by including these elements.

1. *A brief description of the accident;*
2. *A summary of the causes; and*
3. *List the following recommendations:*
  - Medical evacuation procedures and contact should be prominently displayed and all crew members should be acquainted with that information and the procedures.
  - P&A/platform abandonment operations should have a comprehensive safety evaluation to review organization of multiple tasks.
  - A fully attended and comprehensive JSA that covers all the risks should be a requirement.
  - Fall protection should available and used in the presence of open holes, or holes that will be opened;
  - A lift should be evaluated for all risks, and the appropriate tag lines, and use of tag lines, should be reviewed.
  - Management and supervisors of P&A/platform decommissioning operations should insure the work space organization, availability of necessary equipment, proper positioning of equipment, and the conduct of operations, be fully and constantly reviewed for safety hazards before and during operations.
  - Management should assign enough supervisors to P&A/platform decommissioning to allow direct oversight of operations.

## **BSEE Recommendation**

The Bureau should consider having the BSEE District Operations Support section develop a methodology to review interaction of all simultaneous operations associated with P&A/platform decommissioning, as a unit.

The Bureau should consider allocating additional resources to perform more frequent inspections of platform P&A, abandonment, and/or decommissioning operations.