



Investigation of Fatality,
Pipe Rack Finger Failure and Fall
South Marsh Island Block 93
OCS-G 21618
October 13, 2001

Gulf of Mexico
Off the Louisiana Coast



U.S. Department of the Interior
Minerals Management Service
Gulf of Mexico OCS Regional Office

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New Orleans
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Investigation and Report

Authority On October 13, 2001, during the drilling of Well A-1, an accident that resulted in one fatality and one injury occurred on Marine/Pride Offshore's (hereinafter referred to as "Contractor") jack-up rig the *Marine15/Pride Arizona*. The rig was located on Remington Oil and Gas Corporation's (hereinafter referred to as "Operator") South Marsh Island Block 93, Lease OCS-G 21618 in the Gulf of Mexico, off the coast of the State of Louisiana. (Note: Following the spudding of the subject well on August 8, 2001, the ownership of the jack-up rig changed from Marine to Pride Offshore, and the rig was renamed *Pride Arizona* from the previous *Marine 15*.)

Pursuant to Section 208, Subsection 22 (d), (e), and (f), of the Outer Continental Shelf (OCS) Lands Act, as amended in 1978, and the Department of the Interior regulations 30 CFR 250, the Minerals Management Service (MMS) is required to investigate and prepare a public report of this accident. By memorandum dated November 27, 2001, the following MMS personnel were named to the investigative panel:

Buddy Stewart, Chairman – Lafayette District, GOM OCS Region

Tom Basey – Lafayette District, GOM OCS Region

Johnny Serrette – Lafayette District, GOM OCS Region

Melinda Mayes – Engineering and Operations Division, Herndon, Virginia

Procedures On the morning of October 13, 2001, personnel from the MMS Lafayette District visited the site of the accident to assess the situation and begin gathering information, initiating MMS's investigation of the incident. On that morning, a representative from the USCG also visited the site of the accident. The USCG obtained and provided to MMS written statements from the night tool pusher, the driller, one of the floorhands, and an inspector

for Universal Marine Inspections. On November 15, 2001, three panel team members examined the pipe rack finger that fell during the accident and conducted interviews at Pride Offshore's office in Houma, Louisiana. The following people were interviewed:

Pride Offshore safety supervisor

Offshore installation manager

On November 26, three panel members conducted a telecom with Universal Marine Inspections located in Beaumont, Texas. On February 20, 2002, three panel members traveled to the *Marine 15/Pride Arizona* rig that was stacked at West Cameron 38 to review documents and examine the installation of the new pipe rack fingers on the rig. On February 21, 2002, three panel members interviewed Pride Offshore's drilling superintendent.

The panel met at various times and gathered information from a variety of sources. After having considered all of the information available, the panel produced this report.

Introduction

Background Lease OCS-G-21618 covers approximately 5,000 acres and is located in South Marsh Island Block 93, Gulf of Mexico, offshore, Louisiana. (*For lease location, see Attachment 1.*) The lease is currently owned jointly by Remington Oil and Gas Corporation, Magnum Hunter Production, Inc., and The Wiser Oil Company. The lease was originally issued to Remington Oil and Gas Corporation and Magnum Hunter Production, Inc., effective May 1, 2000. Remington Oil and Gas Corporation became the designated operator of the lease on April 1, 2001.

Brief Description of the Accident On October 13, 2001, stands of pipe were being racked into the derrick pipe rack fingers during a trip out of the hole. As a third stand of pipe was being racked into the nine-stand pipe rack finger, the pipe rack finger broke loose and fell approximately 85 feet to the rig floor. As it fell, the pipe rack finger struck one man on the crown of his hard hat, killing him, and then hit another on the right forearm, injuring him.

Findings

Preliminary Activities At 0315 hours, the crew was pulling out of the hole with a tapered (5-inch and 3½-inch) drill pipe. Weather conditions were fair, partly cloudy, with visibility of five miles and air temperature of approximately 80 degrees. The wind was from the east at approximately 25 miles per hour with seas running 6-8 feet, causing the rig to rock evenly.

The night tool pusher indicated that the crew had been pulling pipe since approximately 2000 hours. He had remained on the drill floor until the bottomhole assembly was up into the cased section of the hole. It was a normal trip out of the hole and no problems were encountered.

One hundred-two stands of 5-inch drill pipe and 41 stands of 3½-inch drill pipe had been pulled out of the hole and racked into the derrick pipe rack fingers. The drill crew consisted of the driller, three floorhands F-1, F-2, and F-3, and a derrickman.

