



Report

Ms. Adell Heneghan
V. P. Environmental Health & Safety
PDC Energy
1775 Sherman St., Ste. 3000
Denver, CO 80203

SUBJECT: Spaur Well Flash Fire
Injured: [REDACTED]
Location: Spaur Well Pad, Weld Co, CO.

Date of Loss: 9/27/16

REFERENCE: Our File Number: 16-227

DATED: October 7, 2016

PREPARED BY: Randolph J. Harris, B.S. Ch.E., C.F.E.I., C.V.F.I., C.P.H.

INTRODUCTION: During the morning of September 27, 2016, workers were cleaning out a separator at the Spaur Well Pad. A flash fire occurred, which injured [REDACTED] and the equipment.

I was requested to conduct an on-site examination to determine the origin and cause of the flash fire.

EXAMINATION: Pursuant to my assigned task, I:

1. Conducted an on-site examination of the flash fire site on September 29 and 30th 2016.
2. Discussed the incident with [REDACTED] injured party and witness.
3. Discuss the incident with Mr. Gene Carlson of Energes.
4. Discusses the incident with J. D. Adams of PDC Energy.
5. Discussed the incident with Mr. Jason Thron of PDC Energy.

DISCUSSIONS: From my discussions, I learned that:

1. [REDACTED] has been a pumper with PDC Energy for seven years. He has worked in the oil field since 1979. This was a routine job that he has done many times, the same way; bleeding down a separator so a fitting can be replaced.

2. [REDACTED] arrived at the Spaur Well Site about 9:00 AM on September 27, 2016. He shut the main valve into the separator and shut off the main burner. He dumped the oil and water as much as possible and shut the sales line, for safety. They opened a ½ inch bleeder valve outside, took off a gauge and let it bleed down for 15 to 20 minutes. There was still some pressure inside. Roustabouts from Energes were assisting, taking fitting loose inside. These Energes employees put down a plastic drip pan and a metal bucket underneath the valves location.
3. [REDACTED] opened low valves to drain the last liquid. He drained approximately 12 gallons off, then making three trips to dump the metal bucket. One metal bucket on the plastic drip pan was catching liquid below valves D & E, where gas was still forcefully blowing out. [REDACTED] was holding a second bucket under valve B with his left hand, as he opened valve B with a crescent wrench in his right hand. Then, the flash fire occurred.
4. [REDACTED] does not remember every detail precisely. The first bucket may have had a couple of inches of liquid in it. His metal bucket had a plastic handle on top. Gas was flowing out of valves D and E. He had the bucket in his hand, tipping it under valve B. He did not see a spark, just flames everywhere. His four gas alarm had gone off sometime earlier, but not before the flash fire. He was wearing his PPE but got burned where his skin was exposed.
5. Mr. Gene Carlson is a supervisor and has been with Energes for nine years. His crew arrived on-site at 8:30 AM and he at 8:50 AM. [REDACTED] was already present and Gene's crew was waiting for [REDACTED] to blow down the separator. His roustabouts took the meter out and pushed it to the side, out of the way, with the electric conduit still in the ground. He checked that the valves were locked out, and checked the pressure and fluids remaining. His crew brought the plastic catch basin and two, 5 gallon buckets.
6. Mr. Carlson was standing outside, east of the separator, watching [REDACTED]. Liquid was still dripping and pressurized gas flowing. [REDACTED] was putting a second bucket under the right side valve when the flash fire occurred. The first bucket was on the plastic catch basin, on the ground, with the handle, down. They dumped three buckets of liquid condensate. He believes the separator was 98% blown down. [REDACTED] was moving the second bucket when the flash fire occurred. He never saw a spark. All five doors of the enclosure were wide open. It did not appear dangerous to him. [REDACTED] was kneeling near the right side of the separator enclosure, moving the second bucket, when the flash occurred. Mr. Carlson ran.
7. J. D. Adams of PDC Energy arrived on site at 9:20 AM. He verified that the four valves to the separator were off and that no additional fuel could get in. They usually use a metal bucket directly on the ground to catch the dripping condensate. This plastic drip pan, brought by Energes, was different. The meter was taken off, leaning over with its electric conduit still in the ground. The Energes roustabouts probably helped [REDACTED]. [REDACTED] The separator operates at 160 degrees and continues to give off vapors. One

bucket was on the plastic catch basin, catching the still dripping liquid condensate. [REDACTED] was kneeling by the door, moving buckets, when the flash fire occurred. (He observed valve B closed before the incident, but it was open afterwards). [REDACTED] hit the ground, got up and ran west, while J D ran northeast. The separator continued burning until the fire department arrived, 20 to 30 minutes later. The whole cabinet was engulfed, with a sheet of flames against the back, west. There was a slight breeze to the west, but it was mostly calm. J.D.'s four gas alarm never went off. [REDACTED] alarm went off several times, the last time at 9:42 AM.

