OCS Report
BSEE 2012-104

Investigation of H_2S Gas Release
Platform Hidalgo, OCS-P 0450
Pacific OCS Region

BSEE
Bureau of Safety and Environmental Enforcement

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Executive Summary

On February 23, 2012, at approximately 1352 hours, a hydrogen sulfide (H2S) gas release occurred on Platform Hidalgo on Lease OCS-P 0450. The release was from a piping corrosion failure near a weld, on the 8-inch side of an 8-inch by 4-inch reducer on the blowdown line for vessel V-13, third stage section scrubber. Multiple H_2S sensors detected the release and initiated a platform shutdown. Platform personnel were directed to muster to the safe briefing areas. Response personnel using breathing apparatus isolated the leak. No injuries to any personnel occurred from the incident. No harm to seabirds or other wildlife was observed. Prior to the platform being restarted, the failed spool was removed and saved for testing, and a new spool was installed. The H_2S concentration at the release point was estimated to be 40,000 ppm.

The investigation team has concluded that the corrosion failure was caused by accelerated corrosion resulting from elemental sulfur in contact with steel in an area where deposits could build up. Elemental sulfur acts as an oxidizer and is known to accelerate steel corrosion and cause localized attack. The elemental sulfur in the scale was the result of oxygen contamination in the wet, sour gas stream. Oxygen reacts with hydrogen sulfide in liquid water to form elemental sulfur.

PXP commissioned Efird Corrosion International, Inc. a third-party corrosion testing company to perform a failure analysis. The report recommended a comprehensive list of corrective actions. PXP has implemented the complete set of recommended corrective actions and have incorporated changes as part of their mechanical integrity program.

This investigative team recommends that BSEE verify the status of PXP's work to implement the third party's recommended corrective actions by reviewing the submittal of periodic status reports and Radiography Examination Reports.

Introduction

Authority

The 8-inch side of an 8-inch by 4-inch reducer ruptured on February 23, 2012, at approximately 1352 hours, resulting in a sour gas release at Plains Exploration & Production's Platform Hidalgo on Lease OCS-P 0450, Area SM, Block 6524, in the Santa Maria Basin. (Sour gas is natural gas contaminated with hydrogen sulfide [H_2S] or other sulfur compounds.) Pursuant to U.S. Department of the Interior regulations at 30 CFR 250, the Bureau of Safety and Environmental Enforcement (BSEE) is authorized to investigate and prepare a public report of this accident. On February 29, 2012, the following BSEE Pacific OCS Region (POCSR) personnel were named to investigate the incident:

Michael Mitchell, Chair – Office of Field Operations, California District
Theresa Bell – Office of Field Operations, Regional Operations Section
Chet Miller – Office of Field Operations, California District

Background

Lease OCS-P 0450 covers approximately 2076 hectares and is located in Area SM, Block 6524, in the Santa Maria Basin, offshore the California coast. (*For lease location, see Attachment 1 – Location of Lease OCS-P 0450, Area 6B, Block 6524.*) The lease was originally issued to Chevron U.S.A. Inc., effective July 1, 1981. Through numerous transfers, Arguello Inc. became sole lease owner effective April 1, 1999. Plains Exploration & Production Company (PXP) became the designated unit operator effective May 21, 2007. Lease OCS-P 450 along with leases 451, 315, and 316 make up the Point Arguello Unit. The unit contains the Point Arguello Field which is produced by Platforms Hidalgo, Harvest and Hermosa.

Prior H_2S Gas Release on Another Platform in the Point Arguello Unit

On August 3, 1999, at about 2:00 p.m., an 8-inch high pressure gas flowline on Platform Hermosa ruptured, resulting in a sour gas release. The break occurred on the mezzanine deck, about 64 feet above the ocean, downstream of a third-stage discharge scrubber, V-14, and just prior to the glycol contactor inlet, V-16. The drop in pressure activated the automatic safety system on the platform, which shut in oil and gas production. Platform Hidalgo, with pipelines transporting oil and gas to Platform Hermosa, was also shut in.

The released gas had an H_2S concentration of about 18,000 ppm. The H_2S alarms on Platform Hermosa activated. No one on Platform Hermosa was harmed. No harm to seabirds or other wildlife was observed.

The flowline failed due to internal corrosion, which reduced the wall thickness until it could no longer contain the normal operating pressure. Corrosion was caused by condensed liquid water reacting with H_2S gas to form a corrosive acid gas.

The Minerals Management Service (MMS), a BSEE predecessor agency, conducted an investigation. The recommendations from OCS Report MMS 2000-48, Investigation of H_2S Gas Release Platform Hermosa, OCS-P 0316 can be found in Attachment 2 – OCS Report MMS 2000-48, Investigation of H2S Gas Release, Platform Hermosa, OCS-P 0316; Recommendations Section.

Review of 2000 Recommendations for Platform Hermosa

Implementation of recommendations and operator actions:

MMS Actions	***Implemented***	***Comments***
Issue Safety Alert	Issued on July 10, 2000	
Inspection	H_2S Inspections, review of operator conducted H2S drills, participant logs and debriefing notes	Completed as part of Partial and Annual Inspections
Maintenance Requirements	Incorporated in Safety & Environmental Management System (SEMS) Regulations, 30 CFR 250 Subpart S	All POCSR operators have critical piping and vessel ultrasonic inspection programs in place
Regulations	Mechanical Integrity Requirements Incorporated in SEMS Regulations	Recommend compliance with ASME B31.3, API 570 and API 510
Process Modifications:	Acid Gas Injection	Installed on Hermosa
Operator Actions		
H_2S Contingency Plan Updated Notification Lists	Last updated in March 2012	Up-to-date H_2S concentrations and notification lists
Maintenance and Testing; Consider incorporating API 570 and API 510	Increased Ultrasonic Testing (UT) inspections V-12 to V-16	Results submitted to District Manager, California District
H_2S Drills: Debriefings	Weekly drills, each crew is drilled and a debriefing is conducted to provide feedback.	Incorporates donning of breathing apparatus
Operations Plan	Last updated in March 2012	Incorporates review of UT inspection results, specifies specific actions for minimum wall thickness.

Findings

Brief Description of Incident on Platform Hidalgo

On February 23, 2012, at approximately 1352 hours, a gas release occurred due to corrosion failure near a weld on the 8-inch side of an 8-inch by 4-inch reducer that is on the blow down line for vessel V-13, third stage section scrubber. The vessel is an inter-stage vessel for both the K-12 and K-13 gas compressors which handles the produced gas; see Attachment 3. Multiple H_2S sensors detected H2S levels above 10 parts per million (ppm) from the release which activated alarms. Personnel initiated a platform shutdown and directed personnel to muster to the safe briefing areas. Teams under air isolated the leak area. Once the area was deemed safe, personnel were notified and returned to normal duties. Actions taken by PXP personnel were consistent with their approved H2S plan, no injuries occurred from this incident.

The H_2S concentration at the leak point was approximately 40,000 parts per million (ppm).

History of Ultrasonic Testing

The reducer spool that failed is included in a piping circuit in PXP's Mechanical Integrity Program. The circuit was last examined in May 2011 utilizing a non-destructive test (NDT) "A" scan and was run at specific points on the circuit; see Attachment 3. The results of the 2011 inspection did not indicate any issues that required corrective action.

PXP provided NDT results for the piping circuit covering the last 10 years. The results showed no appreciable wall loss; see Attachment 4.

Post-Incident Corrective Actions

PXP adopted all of Efird Corrosion International, Inc.'s (Efird) recommendations and has fully completed implementing them. Efird recommended the following corrective actions:

- The elemental sulfur formation must be prevented, to mitigate the accelerated corrosion that is occurring. Elemental sulfur formation is prevented by identifying and eliminating all sources of oxygen contamination of the gas stream. Oxygen can enter the gas stream from a number of locations including compressor and pump seals, wash water that is not deaerated, and glycol used in the gas dehydration system.

- The absence of elemental sulfur in the outer deposits with elemental sulfur present in the inner scales indicates that, while significant oxygen was present in the gas at one time, it is currently under improved control.

- Normal ultrasonic inspection of this area in the compressor suction scrubber blowdown is difficult due to the pipe configuration, welds and the voluminous deposits on the steel surface. Since the location of the accelerated corrosion in the section is in a well-defined area of the piping, i.e., the flange and reducer, inspection using radiography is viable and should be concentrated in that area.

- All piping with similar internal exposure, i.e., with wet, sour gas where water and deposits can accumulate in a similar configuration, should be inspected as soon as possible and replaced if extensive corrosion is indicated. Inspection using radiography is recommended where normal ultrasonic inspection is difficult.

- Due to the difficulty in removing all corrosion products containing elemental sulfur, a requirement to mitigate the corrosion, replacement of any areas showing corrosion damage with new pipe spools of like material is the most efficient method.

On August 23, 2012, PXP reported that all platform circuits on Platforms Hidalgo, Harvest, Hermosa, and Irene were reviewed to determine if similar piping configurations with potential for internal exposure to quiescent wet elemental sulfur existed. Sections of such piping were identified on Platforms Hermosa and Hidalgo, with none noted on Platforms Harvest and Irene.

Radiographic inspections of the piping identified above were performed by Accurate NDE Inspections, LLC; see Attachment 5. The radiography inspection reports for Platforms Hermosa and Hidalgo were submitted to the BSEE POCSR District Manager and reviewed by BSEE POCSR District and Regional staff. No significant indicators of erosion or corrosion were noted on either platform. A low reading was identified on 2" piping from V-20 on Platform Hidalgo and has been replaced by PXP. PXP has committed to examining these circuits by radiographic inspection on a five-year interval.