Description of Accident F-1 was working the backup/make-up tongs; F-2 was working the spinning tongs, and F-3 was working the break-out tongs. Two stands of 3½-inch pipe had been racked into a nine-stand pipe rack finger. A third stand of pipe had just been broken out of the drill pipe string. F-2 spun out the stand of pipe and removed the spinning tongs from the pipe. He was holding the spinning tongs out of the way as F-1 and F-3 were moving toward the rotary to position the pipe to be racked back.

F-1 was standing between the stand of pipe and the mousehole when the nine-stand pipe rack finger holding the two stands of previously racked 3½-inch drill pipe fell approximately 85 feet to the rig floor (*see Attachment 2*). The pipe rack finger fell and apparently struck F-1 on the crown of his hard hat; hit F-2 on the right forearm, then fell onto the drill floor (*see Attachment 3*). F-1 fell onto the rotary table.

Subsequent Activities The operation was shut down and the night tool pusher was called over the PA system to come to the rig floor. When he arrived on the rig floor, he noticed that F-1 was not responding to calls of his name. The night tool pusher went downstairs and notified the offshore installation manager (OIM) and the company man. The company man called a helicopter. The OIM arrived on the rig floor and asked the night tool pusher to call the drilling superintendent, and the safety superintendent for Pride Offshore Inc. The OIM began CPR on F-1.

F-1 failed to respond to CPR after 2½ hours and was pronounced dead on the rig floor by Air Med emergency medical technicians. Both F-1 and F-2 were evacuated to Terrebonne General Hospital in Houma, Louisiana.

Description of Pipe Rack Fingers A typical nine-stand pipe rack finger on the *Marine 15/Pride Arizona* consists of an 8-foot long by 1¼-inch diameter solid bar that is attached and hinged to a 12-inch long by 1¼-inch diameter machined bolt. A piece of flat iron approximately 3-inch by 3-inch is welded at approximately the midway point onto the machined bolt. The machined bolt is equipped with the flat plate and a companion piece of flat plate, washer, and nut anchor the pipe rack finger to an 8-inch thick “I” beam, which is bolted to the derrick (*see Attachment 4 and 5*). The overall weight of the pipe rack finger is approximately 60-70 pounds. The hinge allows the pipe finger to be raised and secured out of the way when

not in use (*see Attachment 6*). When in use, the pipe rack finger is lowered at the hinge. As each stand of pipe is racked against the pipe finger, it is chained to the finger. Each pipe rack finger is also supposed to be equipped with a safety chain attaching the pipe rack finger to the derrick. This safety chain is installed to prevent the pipe rack finger from falling from the derrick should the pipe rack finger break or become detached from the derrick (*see Attachment 7*).

Post-Accident Inspection of the Derrick and Pipe Rack Fingers

On October 14, 2001, Universal Marine Inspections conducted a derrick inspection and the following are the results of their findings:

- All the bolts attaching the derrick legs to the shoes show severe corrosion; base shoe bolts are also badly corroded; some have been changed out with studs and nuts; all bolts in the derrick are corroded; a large number of the bolts are too short; the locks on lock nuts are not making sufficient contact to properly lock.
- Braces in the space above the V-door need replacing.
- At least two other fingers appear to be cracked in the same area as the one that fell (*see Attachment 8*).
- Most of the fingers have been repaired or worked on.

The Universal Marine Inspections report recommended:

- A complete new set of bolts be installed within 90 days,
- Braces in spacing above the V-door be replaced, and
- A complete new set of fingers be installed.

The Universal Marine Inspections report indicated that the condition of the pipe fingers was a dangerous situation and that while pipe was being put back in the hole, great care should be taken.

Universal Marine Inspections also conducted a magnetic-particle inspection of all the pipe rack fingers that were installed on the rig at the time of the accident and summarized the results as follows:

- Derrick – Finger pin welds (Fwd) – all welds cracked at pin;
- Derrick – Finger pin welds (Aft) – all welds are cracked and some have been repaired using all-thread rod that was welded to existing stock.

The Contractor's drilling superintendent indicated that all of the pipe rack fingers were replaced on the *Marine 15/Pride Arizona* after the accident. He also indicated that a new pipe racking system would be installed in the future.

From the investigators' examination of the pipe racking area in the derrick and examination of the pipe rack finger that failed, the investigators observed that the metal rod attaching the finger to the derrick broke next to the 3x3 metal plate. This left the plate and the rod attached to the "I" beam in the derrick (*see Attachment 9*). The break showed irregularity along the face and indications of corrosion (*see Attachment 10*). A piece of ½ inch by 3 feet angle iron was welded along the metal rod of the finger to keep the rod from bending. A second short metal rod had been welded beneath the main rod between the metal plate and the hinge. This rod also broke away from the metal plate as shown in Attachments 9, 10, and 11. MMS requested copies from the Operator of any metallurgical analyses that were done on the broken pipe rack fingers or other pipe rack fingers that were removed after the accident. The only information given to MMS was the results of post-accident magnetic particle inspection of the pipe fingers. These inspection results did not provide any information as to the cause of the metal rod failure.