8. Mr. Jason Thron is a supervisor with PDC Energy. The Spaur Well Pad has 16 wells and has only been in production and a couple of months. [REDACTED] and J D are experienced pumpers who have worked for PDC over four years. Energes had a roustabout crew on location working with [REDACTED] and JD to change a leaky fitting on the separator. The Energes crew set a plastic load line cover under the bucket, to keep oil off the ground.

FINDINGS: From my on-site examinations of the fire scene on September 29 and 30th 2016, I found that:

1. The Spaur Well Pad was located between Johnstown and Milliken, Colorado. This incident occurred on the west pad, which had eight separators. These were new separators and had only been operating a few months. The site was very clean.
2. The separator generally measured 24 feet by 4 feet and set east to west. The east end valves were enclosed in a metal box, 8 1/2 feet long, by 4 feet 8 inches wide, by 6 feet tall. All five doors were open. (See photo one in appendix).
3. The fire occurred in this east end metal enclosure. The worst damage was to the west, near the end of the separator. The damage lessened, moving east. J.D. showed the position [REDACTED] was in, when the flash fire occurred. (See photo two in appendix).
4. Inside the enclosure, the end of the separator showed fire damage, as well as above and below. Two buckets were still present under the lower valves. Under the left bucket was a partially burned plastic drip pan. This plastic drip pan was secured as evidence. (See photos three - six in appendix).
5. The position of the valves was documented. As found, vapors and liquid would flow out of all three openings. This valve manifold and the buckets were secured as evidence. (See photo seven in appendix).
6. After the incident, the flow meter's electrical conduit and wires were exposed. Close examination showed minor melting of insulation and mechanical damage. There was no arcing and no signs of electrical activity. (See photo eight in appendix).

7. I assisted in removing, wrapping and marking the evidence. The evidence was secured by PDC Energy personnel.

ANALYSIS: Based on my above discussions and findings, the cause of the flash fire was a static electric discharge into an explosive atmosphere. The plastic drip pan contributed to the static electric buildup.

When [REDACTED] arrived on site, he closed the valves to the separator and started draining it. Flammable gasses were blowing out for over half an hour, with the pressure decreasing. [REDACTED] was draining out the last liquid condensate. Bucket number one was sitting on a plastic drip pan, on the ground, with no electrical connection to the separator. [REDACTED] was holding the second bucket in his right hand, to catch condensate as he opened valve B with a crescent wrench. Then the flash fire occurred.

[REDACTED] and J.D. Adams have performed this same operation many times before. The only thing different this time was the Energex crew put a plastic load line cover underneath the bucket as a drip pan. This was a mistake. Oil, condensate and even their vapors flowing out of a pipe creates static electricity. The flowing vapors transfer this static charge to the condensate liquid dripping into the bucket. The bucket was not electrically connected to the separator or ground. The plastic load line cover, being used as a drip pan, kept the bucket insulated from ground. The electrically charged condensate dripping into the bucket caused the bucket to become more and more electrically charged. As [REDACTED] was moving the second bucket, he made contact between the bucket and the separator, causing a static discharge, or spark. Unfortunately, the gas concentration was in the flammable range where the discharge occurred. This spark ignited the flammable vapors (which were still flowing out of the separator), and condensate in the buckets.

Flammable vapors had been flowing out of the separator for over ½ hour. The pressure was decreasing but [REDACTED] said he could still feel the gas flow from 5 inches away. This suggests a few PSI still in the separator. There was some condensate in the buckets, giving off flammable vapors. Thus, adequate fuel was present. J.D.'s 4 gas monitor never alarmed, but reportedly [REDACTED] had. The vapors coming out would predominantly be heavier than air, and sink. The 4 gas monitor would only pick up vapors if held low to the ground. They wore their Gas Monitors on their chest. Despite this, the workers knew that flammable gases were flowing. This gas only has to be 2% in air to be explosive.