Conclusion

Cause

After extensive review of the circumstances of the incident, along with Efird's failure analysis, the Team finds that the failure at the reducer was caused by accelerated corrosion resulting from elemental sulfur in contact with steel in an area where deposits could build up. Elemental sulfur acts as an oxidizer and is known to accelerate steel corrosion and cause localized attack. The elemental sulfur in the scale was the result of oxygen contamination in the wet, sour gas stream. Oxygen reacts with hydrogen sulfide in liquid water to form elemental sulfur.

Contributing Factors

There are several contributing factors to the failure:

- High H_2S concentrations sufficient to introduce elemental sulfur which exacerbates the corrosion process.

- The flange had a directional microstructure from forging which could have contributed to the corrosion occurring in the flange.

- Low flow rate in the area of the failure due to the reducer configuration. The areas in the reducer with higher flow rates did not have heavy buildup of corrosion products.

Recommendations

The results of the investigation into the February 23, 2012, incident led to the following recommendations for PXP and BSEE from the investigation team to prevent a similar event from occurring aboard Platform Hidalgo or other OCS facilities.

PXP Actions

Fully implement all of Efird Corrosion International, Inc.'s recommendations aboard all platforms operated by PXP. (PXP adopted all of Efird Corrosion International, Inc.'s recommendations and has fully completed implementing them)

Verify PXP's Safety and Environmental Management System (SEMS) program adequately addresses inspection testing and quality assurance of similar piping to prevent future releases of H2S gas from occurring.

BSEE Actions

BSEE verify the status of PXP's work to implement the third party's recommended corrective actions by reviewing the submitted radiography examination reports inspection reports. (completed).

Require radiographic inspections of sections of the piping with potential for internal exposure to quiescent wet sulfur be performed on a five-year interval. The radiography inspection reports for Platforms Hermosa and Hidalgo will be submitted to the BSEE POCSR District Manager to be reviewed by BSEE POCSR District and Regional personnel.

Issue a Safety Alert to POCSR Operators detailing the cause and contributing factors of the piping corrosion failure, noting that normal ultrasonic inspection of flanges and reducers is difficult due to the pipe configuration and welds.

Appendix

Attachment 1 – Location of Lease OCS-P 0450, Area 6B, Block 6524.

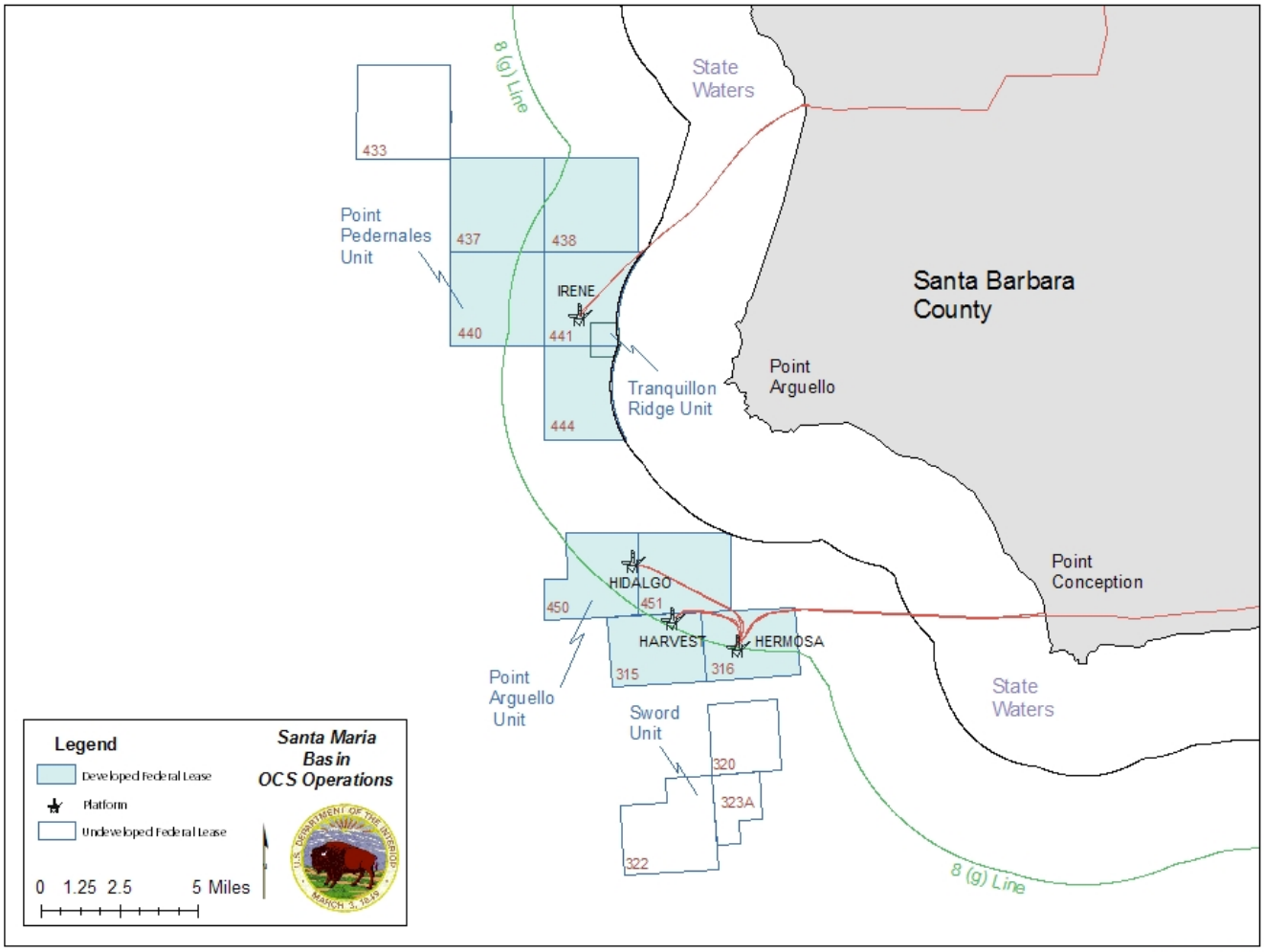
Attachment 2 – OCS Report MMS 2000-48, Investigation of H_2S Gas Release, Platform Hermosa, OCS-P 0316; Recommendations Section

Attachment 3 – Flow Diagram

Attachment 4 – Non-Destructive Testing Results

Attachment 5 – August 23, 2012 Letter from PXP, Detailing additional corrective actions and submitting Radiography reports for Platform Hermosa and Platform Hidalgo.

Attachment 1 – Location of Lease OCS-P 0450, Area 6B, Block 6524



Attachment 2 – OCS Report MMS 2000-48, Investigation of H_2S Gas Release, Platform Hermosa, OCS-P 0316; Recommendations Section

Recommendations

MMS Actions

Safety Alert

The MMS should issue a Safety Alert to lessees concerning this incident. The Safety Alert should emphasize the importance of UT inspections on flowlines containing corrosive and toxic products. The Safety Alert should also recommend the following:

1. Review of UT inspection results should be given a high priority.

2. The minimum allowable wall thicknesses should be determined prior to UT inspections and conveyed to both the UT inspection technician and appropriate platform personnel.

3. The platform foreman should have authority to shut down any equipment and/or the platform immediately if an UT inspection identifies a flowline with a wall thickness at or near the minimum allowable.

4. All platforms with H_2S should have the air inlet H_2S detection device for the living quarters tested regularly.

The Safety Alert should also emphasize the importance of H_2S drills and the use of breathing equipment during those drills.

Inspections

The MMS should consider incorporating the following into inspections of platforms with H2S:

1. Test air inlet heads that detect H_2S on all positive pressure buildings to ensure proper working order.

2. Conduct periodic unannounced H_2S drills, similar to the oil spill drill exercises, and debrief personnel on platform response. This will help keep the element of surprise and minimize complacency among platform personnel with respect to drills.

3. Consider API 570's External Inspection Checklist for Process Piping and determine if the Checklist would be useful in platform process piping inspections.

Maintenance Requirements

The MMS should consider requiring operators to submit inspection plans for process piping and pressure vessels, including test methods, test areas, test frequency and inspection results.

Regulations

The MMS should review ASME B31.3, API 570, and other appropriate industry standards and determine if such documents should become a Document Incorporated by Reference.

Process Modifications

Before the MMS approves any changes in operating conditions different from those in the original design, the MMS should ensure that the operator has closely analyzed the effects of the proposed changes on separate but inter-related upstream or downstream facilities (e.g., pipelines, process equipment), per API RP 75. Process modifications can introduce new hazards or compromise the safeguards built into the original design. Care must be taken to understand the process facility and personnel safety and environmental implications of any changes.

Pacific OCS Operator's Actions

The Team has the following recommendations for Pacific OCS Region operators of platforms processing H_2S gas.

H_2S Contingency Plan

As required by MMS regulations:

1. H_2S contingency plans should be updated to reflect the numbering changes in MMS's regulations.

2. Emergency Notification and Telephone Lists should include all agencies that need to be notified in the event of an H_2S release.

Maintenance and Testing

Pacific OCS Region operators should consider incorporating the guidelines of API 570 and API 510 into their maintenance and testing program, where applicable.