During the investigation, MMS investigators also discovered that there was no safety chain attaching the pipe rack finger to the derrick. Thus, when the metal rod failed, the pipe rack finger fell to the floor.

**MMS
Regulations
and Industry
Inspection
Standards**

The MMS does not have any regulations that address pipe rack fingers. There is also very little in the way of industry guidelines for inspection, maintenance, and repair of pipe rack fingers. The investigators were able to find only one industry standard document that addresses these issues. *API RP 4F, Maintenance and Use of Drilling and Well Servicing Structure*, recommends periodic visual structural inspections of the derrick or mast and substructure. *Appendix A* of *API RP 4F* includes a report form, *Report of Visual Field Inspection of Derrick or Mast and Substructure*, which can be used to document the inspection. This report form includes a visual examination of the fingers for damage and cracked welds. However, the form does not include any visual check for safety chains on the fingers.

**Drilling
Contractor
Policies and
Procedures
for Derrick
Inspection,
Repair, and
Maintenance**

The Contractor's drilling superintendent indicated that it was standard company practice and policy to have a safety chain on all pipe rack fingers and to chain each stand of pipe after it is placed in the finger. However, the team could not find this policy written in any specific policy document.

A visual check for pipe rack safety chains and individual pipe finger chains (for each stand of pipe) was written in the Contractor's monthly derrick inspection checklist. The last monthly derrick inspection before the accident for which the team was able to find documentation was conducted on September 19, 2001. Documentation for this visual inspection consists of a checklist where the item is either initialed as being "OK" or is

marked “NO.” The inspection checklist included the following elements relating to the pipe rack fingers:

- Pipe rack fingers attachment to derrick secure
- Safety chain/wire on each pipe finger
- Pipe racking finger chains in place – functional.

The Contractor’s drilling superintendent indicated that the individuals who conducted the monthly derrick inspections were trained “on-the-job” for this inspection duty. They would be looking for obvious problems, like cracks, safety chains, frayed belts, etc. However, the Contractor did not specifically incorporate examination of the fingers for damage and cracked welds in their inspection checklist, as is recommended in *API RP 4F, Maintenance and Use of Drilling and Well Servicing Structure Appendix A*.

The checklist for the September 19th inspection did not indicate any problems with the pipe rack fingers or safety chains. In the investigation, the investigators were not able to determine why there was no safety chain installed on the pipe rack finger at the time of the accident. It is possible that the missing safety chain was overlooked in the monthly derrick inspection that occurred in September 2001. Another possibility is that the chain was present at the time of the September derrick inspection, but became detached or was removed before the accident occurred.

Except for the three items documented on the monthly derrick inspection checklist, the team was not able to find that the Contractor had any written policy for inspection, maintenance, or repair and replacement of pipe rack fingers. Both the Contractor’s drilling superintendent and one of the senior tool pushers indicated that repairs were

made to the pipe rack fingers whenever problems were noticed. However, the Contractor does not routinely document maintenance repair work or replacement of the pipe rack fingers. Therefore, it was not possible to determine the age or maintenance and repair history of the pipe rack finger that failed or of the other pipe rack fingers installed on the jack-up rig at the time of the accident.

Marine/Pride did have a written JSA worksheet for tripping. However, the JSA did not identify any hazards or hazard management actions associated with the pipe rack fingers during tripping operations.

Conclusions

The Accident After a review of the information obtained during the investigation, it is the conclusion of this panel that at approximately 0315 hours, while a stand of 3½-inch drill pipe was being racked during a trip, the nine-stand pipe rack finger broke and fell approximately 85 feet to the rig floor, striking and killing one rig-floor worker and hospitalizing another.

Causes The accident was a result of the failure of the metal pipe rack finger rod and the absence of a safety chain to prevent the pipe rack finger from falling to the rig floor. The associated failure of the Contractor to detect the missing safety chain and the unsafe condition of the pipe rack finger prior to the accident was also a cause of the accident.

Contributing Causes The failure to detect the missing safety chain and the unsafe condition of the pipe rack finger was the result of the Contractor's lack of an effective program for maintaining, inspecting, and documenting the integrity of the pipe rack fingers. The ineffectiveness of the Contractor's program is demonstrated by the following:

- a. When examined after the accident, all of the other welds on the pipe fingers installed on the jack-up rig were found to be cracked. Problems with the welds were not identified in a derrick inspection conducted on September 19th, 24 days prior to the accident.
- b. At the time of the accident, there was no safety chain on the pipe rack finger. This problem was not identified prior to the accident.
- c. There was no comprehensive written policy for inspection, maintenance, repair, or replacement of the pipe rack fingers.
- d. There was no routine documentation of maintenance, repair, or replacement of the pipe rack fingers.