[REDACTED] and JD had performed this operation many times in the past. The one thing different was the plastic drip pan on the ground. This suggests that a metal bucket sitting on the ground is almost an adequate ground. The plastic drip pan insulated the bucket from the separator and ground. The dripping, charged condensate transferred this static charge to the insulated bucket. [REDACTED] allowed this static to discharge when he made electrical contact; either by the second bucket touching the insulated bucket and separator; or through his body by touching the insulated bucket and valve B simultaneously. A small static discharge is enough energy to ignite a flammable atmosphere.

In the future, a plastic drip pan should not be used. The use of plastic in the oil field should be avoided. Oil fluids flowing out of a pipe will create static electricity. Plastics can make it worse. If a drip pan must be used, it should be metal. In addition, the metal catch bucket should be electrically connected to the separator. A copper wire with alligator clips or other bonding method is suggested. As long as all metals are at the same potential, a static discharge cannot occur.

CONCLUSIONS: Based on my above Findings and Analysis, I conclude that:

1. The cause of the subject flash fire was a static discharge in a flammable atmosphere.
2. The plastic drip pan under bucket one, insulated the bucket from ground and the separator. Dripping condensate transferred its static electric charge to the bucket.
3. [REDACTED] inadvertently made electrical contact between the bucket and the separator, causing a static spark which ignited the flammable gases.
4. The use of plastics in the oil field should be avoided.
5. Metal buckets used for such purposes should be electrically connected to the separator.

I reserve the right to change these opinions, should additional information become available.

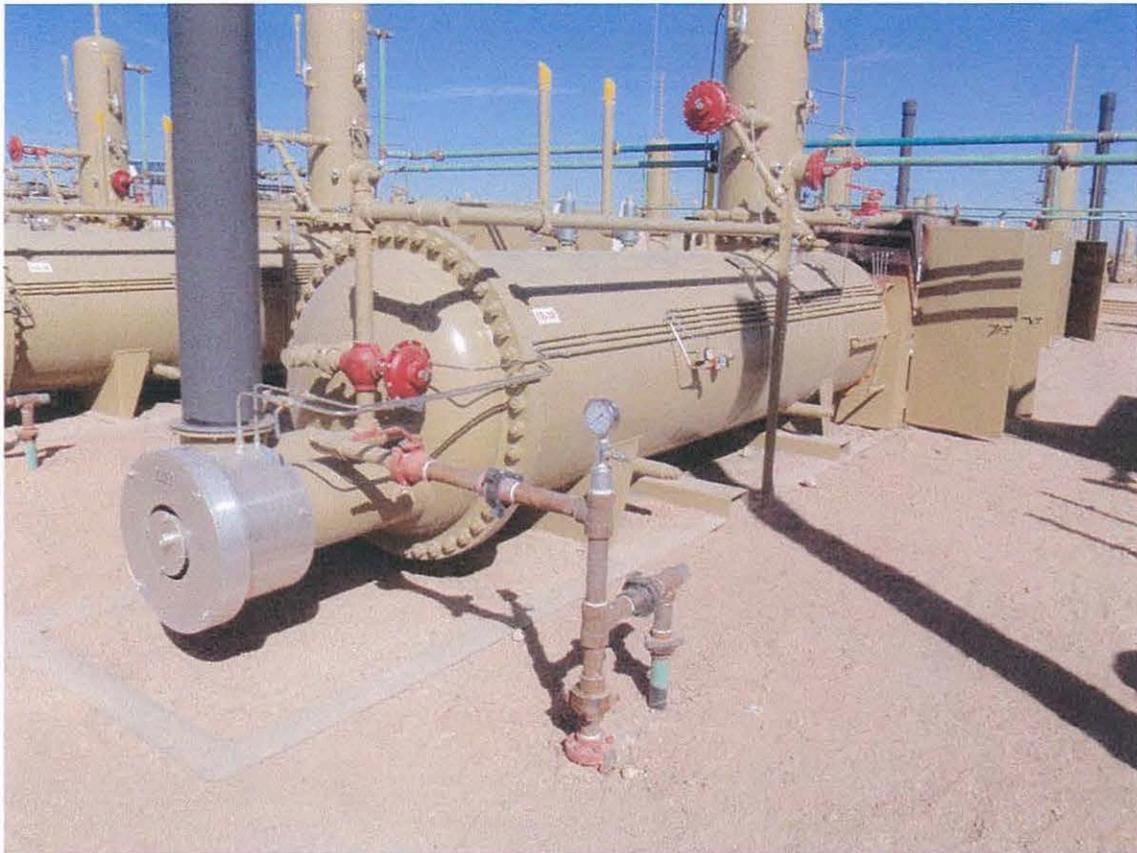
Sincerely,

FAY ENGINEERING CORP.