H_2S Drills

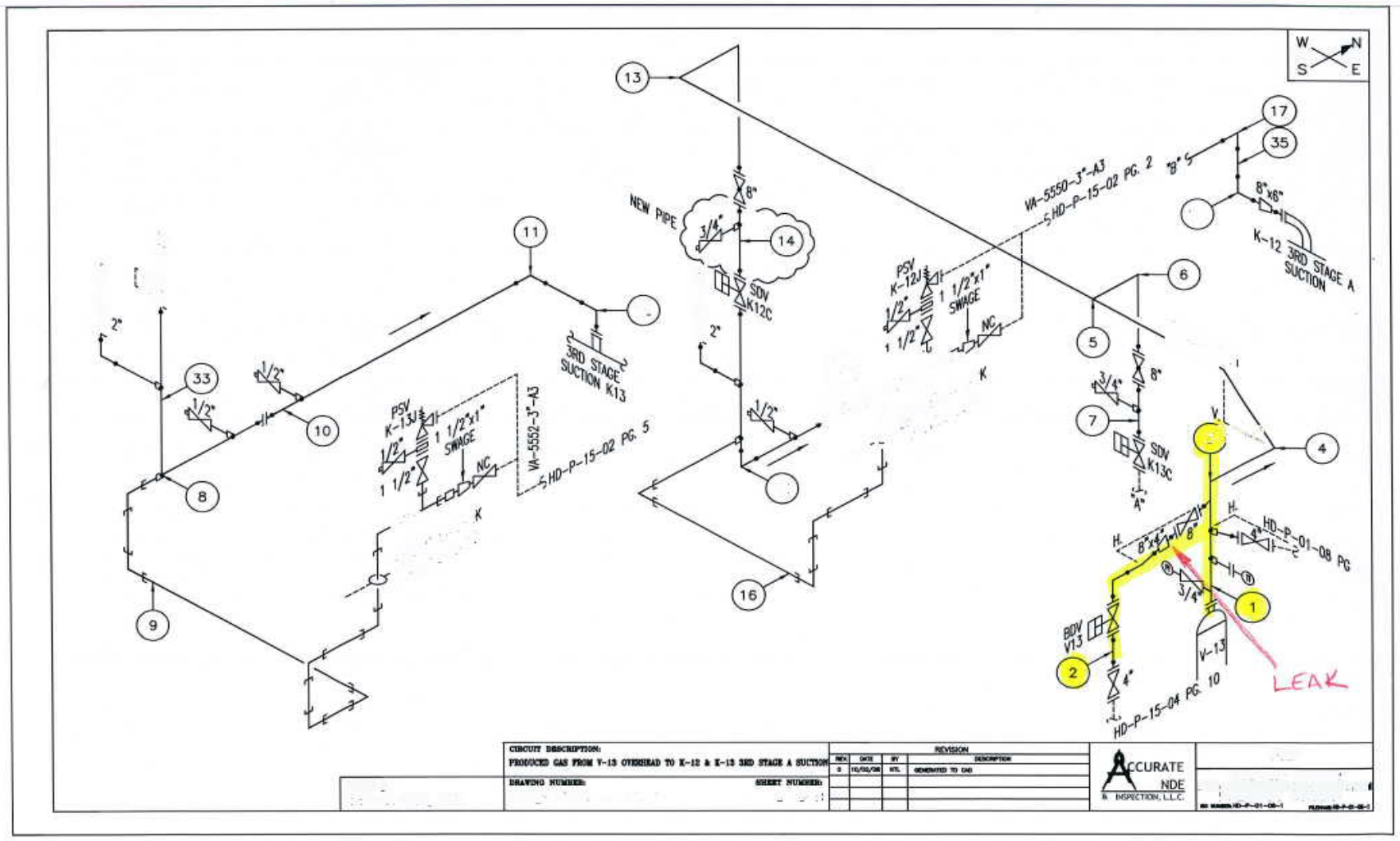
A debriefing after H_2S drills should be conducted to give platform personnel feedback on platform response.

Platform personnel should don breathing equipment during H_2S drills.

Operations Plan

Operations plan should include some procedure for utilizing critical information to avert accidents. This should include established timeframes to review inspection results and established criteria for when immediate action is necessary. The plan should prescribe procedures to initiate an emergency shut-in of facility or component when an UT inspection shows wall loss anomalies in high-pressure and/or toxic material flowlines at or near its minimum thickness.

Attachment 3 – Flow Diagram



Source: PXP

Attachment 4 - Non-Destructive Testing Results

ACCURATE NDE & INSPECTION LLC
MECHANICAL INTEGRITY DEPARTMENT
PLAINS EXPLORATION AND PRODUCTION COMPANY

Corrosion Monitoring Eq/Circ ID Analysis Report

(Report in Inches, Corrosion Rates in MPY)
Analysis: Statistical/Straight Line

Report Date: 07/22/2011 09:39:16

LOCATION: HIDALGO
Eq/Circ ID: HD-P-01-08
Eq Type: ICP
Class: 1
RBI:

Description:
PROD GAS FROM V-13 OVERHD TO K-12 & K-13
3RD STG A SUCT P&ID: E-SB-11-5355, 5357

Flange Rating: 740 lb/in²
Design Pressure: 740 lb/in²
Design Temp: 100 °F

Summary: Group Name:
Insp. Due Date = 10/23/2012
Pred. Ret. Date = 03/29/2014

Group description:
RCR = 3.5 MPY
Rem. Life (from last survey 05/20/2011) = 2.9 yrs