**Possible
Contributing
Causes**

1) The failure of the Contractor to include examination of the pipe rack fingers for damage and cracked welds (as recommended by *API RP 4F, Appendix A*) in the monthly inspection checklist for the derrick possibly contributed to the accident. The magnetic particle examination of the pipe rack fingers conducted after the accident by Universal Marine Inspections showed that all of the finger pin welds were cracked. Although the cause of the failure of the pipe rack finger rod is not known, had the Contractor included examination of the pipe rack fingers for damaged welds as recommended in the inspection checklist, the cracked welds might have been specifically looked for and identified, allowing remedial actions to be taken to repair or replace the equipment.

2) The lack of an adequate Contractor job safety analysis (JSA) for tripping pipe possibly contributed to the accident. The Contractor's standard practice and policy regarding the installation of safety chains on the pipe rack fingers was included in his monthly derrick inspection checklist. However, in their JSA for tripping pipe, there was no identification of the potential hazard caused by pipe rack fingers breaking off and falling from the derrick. This failure to identify the potential hazard in the JSA meant there were no required hazard management actions to alleviate the danger, such as inspecting for the condition of pipe rack fingers and the presence of safety chains prior to the tripping activity.

Recommendations

Safety Alert The Gulf of Mexico OCS Region should issue a Safety Alert recommending the following:

1. Operators and contractors should immediately examine pipe rack fingers on their rigs to ensure the integrity of the fingers and to ensure that adequate steps have been taken to prevent them from falling from the derrick.
2. Operators and contractors should review the effectiveness of their programs for ensuring the integrity of the pipe rack fingers. These programs should, at a minimum, include the following:
 - a. Written policies and procedures for inspection, maintenance/repair, and replacement of pipe rack fingers;
 - b. Use of safety chains or other devices/methods to secure all pipe rack fingers and prevent them from falling from the derrick;
 - c. Inspection of pipe rack fingers for damage and cracked welds as recommended by *API RP 4F, Appendix A*;
 - d. Incorporation of the potential for pipe rack fingers to fall from the derrick as a hazard, along with adequate hazard management actions in the appropriate JSA's.
 - e. It should be an industry practice to secure each stand of drill pipe after being placed in the pipe rack finger.

Study

The Panel recommends that MMS should examine safety issues related to pipe rack fingers to determine if development of MMS regulations or industry standards should be considered.