Randolph J. Harris, B.S. Ch.E., C.F.E.I., C.V.F.I.

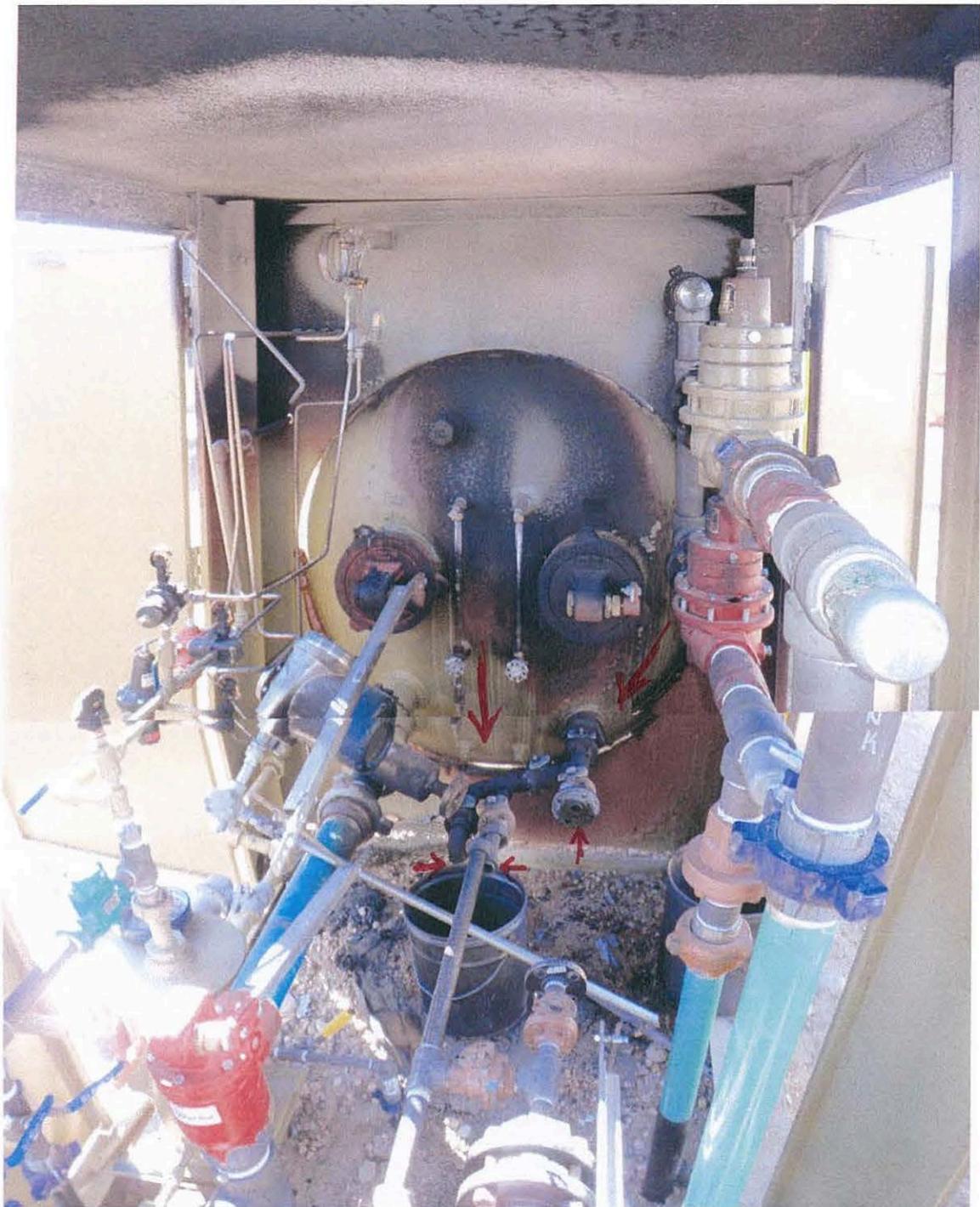
RJH/mag
T:Rjh



1. Looking northeast at subject separator.



2. Separator enclosure. Subject at [REDACTED] position during incident.



3. Looking west inside separator enclosure.



4. Valves used for draining and buckets.



5. Plastic drip pan under bucket.