0 C.A. Status: No
Total Caution TMLs = 4

TML Number	Location Description	Ctn TML	First Survey Thick Nt	First Survey Date	Previous Survey Thick Nt	Previous Survey Date	Last Survey Thick Nt	Last Survey Date	Short Term Rate	Long Term Rate	Best Fit Rate	Max Hist CR	Retirement Thickness	Rep TML CR	TML Retirement Date	TML Inspection Due Date
1.01	8" PIPE @ N	N	0.333	04/30/2002	0.325	05/05/2010	0.332	05/20/2011	0.0	0.1	0.9	2.5	0.157 P	2.0	04/25/2061	05/19/2014
1.02	8" PIPE @ E	N	0.346	04/30/2002	0.338	05/05/2010	0.345	05/20/2011	0.0	0.1	1.0	3.1	0.157 P	2.0	01/11/2065	05/19/2014
1.03	8" PIPE @ S	N	0.329	04/30/2002	0.331	05/05/2010	0.330	05/20/2011	1.0	0.0	0.0	1.6	0.157 P	2.0	09/28/2060	05/19/2014
1.04	8" PIPE @ W	N	0.342	04/30/2002	0.328	05/05/2010	0.339	05/20/2011	0.0	0.3	1.4	3.4	0.157 P	2.0	04/25/2063	05/19/2014
2.01	4" PIPE @ N	N	0.252	04/30/2002	0.221	05/05/2010	0.235	05/20/2011	0.0	1.9	2.8	4.8	0.100 S	2.0	12/14/2049	05/19/2014
2.02	4" PIPE @ E	N	0.249	04/30/2002	0.233	05/05/2010	0.224	05/20/2011	8.7	2.8	2.1	8.7	0.100 S	2.8	10/23/2046	05/19/2014
2.03	4" PIPE @ S	N	0.252	04/30/2002	0.238	05/05/2010	0.232	05/20/2011	5.8	2.2	1.9	5.8	0.100 S	2.2	02/04/2049	05/19/2014
2.04	4" PIPE @ W	N	0.279	04/30/2002	0.234	05/05/2010	0.235	05/20/2011	0.0	4.9	4.6	11.3	0.100 S	4.9	12/07/2038	05/19/2014
3.01	8" ELBOW @ T	N	0.316	04/30/2002	0.308	05/05/2010	0.317	05/20/2011	0.0	0.0	0.6	1.9	0.157 P	2.0	01/11/2057	05/19/2014
3.02	8" ELBOW @ M	N	0.325	04/30/2002	0.319	05/05/2010	0.326	05/20/2011	0.0	0.0	0.3	1.2	0.157 P	2.0	08/08/2059	05/19/2014
3.03	8" ELBOW @ B	N	0.312	04/30/2002	0.310	05/05/2010	0.308	05/20/2011	1.9	0.4	0.6	1.9	0.157 P	2.0	06/16/2054	05/19/2014
4.01	8" ELBOW @ T	N	0.321	04/30/2002	0.319	05/05/2010	0.317	05/20/2011	1.9	0.4	0.6	1.9	0.157 P	2.0	01/11/2057	05/19/2014
4.02	8" ELBOW @ M	N	0.339	04/30/2002	0.340	05/05/2010	0.314	05/20/2011	25.0	2.8	1.9	25.0	0.157 P	2.8	03/04/2056	05/19/2014
4.03	8" ELBOW @ B	N	0.333	04/30/2002	0.328	05/05/2010	0.336	05/20/2011	0.0	0.0	0.1	1.6	0.157 P	2.0	06/16/2062	05/19/2014
5.01	8" TEE @ W	N	0.364	04/30/2002	0.340	05/05/2010	0.352	05/20/2011	0.0	1.3	1.7	5.5	0.157 P	2.0	01/11/2067	05/19/2014
5.02	8" TEE @ M	N	0.429	04/30/2002	0.411	05/05/2010	0.426	05/20/2011	0.0	0.3	1.5	4.6	0.157 P	2.0	03/04/2088	05/19/2014
5.03	8" TEE @ E	N	0.426	04/30/2002	0.320	05/05/2010	0.341	05/20/2011	0.0	9.4	8.9	32.9	0.157 P	9.4	12/06/2030	05/19/2014
6.01	8" PIPE @ N	N	0.348	04/30/2002	0.337	05/05/2010	0.326	05/20/2011	10.6	2.4	2.3	10.6	0.157 P	2.4	08/08/2059	05/19/2014
6.02	8" PIPE @ E	N	0.337	04/30/2002	0.332	05/05/2010	0.330	05/20/2011	1.9	0.8	1.4	1.9	0.157 P	2.0	09/28/2060	05/19/2014
6.03	8" PIPE @ S	N	0.350	04/30/2002	0.320	05/05/2010	0.319	05/20/2011	1.0	3.4	3.7	5.6	0.157 P	3.4	08/07/2057	05/19/2014
6.04	8" PIPE @ W	N	0.352	04/30/2002	0.327	05/05/2010	0.324	05/20/2011	2.9	3.1	4.7	6.8	0.157 P	3.1	01/11/2059	05/19/2014
7.01	8" PIPE @ N	N	0.327	04/30/2002	0.329	05/05/2010	0.318	05/20/2011	10.6	1.0	0.7	10.6	0.157 P	2.0	04/25/2057	05/19/2014
7.02	8" PIPE @ E	N	0.324	04/30/2002	0.324	05/05/2010	0.327	05/20/2011	0.0	0.0	0.0	0.5	0.157 P	2.0	11/20/2059	05/19/2014
7.03	8" PIPE @ S	N	0.311	04/30/2002	0.316	05/05/2010	0.314	05/20/2011	1.9	0.0	0.0	1.9	0.157 P	2.0	03/04/2056	05/19/2014
7.04	8" PIPE @ W	N	0.317	04/30/2002	0.314	05/05/2010	0.310	05/20/2011	3.8	0.8	0.8	3.8	0.157 P	2.0	01/11/2055	05/19/2014
8.01	8" ELBOW @ T	N	0.330	04/30/2002	0.325	05/05/2010	0.326	05/20/2011	0.0	0.4	1.0	1.2	0.157 P	2.0	08/08/2059	05/19/2014
8.02	8" ELBOW @ M	N	0.328	04/30/2002	0.313	05/05/2010	0.310	05/20/2011	2.9	2.0	1.8	3.1	0.157 P	2.0	01/11/2055	05/19/2014
8.03	8" ELBOW @ B	N	0.327	04/30/2002	0.340	05/05/2010	0.342	05/20/2011	0.0	0.0	0.0	2.7	0.157 P	2.0	03/04/2064	05/19/2014
9.01	1.5" PIPE @ T	N	0.269	04/30/2002	0.261	05/05/2010	0.246	05/20/2011	14.4	2.5	2.3	14.4	0.100 S	2.5	02/04/2053	05/19/2014
9.02	1.5" PIPE @ N	N	0.265	04/30/2002	0.255	05/05/2010	0.237	05/20/2011	17.3	3.1	3.2	17.3	0.100 S	3.1	07/11/2050	05/19/2014
9.03	1.5" PIPE @ B	N	0.264	04/30/2002	0.246	05/05/2010	0.240	05/20/2011	5.8	2.7	2.2	5.8	0.100 S	2.7	05/20/2051	05/19/2014
9.04	1.5" PIPE @ S	N	0.246	04/30/2002	0.261	05/05/2010	0.254	05/20/2011	6.7	0.0	0.0	6.7	0.100 S	2.0	05/20/2055	05/19/2014
10.01	8" PIPE @ T	N	0.333	04/30/2002	0.310	05/05/2010	0.311	05/20/2011	0.0	2.5	2.4	4.9	0.157 P	2.5	04/25/2055	05/19/2014
10.02	8" PIPE @ E	N	0.331	04/30/2002	0.322	05/05/2010	0.326	05/20/2011	0.0	0.6	0.7	2.1	0.157 P	2.0	08/08/2059	05/19/2014
10.03	8" PIPE @ B	N	0.334	04/30/2002	0.307	05/05/2010	0.308	05/20/2011	0.0	2.9	2.6	7.9	0.157 P	2.9	06/16/2054	05/19/2014
10.04	8" PIPE @ W	N	0.350	04/30/2002	0.307	05/05/2010	0.319	05/20/2011	0.0	3.4	3.5	12.3	0.157 P	3.4	08/07/2057	05/19/2014
11.01	8" ELBOW @ W	N	0.329	04/30/2002	0.325	05/05/2010	0.336	05/20/2011	0.0	0.0	0.0	2.2	0.157 P	2.0	06/16/2062	05/19/2014
11.02	8" ELBOW @ M	N	0.342	04/30/2002	0.310	05/05/2010	0.314	05/20/2011	0.0	3.1	2.9	9.3	0.157 P	3.1	03/04/2056	05/19/2014
11.03	8" ELBOW @ N	N	0.333	04/30/2002	0.319	05/05/2010	0.321	05/20/2011	0.0	1.3	1.5	2.2	0.157 P	2.0	03/04/2058	05/19/2014
11.04	8" ELBOW @ IR	N	0.327	04/30/2002	0.317	05/05/2010	0.309	05/20/2011	7.7	2.0	3.4	7.7	0.157 P	2.0	09/29/2054	05/19/2014
12.01	8" ELBOW @ T	N	0.343	04/30/2002	0.300	05/05/2010	0.310	05/20/2011	0.0	3.6	3.6	13.4	0.157 P	3.6	10/25/2053	05/19/2014