Appendix



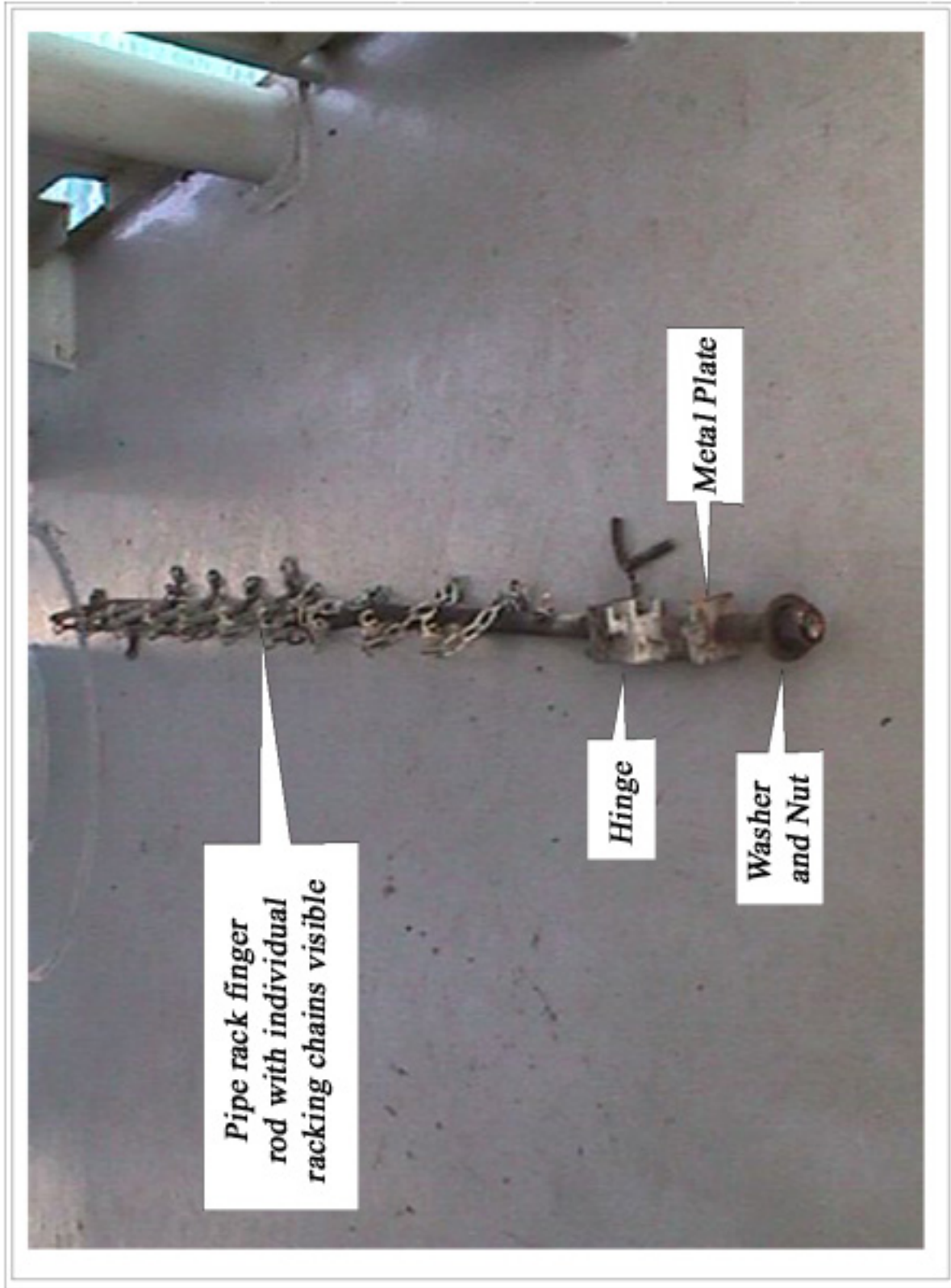
Location of Lease OCS-G 21618 South Marsh Island Block 93



Pride Arizona: Location of Pipe Rack Fingers



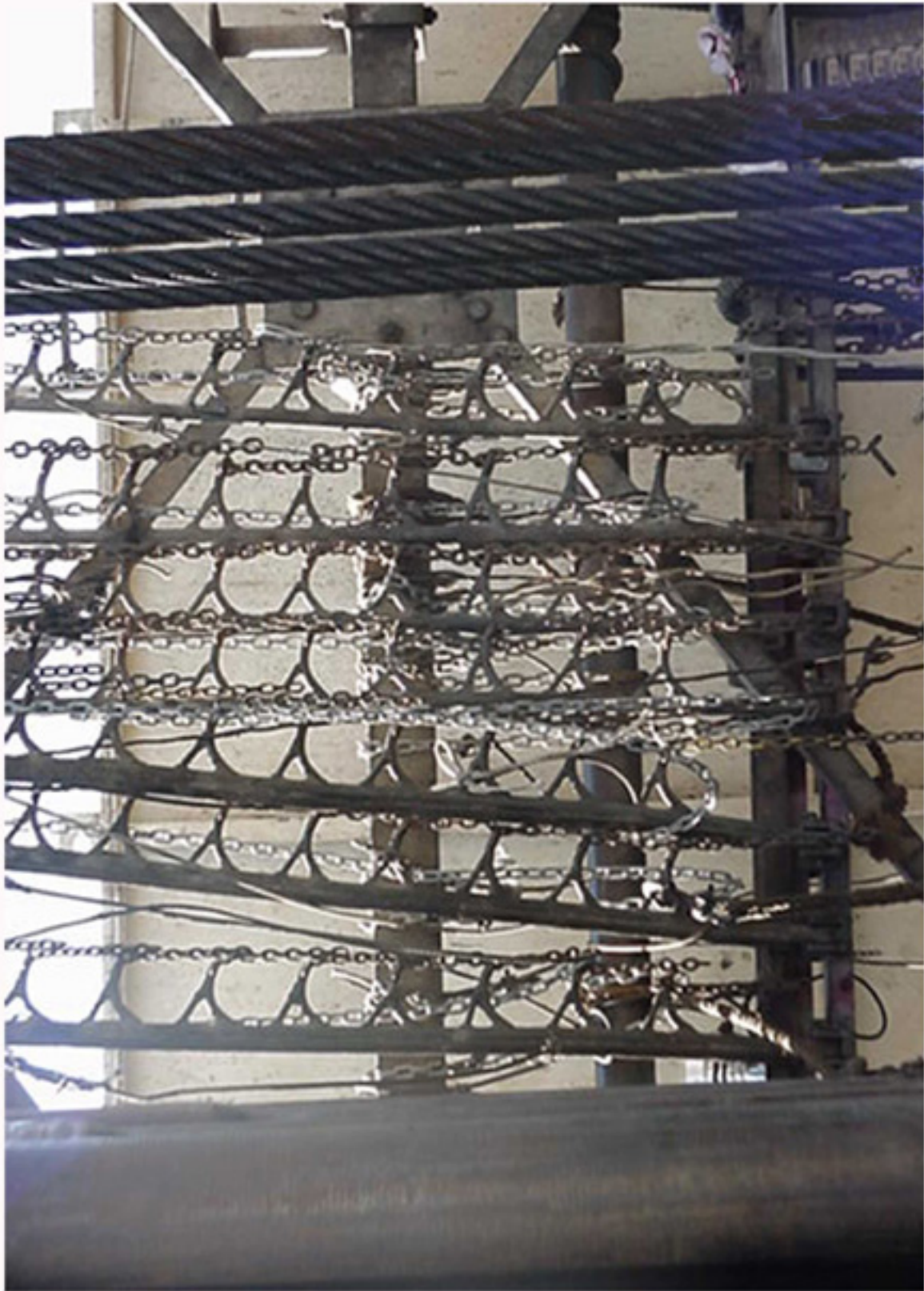
Fallen Pipe Rack Finger on Derrick Floor