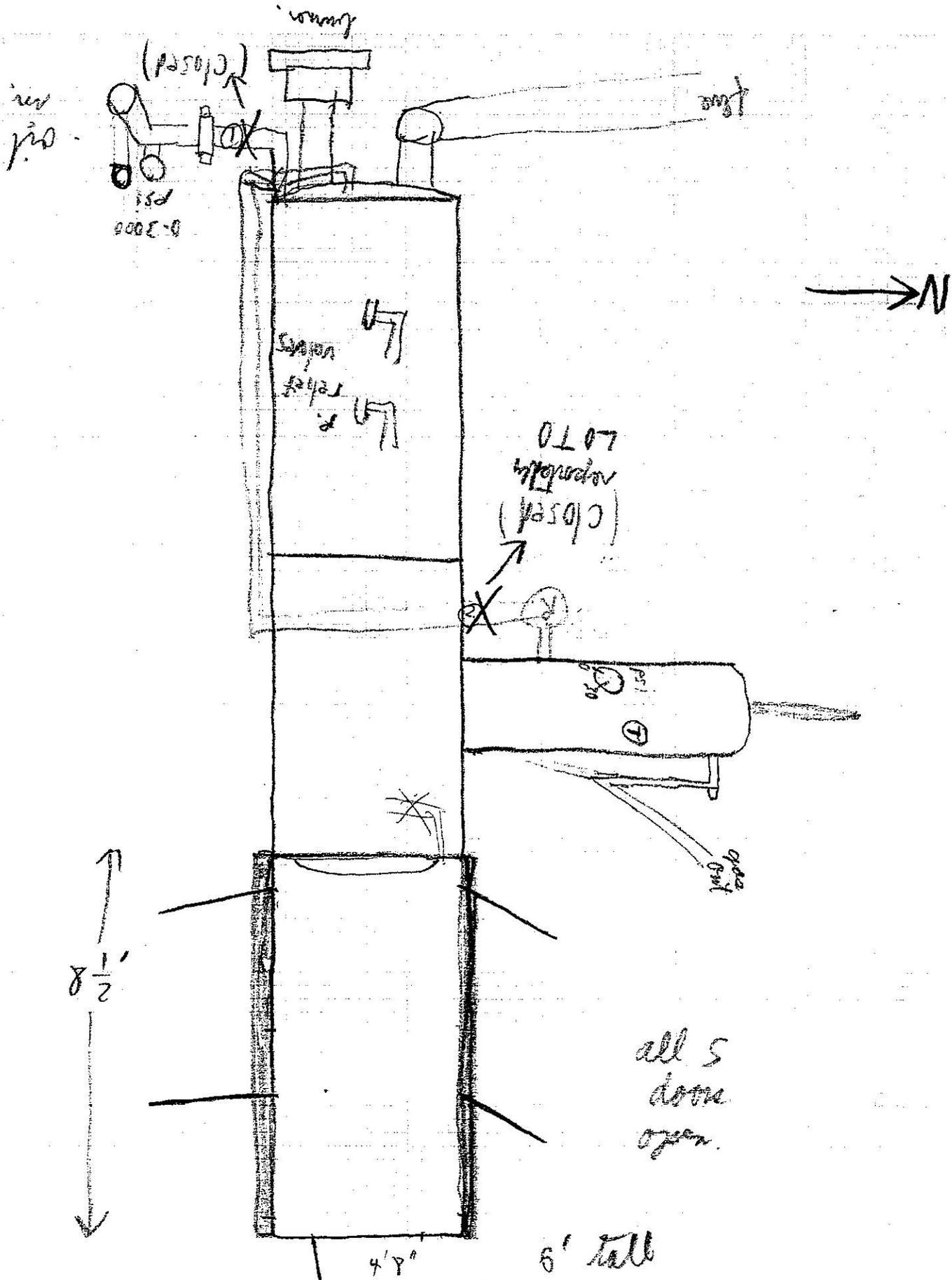
6. Plastic drip pan.



7. Valves used for draining.



8. Meter's electrical wires show minor melting of insulation and mechanical damage, but no arcing.



FAY ENGINEERING CORP.
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 (303) 333-5209

DATE 9/30/16

SCALE ~1"=3'

DR. R.D.H.