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TML Number	Location Description	Ctn TML	First Survey Thick Nt	First Survey Date	Previous Survey Thick Nt	Previous Survey Date	Last Survey Thick Nt	Last Survey Date	Short Term Rate	Long Term Rate	Best Fit Rate	Max Hist CR	Retirement Thickness	Rep TML CR	TML Retirement Date	TML Inspection Due Date
12.02	8" ELBOW @ M	N	0.356	04/30/2002	0.320	05/05/2010	0.336	05/20/2011	0.0	2.2	3.4	8.0	0.157 P	2.2	06/16/2062	05/19/2014
12.03	8" ELBOW @ B	N	0.356	04/30/2002	0.307	05/05/2010	0.300	05/20/2011	6.7	6.2	5.4	13.0	0.157 P	6.2	05/29/2034	05/19/2014
12.04	8" ELBOW @ IR	N	0.351	04/30/2002	0.321	05/05/2010	0.324	05/20/2011	0.0	3.0	2.9	7.2	0.157 P	3.0	01/11/2059	05/19/2014
13.01	8" ELBOW @ W	N	0.347	04/30/2002	0.340	05/05/2010	0.338	05/20/2011	1.9	1.0	1.4	2.2	0.157 P	2.0	01/11/2063	05/19/2014
13.02	8" ELBOW @ M	N	0.340	04/30/2002	0.331	05/05/2010	0.324	05/20/2011	6.7	1.8	1.9	6.7	0.157 P	2.0	01/11/2059	05/19/2014
13.03	8" ELBOW @ S	N	0.351	04/30/2002	0.337	05/05/2010	0.321	05/20/2011	15.4	3.3	2.6	15.4	0.157 P	3.3	03/04/2058	05/19/2014
14.01	8" PIPE @ N	N	0.322 NM	01/01/2009	0.501	05/05/2010	0.510	05/20/2011	0.0	0.0	0.0	5.6	0.157 P	2.0	03/05/2112	05/19/2014
14.02	8" PIPE @ E	N	0.322 NM	01/01/2009	0.506	05/05/2010	0.516	05/20/2011	0.0	0.0	0.0	8.9	0.157 P	2.0	11/21/2113	05/19/2014
14.03	8" PIPE @ S	N	0.322 NM	01/01/2009	0.491	05/05/2010	0.486	05/20/2011	4.8	0.0	0.0	4.8	0.157 P	2.0	04/26/2105	05/19/2014
14.04	8" PIPE @ W	N	0.322 NM	01/01/2009	0.519	05/05/2010	0.530	05/20/2011	0.0	0.0	0.0	3.4	0.157 P	2.0	11/21/2117	05/19/2014
15.01	8" ELBOW @ T	N	0.324	04/30/2002	0.317	05/05/2010	0.314	05/20/2011	2.9	1.1	1.2	2.9	0.157 P	2.0	03/04/2056	05/19/2014
15.02	8" ELBOW @ M	N	0.315	04/30/2002	0.310	05/05/2010	0.304	05/20/2011	5.8	1.2	1.2	5.8	0.157 P	2.0	04/25/2053	05/19/2014
15.03	8" ELBOW @ B	N	0.311	04/30/2002	0.309	05/05/2010	0.305	05/20/2011	3.8	0.7	1.8	3.8	0.157 P	2.0	08/07/2053	05/19/2014
15.04	8" ELBOW @ IR	N	0.333	04/30/2002	0.355	05/05/2010	0.343	05/20/2011	11.5	0.0	0.0	11.5	0.157 P	2.0	06/16/2064	05/19/2014
16.01	1.5" PIPE @ T	N	0.278	04/30/2002	0.270	05/05/2010	0.263	05/20/2011	6.7	1.7	2.4	6.7	0.100 S	2.0	12/14/2057	05/19/2014
16.02	1.5" PIPE @ N	N	0.275	04/30/2002	0.277	05/05/2010	0.274	05/20/2011	2.9	0.1	0.9	2.9	0.100 S	2.0	02/04/2061	05/19/2014
16.03	1.5" PIPE @ B	N	0.272	04/30/2002	0.289	05/05/2010	0.284	05/20/2011	4.8	0.0	0.0	4.8	0.100 S	2.0	12/15/2063	05/19/2014
16.04	1.5" PIPE @ S	N	0.275	04/30/2002	0.265	05/05/2010	0.261	05/20/2011	3.8	1.5	1.7	3.8	0.100 S	2.0	05/20/2057	05/19/2014
17.01	8" ELBOW @ T	N	0.554	03/30/2005	0.551	05/05/2010	0.549	05/20/2011	1.9	0.8	0.7	18.3	0.157 P	2.0	04/26/2123	05/19/2014
17.02	8" ELBOW @ M	N	0.536	03/30/2005	0.533	05/05/2010	0.532	05/20/2011	1.0	0.7	0.5	35.6	0.157 P	2.0	06/17/2118	05/19/2014
17.03	8" ELBOW @ B	N	0.570	03/30/2005	0.560	05/05/2010	0.555	05/20/2011	4.8	2.4	2.3	27.9	0.157 P	2.4	01/12/2125	05/19/2014
17.04	8" ELBOW @ IR	N	0.626	03/30/2005	0.598	05/05/2010	0.600	05/20/2011	0.0	4.2	4.5	8.0	0.157 P	4.2	10/21/2116	05/19/2014
18.01	8" ELBOW @ T	N	0.549	03/30/2005	0.541	05/05/2010	0.537	05/20/2011	3.8	2.0	1.8	3.8	0.157 P	2.0	11/21/2119	05/19/2014
18.02	8" ELBOW @ M	N	0.509	03/30/2005	0.505	05/05/2010	0.517	05/20/2011	0.0	0.0	0.0	2.2	0.157 P	2.0	03/05/2114	05/19/2014
18.03	8" ELBOW @ B	N	0.575	03/30/2005	0.542	05/05/2010	0.523	05/20/2011	18.3	8.5	7.7	18.3	0.157 P	8.5	05/31/2054	05/19/2014
18.04	8" ELBOW @ IT	N	0.590	03/30/2005	0.586	05/05/2010	0.571	05/20/2011	14.4	3.1	2.4	14.4	0.157 P	3.1	08/08/2129	05/19/2014
19.01	4" ELBOW @ T	N	0.340	04/30/2002	0.337	05/05/2010	0.337	05/20/2011	0.0	0.3	0.8	2.2	0.100 S	2.0	02/05/2079	05/19/2014
19.02	4" ELBOW @ M	N	0.320	04/30/2002	0.321	05/05/2010	0.321	05/20/2011	0.0	0.0	0.4	0.4	0.100 S	2.0	07/11/2074	05/19/2014
19.03	4" ELBOW @ B	N	0.330	04/30/2002	0.325	05/05/2010	0.328	05/20/2011	0.0	0.2	1.0	1.1	0.100 S	2.0	07/10/2076	05/19/2014
19.04	4" ELBOW @ IR	N	0.336	04/30/2002	0.381	05/05/2010	0.391	05/20/2011	0.0	0.0	0.0	1.6	0.100 S	2.0	07/11/2094	05/19/2014
20.01	4" TEE @ T	N	0.450	04/30/2002	0.439	05/05/2010	0.440	05/20/2011	0.0	1.1	2.5	3.7	0.100 S	2.0	07/11/2108	05/19/2014
20.02	4" TEE @ M	N	0.455	04/30/2002	0.442	05/05/2010	0.430	05/20/2011	11.5	2.8	2.6	11.5	0.100 S	2.8	09/02/2105	05/19/2014
20.03	4" TEE @ B	N	0.460	04/30/2002	0.437	05/05/2010	0.428	05/20/2011	8.7	3.5	2.8	8.7	0.100 S	3.5	02/05/2105	05/19/2014
21.01	4" ELBOW @ T	N	0.350	04/30/2002	0.373	05/05/2010	0.366	05/20/2011	6.7	0.0	0.0	10.6	0.100 S	2.0	05/20/2087	05/19/2014
21.02	4" ELBOW @ M	N	0.351	04/30/2002	0.348	05/05/2010	0.344	05/20/2011	3.8	0.8	0.8	3.8	0.100 S	2.0	02/04/2081	05/19/2014
21.03	4" ELBOW @ B	N	0.349	04/30/2002	0.378	05/05/2010	0.376	05/20/2011	1.9	0.0	0.0	23.1	0.100 S	2.0	03/29/2090	05/19/2014
21.04	4" ELBOW @ IR	N	0.400	04/30/2002	0.389	05/05/2010	0.391	05/20/2011	0.0	1.0	1.3	15.4	0.100 S	2.0	07/11/2094	05/19/2014
22.01	4" ELBOW @ T	N	0.350	04/30/2002	0.350	05/05/2010	0.347	05/20/2011	2.9	0.3	0.6	2.9	0.100 S	2.0	12/14/2081	05/19/2014
22.02	4" ELBOW @ M	N	0.345	04/30/2002	0.346	05/05/2010	0.343	05/20/2011	2.9	0.2	0.4	2.9	0.100 S	2.0	10/23/2080	05/19/2014
22.03	4" ELBOW @ B	N	0.340	04/30/2002	0.337	05/05/2010	0.326	05/20/2011	10.6	1.5	1.8	10.6	0.100 S	2.0	12/15/2075	05/19/2014
22.04	4" ELBOW @ IR	N	0.370	04/30/2002	0.360	05/05/2010	0.361	05/20/2011	0.0	1.0	3.3	3.3	0.100 S	2.0	12/14/2085	05/19/2014
23.01	3" ELBOW @ T	N	0.219	04/30/2002	0.223	05/05/2010	0.225	05/20/2011	0.0	0.0	0.0	0.0	0.100 S	2.0	02/05/2047	05/19/2014
23.02	3" ELBOW @ M	N	0.220	04/30/2002	0.221	05/05/2010	0.219	05/20/2011	1.9	0.1	0.6	1.9	0.100 S	2.0	05/20/2045	05/19/2014
23.03	3" ELBOW @ B	N	0.220	04/30/2002	0.214	05/05/2010	0.222	05/20/2011	0.0	0.0	0.8	1.9	0.100 S	2.0	03/29/2046	05/19/2014
23.04	3" ELBOW @ IR	N	0.235	04/30/2002	0.230	05/05/2010	0.231	05/20/2011	0.0	0.4	0.7	2.2	0.100 S	2.0	10/23/2048	05/19/2014
24.01	.75" PIPE @ T	Y	0.120	04/30/2002	0.110	05/05/2010	0.113	05/20/2011	0.0	0.8	0.7	5.7	0.100 S	2.0	02/05/2015	03/28/2013
24.02	**.75" PIPE @ E**	**Y ***	**0.130**	**04/30/2002**	**0.110**	**05/05/2010**	**0.110**	**05/20/2011**	**0.0**	**2.2**	**2.1**	**5.1**	**0.100 S**	**2.2**	**03/29/2014**	**10/23/2012**
24.03	.75" PIPE @ B	Y	0.135	04/30/2002	0.108	05/05/2010	0.111	05/20/2011	0.0	2.7	2.4	8.6	0.100 S	2.7	07/11/2014	12/14/2012
24.04	.75" PIPE @ W	Y	0.127	04/30/2002	0.113	05/05/2010	0.112	05/20/2011	1.0	1.7	1.3	5.3	0.100 S	2.0	10/23/2014	02/04/2013
25.01	.75" PIPE @ T	N	0.148	04/30/2002	0.137	05/05/2010	0.139	05/20/2011	0.0	1.0	1.1	4.1	0.100 S	2.0	07/11/2022	05/19/2014
25.02	.75" PIPE @ E	N	0.140	04/30/2002	0.122	05/05/2010	0.124	05/20/2011	0.0	1.8	1.8	4.6	0.100 S	2.0	03/29/2018	05/19/2014
25.03	.75" PIPE @ B	N	0.136	04/30/2002	0.126	05/05/2010	0.125	05/20/2011	1.0	1.2	0.9	4.8	0.100 S	2.0	07/11/2018	05/19/2014
25.04	.75" PIPE @ W	N	0.140	04/30/2002	0.130	05/05/2010	0.131	05/20/2011	0.0	1.0	1.5	4.6	0.100 S	2.0	03/28/2020	05/19/2014
26.01	4" ELBOW @ T	N	0.230	04/30/2002	0.212	05/05/2010	0.210	05/20/2011	1.9	2.2	2.1	3.1	0.100 S	2.2	10/23/2042	05/19/2014