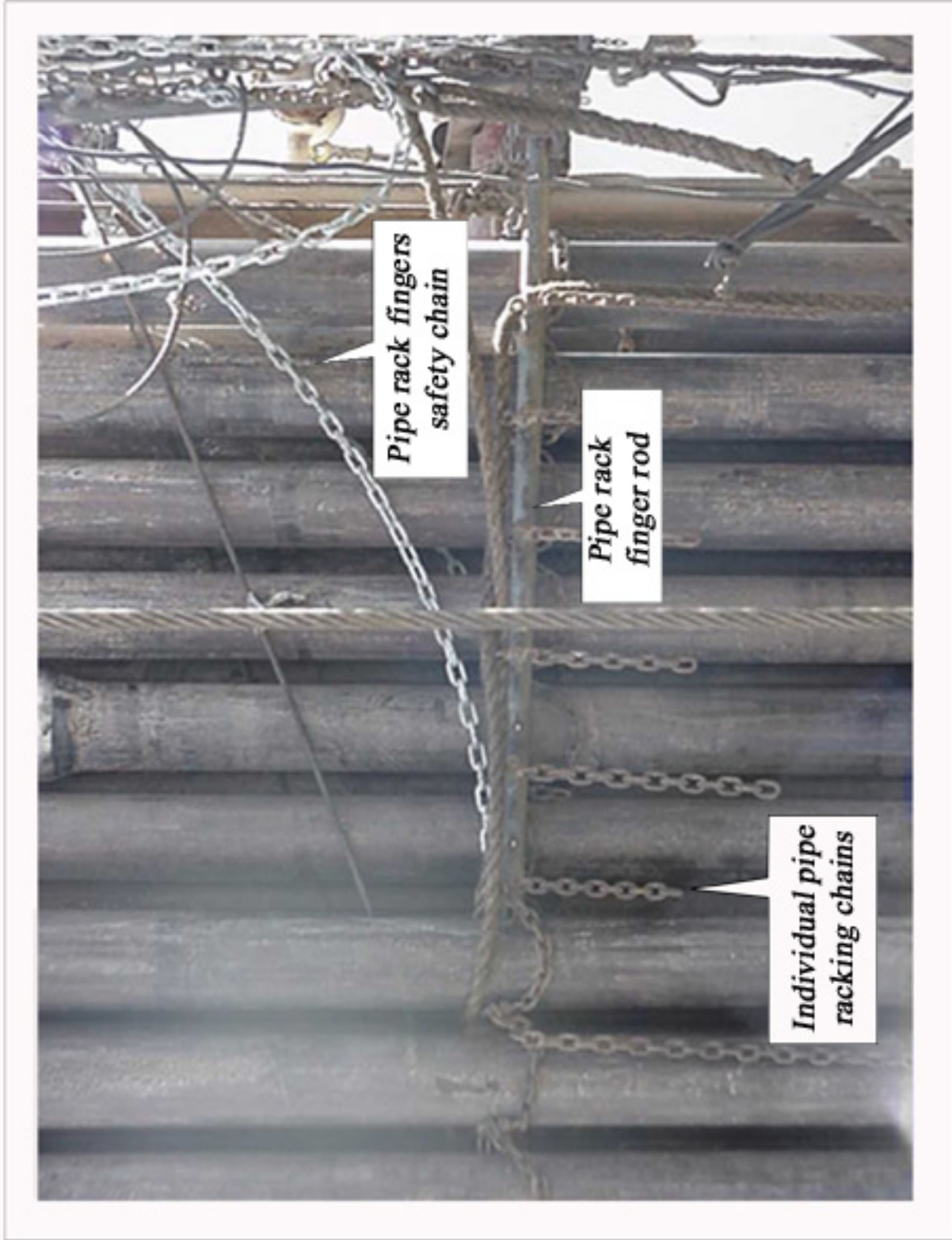
A Nine-stand Pipe Rack Finger Removed from the *Pride Arizona* after the Accident (not the one involved in the accident)