REFERENCE 16-227

FILE NO. 16-227

CK.

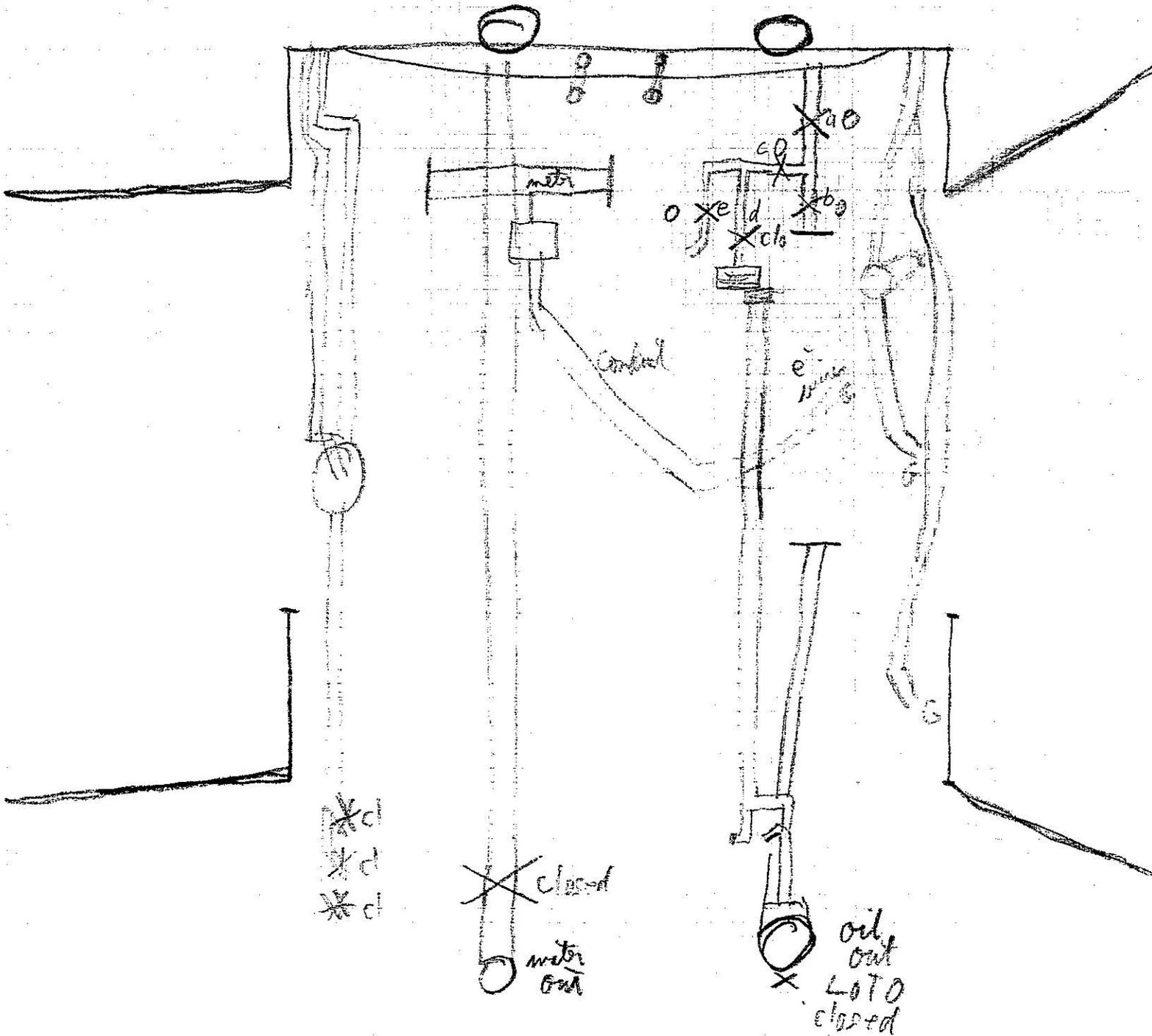
DRAWING NUMBER

1

DESCRIPTION

Separator

APPR.