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TML Number	Location Description	Ctn TML	First Survey Thick Nt	First Survey Date	Previous Survey Thick Nt	Previous Survey Date	Last Survey Thick Nt	Last Survey Date	Short Term Rate	Long Term Rate	Best Fit Rate	Max Hist CR	Retirement Thickness	Rep TML CR	TML Retirement Date	TML Inspection Due Date
26.02	4" ELBOW @ M	N	0.228	04/30/2002	0.221	05/05/2010	0.232	05/20/2011	0.0	0.0	0.3	2.2	0.100 S	2.0	02/04/2049	05/19/2014
26.03	4" ELBOW @ B	N	0.245	04/30/2002	0.240	05/05/2010	0.246	05/20/2011	0.0	0.0	0.2	1.6	0.100 S	2.0	02/04/2053	05/19/2014
26.04	4" ELBOW @ IR	N	0.250	04/30/2002	0.282	05/05/2010	0.274	05/20/2011	7.7	0.0	0.0	7.7	0.100 S	2.0	02/04/2061	05/19/2014
27.01	4" TEE @ N	N	0.370	04/30/2002	0.365	05/05/2010	0.361	05/20/2011	3.8	1.0	1.2	3.8	0.100 S	2.0	12/14/2085	05/19/2014
27.02	4" TEE @ M	N	0.360	04/30/2002	0.371	05/05/2010	0.375	05/20/2011	0.0	0.0	0.0	0.5	0.100 S	2.0	12/14/2089	05/19/2014
27.03	4" TEE @ S	N	0.368	04/30/2002	0.364	05/05/2010	0.366	05/20/2011	0.0	0.2	0.8	3.2	0.100 S	2.0	05/20/2087	05/19/2014
28.01	4" PIPE @ N	N	0.235	04/30/2002	0.214	05/05/2010	0.218	05/20/2011	0.0	1.9	1.8	5.8	0.100 S	2.0	02/04/2045	05/19/2014
28.02	4" PIPE @ E	N	0.226	04/30/2002	0.215	05/05/2010	0.212	05/20/2011	2.9	1.5	1.9	4.3	0.100 S	2.0	05/20/2043	05/19/2014
28.03	4" PIPE @ S	N	0.233	04/30/2002	0.210	05/05/2010	0.216	05/20/2011	0.0	1.9	2.4	4.6	0.100 S	2.0	07/10/2044	05/19/2014
28.04	4" PIPE @ W	N	0.226	04/30/2002	0.196	05/05/2010	0.189	05/20/2011	6.7	4.1	4.4	8.0	0.100 S	4.1	02/02/2033	05/19/2014
29.01	4" ELBOW @ T	N	0.235	04/30/2002	0.218	05/05/2010	0.219	05/20/2011	0.0	1.8	1.8	2.7	0.100 S	2.0	05/20/2045	05/19/2014
29.02	4" ELBOW @ M	N	0.230	04/30/2002	0.222	05/05/2010	0.224	05/20/2011	0.0	0.7	0.9	1.6	0.100 S	2.0	10/23/2046	05/19/2014
29.03	4" ELBOW @ B	N	0.232	04/30/2002	0.244	05/05/2010	0.238	05/20/2011	5.8	0.0	0.0	5.8	0.100 S	2.0	10/23/2050	05/19/2014
29.04	4" ELBOW @ IR	N	0.252	04/30/2002	0.261	05/05/2010	0.273	05/20/2011	0.0	0.0	0.0	1.6	0.100 S	2.0	10/23/2060	05/19/2014
30.01	4" ELBOW @ T	N	0.233	04/30/2002	0.233	05/05/2010	0.238	05/20/2011	0.0	0.0	0.0	1.6	0.100 S	2.0	10/23/2050	05/19/2014
30.02	4" ELBOW @ M	N	0.230	04/30/2002	0.236	05/05/2010	0.239	05/20/2011	0.0	0.0	0.0	0.4	0.100 S	2.0	02/05/2051	05/19/2014
30.03	4" ELBOW @ B	N	0.241	04/30/2002	0.230	05/05/2010	0.239	05/20/2011	0.0	0.2	0.6	2.1	0.100 S	2.0	02/05/2051	05/19/2014
30.04	4" ELBOW @ IR	N	0.250	04/30/2002	0.250	05/05/2010	0.246	05/20/2011	3.8	0.4	0.7	3.8	0.100 S	2.0	02/04/2053	05/19/2014
31.01	4" ELBOW @ T	N	0.245	04/30/2002	0.239	05/05/2010	0.245	05/20/2011	0.0	0.0	0.9	1.2	0.100 S	2.0	10/23/2052	05/19/2014
31.02	4" ELBOW @ M	N	0.248	04/30/2002	0.242	05/05/2010	0.250	05/20/2011	0.0	0.0	0.3	1.2	0.100 S	2.0	03/29/2054	05/19/2014
31.03	4" ELBOW @ B	N	0.250	04/30/2002	0.249	05/05/2010	0.238	05/20/2011	10.6	1.3	1.0	10.6	0.100 S	2.0	10/23/2050	05/19/2014
31.04	4" ELBOW @ IR	N	0.250	04/30/2002	0.251	05/05/2010	0.246	05/20/2011	4.8	0.4	0.6	4.8	0.100 S	2.0	02/04/2053	05/19/2014
32.01	4" ELBOW @ T	N	0.230	04/30/2002	0.227	05/05/2010	0.230	05/20/2011	0.0	0.0	0.4	1.6	0.100 S	2.0	07/10/2048	05/19/2014
32.02	4" ELBOW @ M	N	0.226	04/30/2002	0.230	05/05/2010	0.228	05/20/2011	1.9	0.0	0.0	1.9	0.100 S	2.0	12/15/2047	05/19/2014
32.03	4" ELBOW @ B	N	0.235	04/30/2002	0.222	05/05/2010	0.221	05/20/2011	1.0	1.5	1.8	3.2	0.100 S	2.0	12/14/2045	05/19/2014
32.04	4" ELBOW @ IR	N	0.257	04/30/2002	0.271	05/05/2010	0.265	05/20/2011	5.8	0.0	0.0	5.8	0.100 S	2.0	07/11/2058	05/19/2014
33.01	8" PIPE @ E	N	0.313	03/30/2005	0.309	05/05/2010	0.310	05/20/2011	0.0	0.5	0.6	1.6	0.157 P	2.0	01/11/2055	05/19/2014
33.02	8" PIPE @ S	N	0.319	03/30/2005	0.307	05/05/2010	0.316	05/20/2011	0.0	0.5	1.0	2.5	0.157 P	2.0	09/28/2056	05/19/2014
33.03	8" PIPE @ W	N	0.322	03/30/2005	0.311	05/05/2010	0.304	05/20/2011	6.7	2.9	2.7	6.7	0.157 P	2.9	04/25/2053	05/19/2014
34.01	8" PIPE @ T	N	0.503	03/30/2005	0.480	05/05/2010	0.485	05/20/2011	0.0	2.9	3.3	6.5	0.157 P	2.9	01/12/2105	05/19/2014
34.02	8" PIPE @ E	N	0.496	03/30/2005	0.491	05/05/2010	0.477	05/20/2011	13.5	3.1	2.5	13.5	0.157 P	3.1	09/30/2102	05/19/2014
34.03	8" PIPE @ B	N	0.521	03/30/2005	0.507	05/05/2010	0.520	05/20/2011	0.0	0.2	0.9	3.4	0.157 P	2.0	01/12/2115	05/19/2014
34.04	8" PIPE @ W	N	0.521	03/30/2005	0.501	05/05/2010	0.512	05/20/2011	0.0	1.5	2.1	4.9	0.157 P	2.0	09/29/2112	05/19/2014
35.01	8" PIPE @ N	N	0.511	03/30/2005	0.505	05/05/2010	0.515	05/20/2011	0.0	0.0	0.0	1.2	0.157 P	2.0	08/08/2113	05/19/2014
35.02	8" PIPE @ E	N	0.515	03/30/2005	0.510	05/05/2010	0.490	05/20/2011	19.2	4.1	3.2	19.2	0.157 P	4.1	07/17/2092	05/19/2014
35.03	8" PIPE @ S	N	0.504	03/30/2005	0.500	05/05/2010	0.492	05/20/2011	7.7	2.0	1.6	7.7	0.157 P	2.0	01/12/2107	05/19/2014
35.04	8" PIPE @ W	N	0.511	03/30/2005	0.500	05/05/2010	0.501	05/20/2011	0.0	1.6	1.7	2.8	0.157 P	2.0	08/08/2109	05/19/2014

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(Report in Inches, Corrosion Rates in MPY) Report Date: 07/22/2011 09:39:21
Analysis: Statistical/Straight Line

LOCATION: HIDALGO
Eq/Circ ID: HD-P-01-08
Eq Type: ICP
Class: 1
RBI:

Description:
PROD GAS FROM V-13 OVERHD TO K-12 & K-13
3RD STG A SUCT P&ID: E-SB-11-5355, 5357

Flange Rating: 740 lb/in²
Design Pressure: 740 lb/in²
Design Temp: 100 °F

TML Corrosion Rates are each the maximum of:
(A) -- Calculated Corrosion Rates x 1.00 : Varies
(B) -- Default Corrosion Rate : 2.0 MPY

Representative Corrosion Rate is the Maximum of:
(A) -- Average Corrosion Rate x 1.10 : 2.6 MPY
(B) -- Average Max 25.0% of TMLs, Min of 2 : 3.5 MPY
(C) -- Formula Corrosion Rate (Sigma = 1.28) : 2.7 MPY
(D) -- Default Corrosion Rate : 2.0 MPY
Representative Corrosion Rate = 3.5 MPY

TML thickness readings taken above 150.0 °F have been compensated by 1% per 100.0 °F

TML thickness readings have not been compensated for growths.

TML Life calculations are based on the maximum of the Rep. TML CR and the RCR using Long Term Corrosion Rate.

Nominal thickness is used for TML corrosion rate calculations with less than 3 surveys.

Minimum time between inspections required for corrosion rate calculation is 6 months.

TML Inspection Interval is:
(A) -- Minimum(TML Life / 2.00, 3.00 years)

Eq/Circ ID Last Survey Date is based on the LAST of the last 0% of TML survey dates (Min 1).

Eq/Circ ID Estimated life = 2.9 years from the most recent survey date.
(Estimated Life is based on the average of the earliest 0% (Min 1) TML retirement dates.)

Predicted Eq/Circ ID Retirement date is 03/29/2014

Recommended Eq/Circ UT/RT Inspection Date is 10/23/2012
UT/RT Inspection Interval is the minimum(Remaining life / 2.0, 3.00 years).

Caution TML Logic: TML Corrosion Rate > 30.0 MPY .OR. TML Remaining Life < 5.00 Years.

There are 4 Caution TMLs in this Eq/Circ ID.