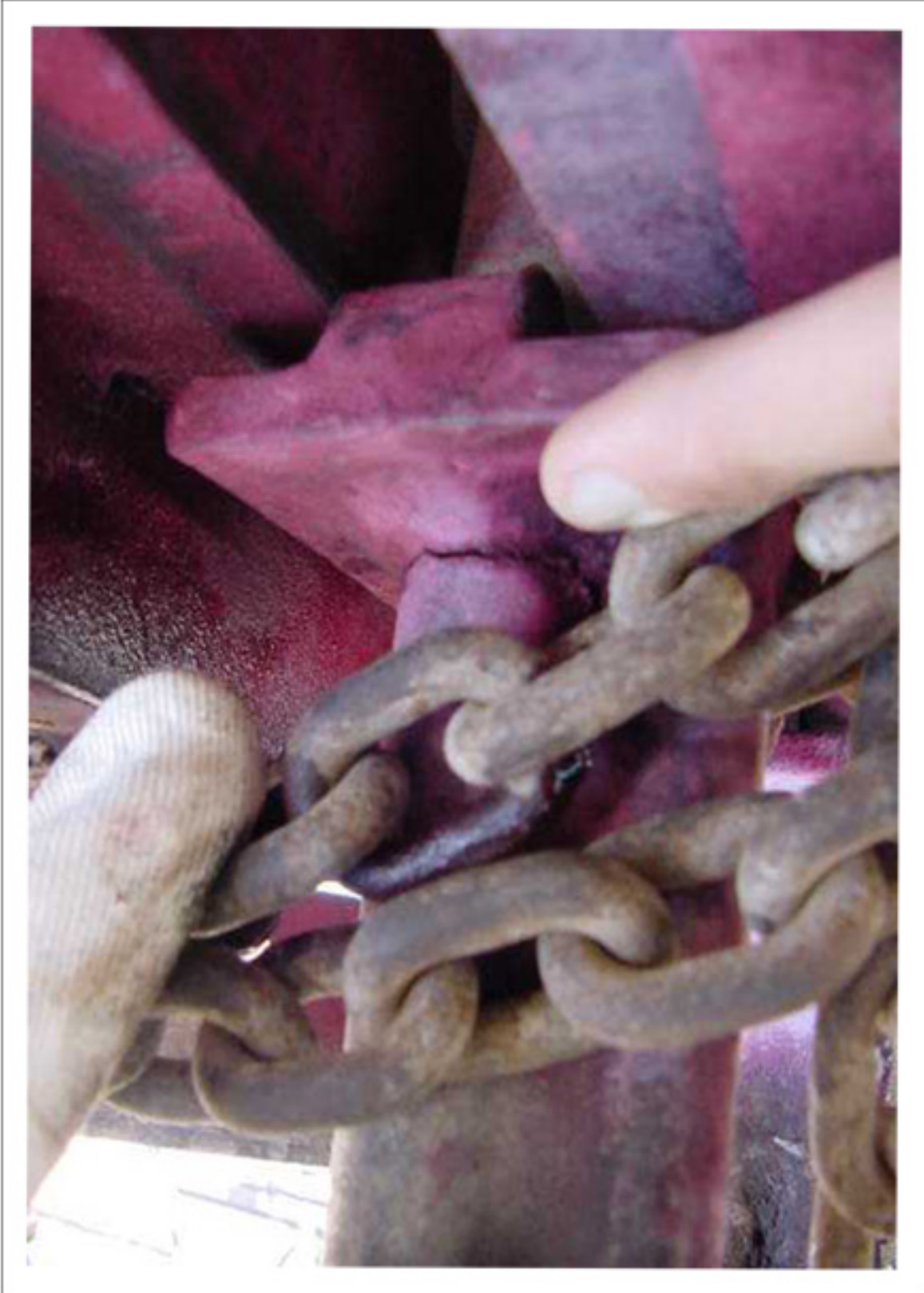
Fallen Pipe Rack Finger



Pipe Rack Fingers and Chains, Secured Position on the Pride Arizona



Example of a Pipe Rack Finger Holding Pipe on the *Pride Arizona* at the Time of the Accident