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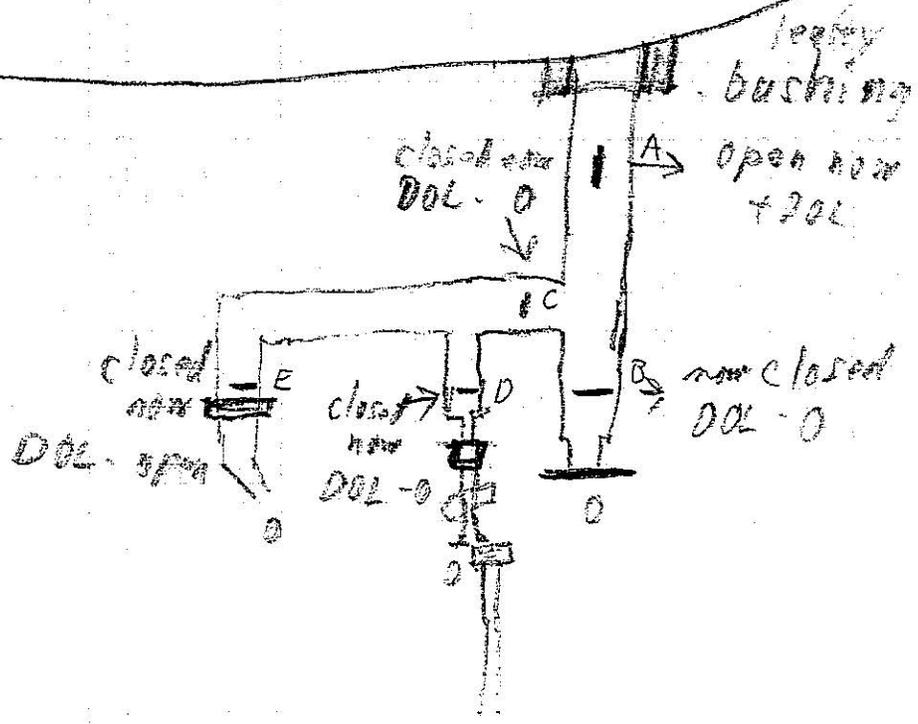
SCALE 1" = 1'
 FILE NO.

DR. RW
 CK.

DRAWING NUMBER
 2

DESCRIPTION
 Separator Enclosure

APPR.



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DATE 9/30/16

SCALE not

DR. R.04

REFERENCE 16-227

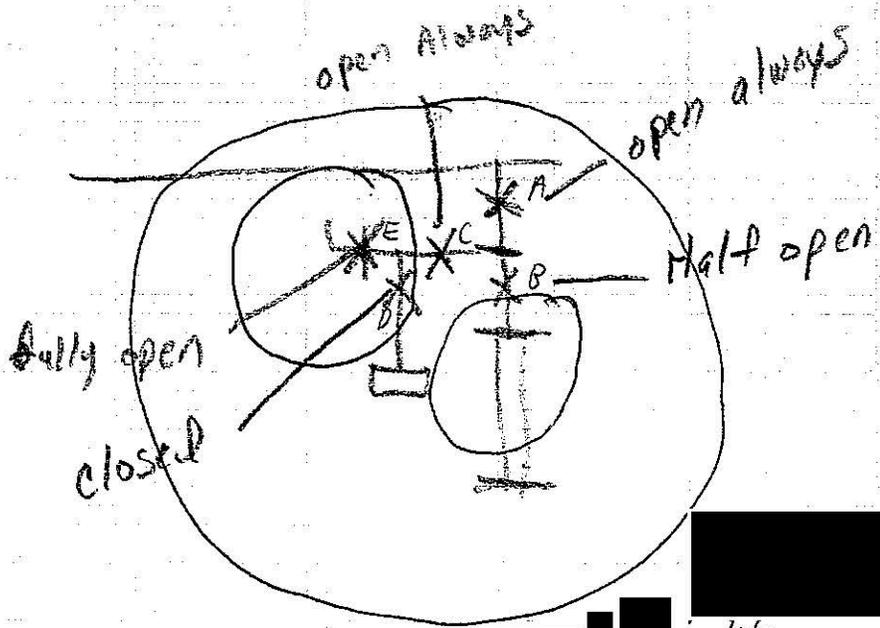
FILE NO.

CK.

DRAWING NUMBER
 3

DESCRIPTION
 Manifold - Condensate/Oil

APPR.



9/30/16

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	REFERENCE	76-227	FILE NO.	CK.
DRAWING NUMBER	DESCRIPTION			APPR.
4	Manifold - Valves by [redacted]			