PXP

Plains Exploration & Production Company

August 23, 2012

Mr. Phillip Schroeder
California District Manager
Bureau of Safety and Environmental Enforcement
Pacific OCS Region
770 Paseo Camarillo, #200
Camarillo, CA 93010

Subject: Additional Follow-Up to Previous Incident
Personnel Muster from Production Activity
Platform Hidalgo (OCS P-0450) PXP Incident # INR-12-0142

Dear Mr. Schroeder:

In addition to the follow up letter and failure analysis report dated May 8, 2012, PXP has implemented the following corrective actions:

- Original piping spool at Hidalgo has been replaced; follow up radiographic inspection (attached) and hydro test performed.

- All platform circuits were reviewed to determine if similar piping configurations with potential for internal exposure to quiescent wet elemental sulfur existed. Sections of piping were identified on Platforms Hermosa and Hidalgo, with none noted on Platforms Harvest or Irene. Radiographic inspections of the piping identified above were performed (attached).

Please review the attached Radiography reports for Platform Hermosa and Platform Hidalgo. In the future, these circuits will be examined on a five year interval by radiographic inspection.

Sincerely,

Gerald R. Penny
Production Superintendent

Attach.

cc: Ops Manager
Foremen
EH&S
BSEE

PXP

Platform Hidalgo

Produced Gas Piping Components
Profile Radiography Examination

Inspection Report
June 2012

Prepared By:

ACCURATE NDE & INSPECTION, L.L.C.

209 Industrial Trace Road
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Rev	Date	Description
1	06/11/12	Issued for Review

209 Industrial Trace Broussard, LA 70518
Phone: (337) 839-1055 Fax: (337) 839-1059

June 11, 2012

Plains Exploration & Production Company

Re: Platform Hidalgo, Profile Radiography Inspection

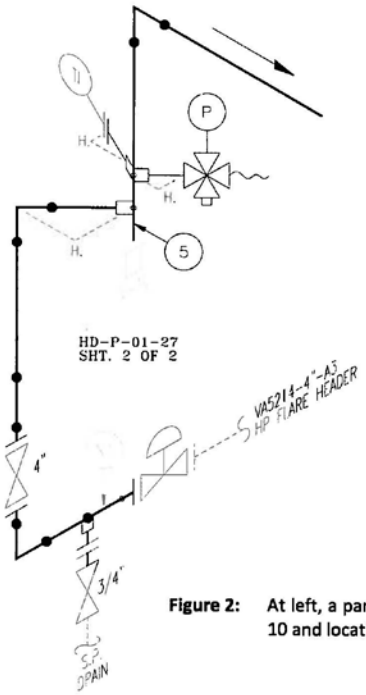
An Erosion/Corrosion crew traveled to Platform Hidalgo on June 3, 2012 to perform *Profile Radiography Examinations* on various produced gas piping circuit components. Shown below are partial isometric drawings which specify the location of radiography (X1) and processed radiographic images for each component inspected. The circuits examined during this inspection include:

- **HD-P-01-27** (near Vapor Recovery Suction Scrubber, V-10), 4" Sch. STD Pipe
- **HD-P-01-02** (near Main Gas Compressor - 1st Stage Suction, V-11), 4" Sch. STD 90° Elbow
- **HD-P-01-05** (near Main Gas Compressor - 2nd Stage Suction, V-12), 4"x2" Sch. STD Reducer
- **HD-P-01-08** (near Main Gas Compressor - 3rd Stage Suction, V-13), 8"x4" Sch. XH Reducer

Table 1: Produced Gas from *V-10* to K-12 & K-13 VRU Suction & PSV-V-10

Circuit ID	P&ID	Design	Component Examined	Pressure T-Min	Actual Wall Thk.
HD-P-01-27	E-SB-11-5352	285 PSIG at 100°F	4" Sch. STD (0.237" W.T.) Pipe	0.032"	**0.249"**

Note: Actual wall thickness determined by profile radiography. See Fig. 1 for radiographic image.



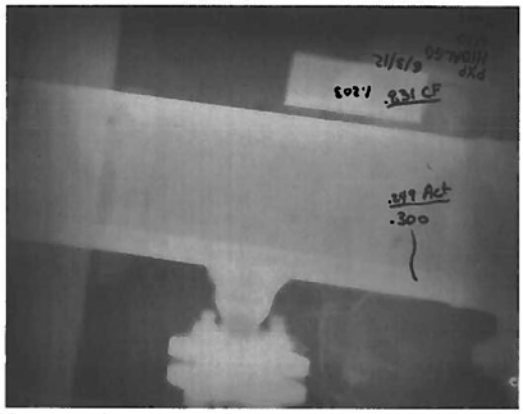


Figure 1: Above at right, processed profile radiographic image which shows a minimum (actual) wall thickness of 0.249" and no significant indications of erosion / corrosion.

Figure 2: At left, a partial view of isometric drawing HD-P-01-27, sheet 2 of 2. The tie-in to V-10 and location of profile radiography (X1) are shown in red.

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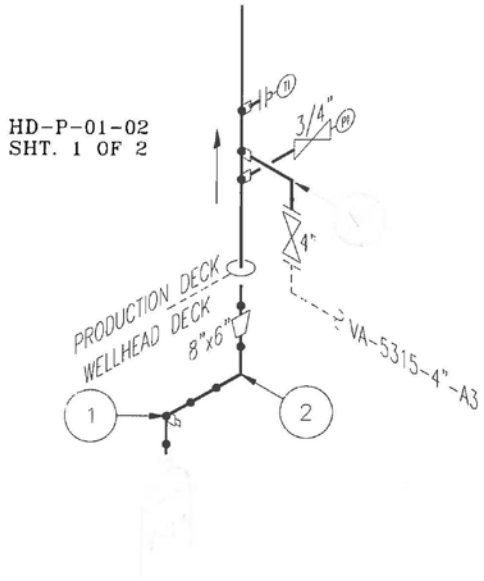
Table 2: Produced Gas from *V-10* Overhead to K-12 & K-13 1st Stage Suction

Circuit ID	P&ID	Design	Component Examined	Pressure T-Min	Actual Wall Thk.
HD-P-01-02	E-SB-11-5353	285 PSIG at 100°F	4" Sch. STD (0.237" W.T.) 90° Elbow	0.032"	**0.258"**

Note: Actual wall thickness determined by profile radiography. See Fig. 3 for radiographic image.



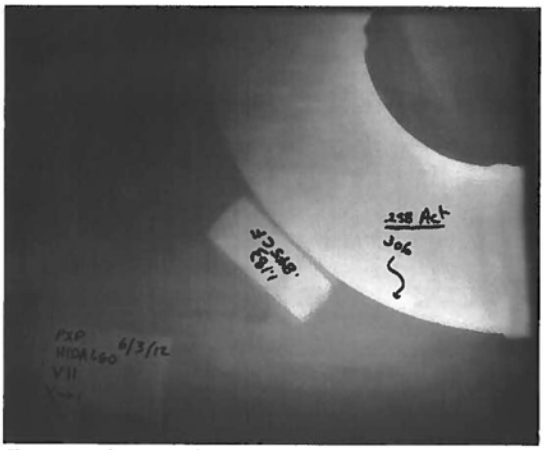


Figure 3: Above at right, processed profile radiographic image which shows a minimum (actual) wall thickness of 0.258" and no significant indications of erosion / corrosion.

Figure 4: At left, a partial view of isometric drawing HD-P-01-02, sheet 1 of 2. The tie-in to V-11 and location of profile radiography (X1) are shown in red.

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Table 3: Produced Gas from *V-12* Overhead to K-12 & K-13 2nd Stage Suction

Circuit ID	P&ID	Design	Component Examined	Pressure T-Min	Actual Wall Thk.
HD-P-01-05	E-SB-11-5354	285 PSIG at 100°F	4"x2" Sch. STD (0.237" W.T.) Reducer	0.032"	**0.286"**

Note: Actual wall thickness determined by profile radiography. See Fig. 5 for radiographic image.

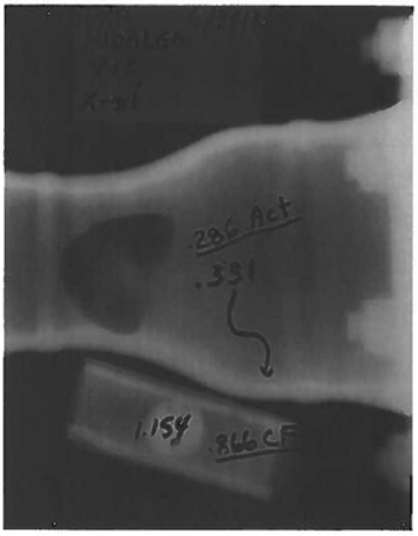

Figure 5: Above at right, processed profile radiographic image which shows a minimum (actual) wall thickness of 0.286" and no significant indications of erosion / corrosion.

The dark spot seen on the 2" side of the reducer is not a defect. It is present because this part of the film was in contact with another piece of film while being processed (a similar spot will be seen on Fig. 7).

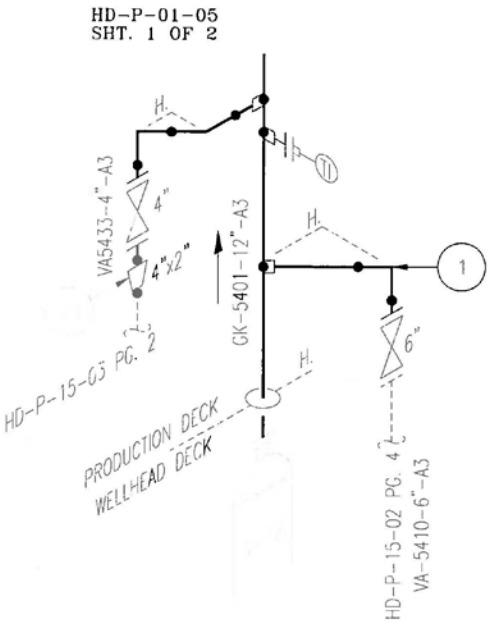

Figure 6: At left, a partial view of isometric drawing HD-P-01-05, sheet 1 of 2. The tie-in to V-12 and location of profile radiography (X1) are shown in red.