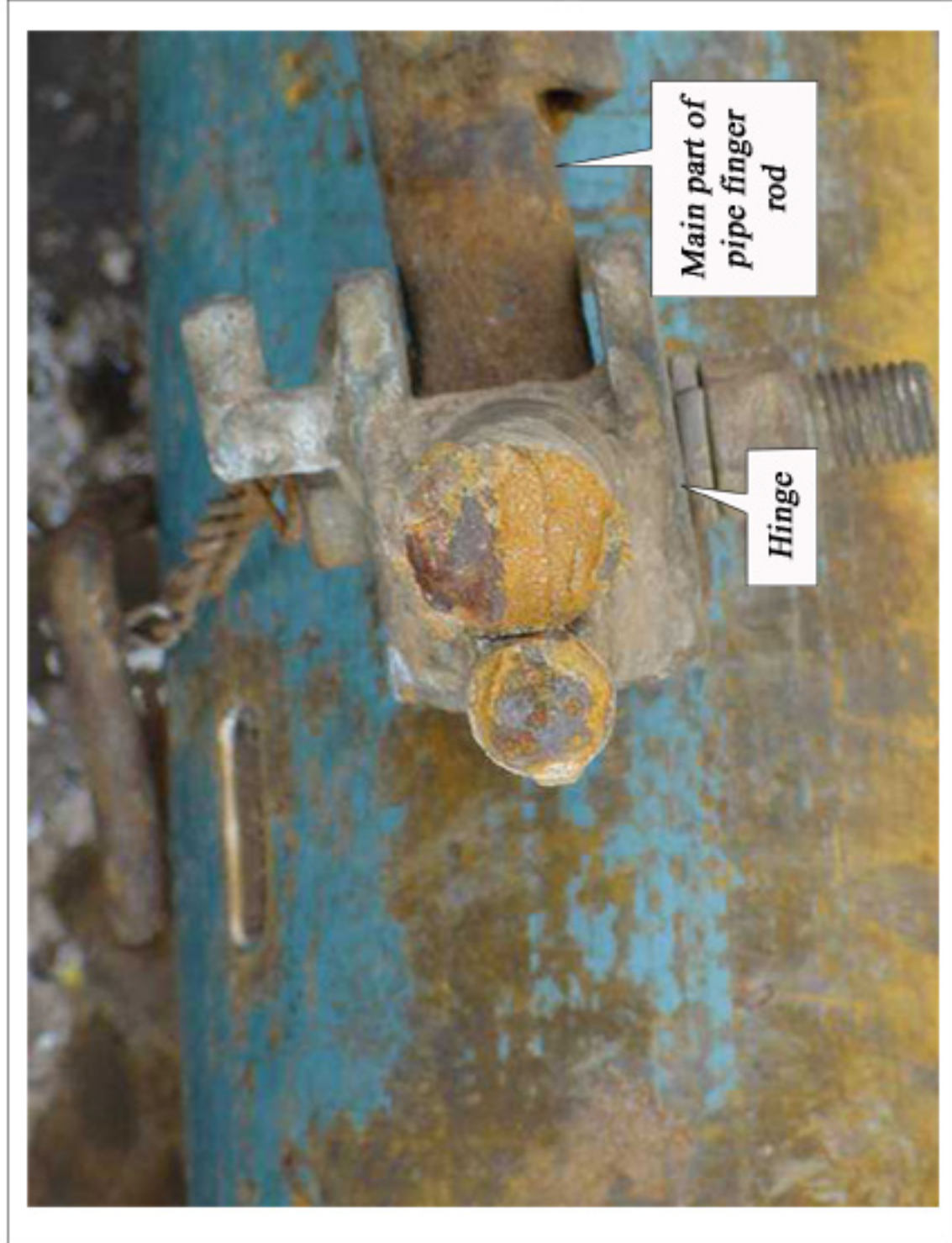
Example of a Cracked Weld on a Pipe Rack Finger Installed on the *Pride Arizona* at the Time of the Accident. (Note: This picture was obtained by MMS during the investigation. It was not taken from the inspection report prepared by Universal Marine Inspections)



Base-End of Broken Pipe Rack Finger still Attached to Derrick after the Accident



Base-End of the Broken Pipe Rack Finger Removed from the Derrick after the Accident.



Broken End of Pipe Rack Finger-Part that Fell from the Derrick.