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Table 4: Produced Gas from *V-13* Overhead to K-12 & K-13 2nd Stage Suction

Circuit ID	P&ID	Design	Component Examined	Pressure T-Min	Actual Wall Thk.
HD-P-01-08	E-SB-11-5355, 5357	740 PSIG at 100°F	8"x4" Sch. XH (0.500" W.T.) Reducer	0.157"	**0.528"**

Notes: Actual wall thickness determined by profile radiography. See Fig. 7 for radiographic image.
Previous UT thickness readings (TML 44, February 24, 2012) at this reducer are:
Top = 0.538", East = 0.536", Bottom = 0.534", and West = 0.530"

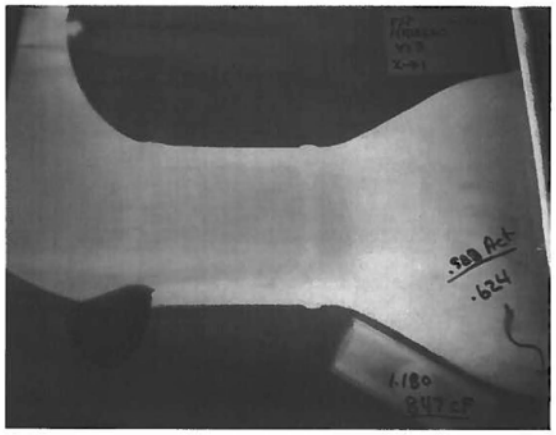

Figure 7: Above at right, processed profile radiographic image which shows a minimum (actual) wall thickness of 0.528" and no significant indications of erosion / corrosion.

Similar to Fig. 7, the dark spot seen near the 4" elbow is not a defect. It is present because this part of the film was in contact with another piece of film while being processed (see Fig. 5).

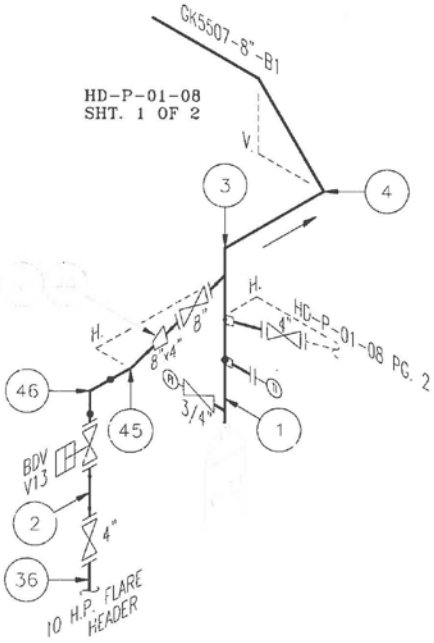

Figure 8: At left, a partial view of isometric drawing HD-P-01-08, sheet 1 of 2. The tie-in to V-13 and location of profile radiography (X1) are shown in red.

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Upon review, results indicate that all areas examined during this inspection are above the designed nominal thickness as well as the required structural thickness (structural T-Min = 0.100") and calculated minimum pressure thickness (see tables 1 through 4, pressure T-Min). Thickness monitoring locations, TML's, will be added to the above components radiographically examined during future ultrasonic thickness inspections.

If you have any questions regarding this inspection or need any assistance, please contact me at Accurate NDE: (337) 839-1055.

Best regards,

Nicholas J. Hebert
Accurate NDE & Inspection, LLC
Mechanical Integrity Department

PXP

Platform Hidalgo

Produced Gas Piping Components
Profile Radiography Examination

Inspection Report
July 6 2012

Prepared By:

ACCURATE NDE & INSPECTION, L.L.C.

209 Industrial Trace Road
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Phone: (337) 839-1055
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Rev	Date	Description
1	07/26/12	Issued for Review

209 Industrial Trace Broussard, LA 70518
Phone. (337) 839-1055 Fax: (337) 839-1059

July 16, 2012

Plains Exploration & Production Company

Re: Platform Hidalgo, Profile Radiography Inspection

An Erosion/Corrosion crew traveled to Platform Hidalgo on July 6, 2012 to perform *Profile Radiography Examinations* on various produced gas piping circuit components. Included are partial isometric drawings which specify the location of radiography (X#) as well as inspection set-up photographs, processed radiographic images and ultrasonic thicknesses obtained for each component inspected. The circuits examined during this inspection include:

- **HD-P-01-08:** Produced Gas from V-13 Overhead to K-12 & K-13 3rd Stage-A Suction (4" Sch. XH 90° Elbow)
- **HD-P-01-15:** Produced Gas from V-17 Overhead to E14 (3" Sch. XH 90° Elbow)
- **HD-P-01-33:** Produced Gas from V-9 to VRU, E-11, V-92, V-71, & V-72 (3" Sch. XH Pipe)
- **HD-P-15-08:** Vent from V-86 to M-12 (3" Sch. XH 90° Elbow)
- **V-20:** Gas from V-20 to HP Flare Header (4" Sch. STD Pipe & 2" Sch. XH Pipe, items not part of annual inspection cycle)

List of Tables:

TABLE 1: PRODUCED GAS FROM V-10 TO K-12 & K-13 VRU SUCTION & PSV-V-10 2
TABLE 2: PRODUCED GAS FROM V-17 OVERHEAD TO E-14 3
TABLE 3: PRODUCED GAS FROM V-9 TO VRU, E-11, V-92, V-71, & V-72 4
TABLE 4: VENT FROM V-86 TO M-12 5
TABLE 5: GAS FROM V-20 TO HP FLARE HEADER 6

209 Industrial Trace Broussard, LA 70518
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TABLE 1: PRODUCED GAS FROM V-10 TO K-12 & K-13 VRU SUCTION & PSV-V-10

Circuit ID	P&ID	Design	Component Examined	Pressure T-Min	Actual Thk. (UT)		Actual Thk. (RT)
HD-P-01-08	E-SB-11-5355, 5357	740 PSIG at 100°F	4" Sch. XH (0.337" W.T.) 90° Elbow	0.082"	0.372"	Top	0.370"
					0.368"	Mid	
					0.377"	South	

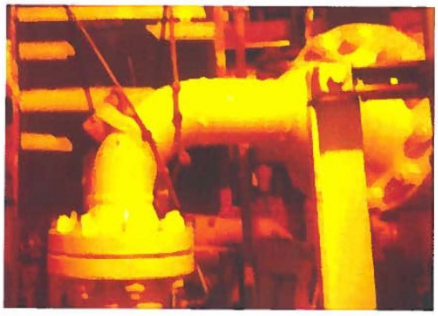

Figure 1: Set up for radiography at HD-P-01-08, 4" elbow (TML 46).

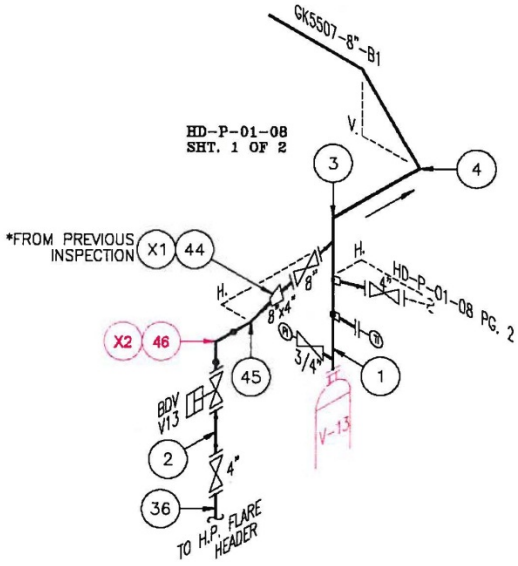

Figure 2: A partial view of isometric drawing HD-P-01-08, sheet 1 of 2. The tie-in to V-13 and location of profile radiography (X2) are shown in red.

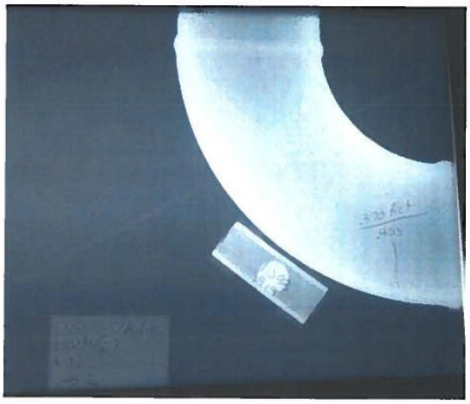

Figure 3: Processed radiographic image at HD-P-01-08, 4" elbow (TML 46), which shows a minimum (actual) wall thickness of 0.370" and no significant indications of erosion or corrosion.

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TABLE 2: PRODUCED GAS FROM V-17 OVERHEAD TO E-14

Circuit ID	P&ID	Design	Component Examined	Pressure T-Min	Actual Thk. (UT)		Actual Thk. (RT)	
HD-P-01-15	E-SB-11-5358, 5359	1350 PSIG at 100°F	3" Sch. XH (0.300" W.T.) 90° Elbow	0.115"	0.267"	Top	0.255"	X1.1
					0.258"	Mid	0.148"	X1.2
					0.263"	East		

Notes: 1) Currently, a designated TML is not assigned to this area. **TML 11** shall be incorporated during the next UT inspection.
2) Internal corrosion observed by profile radiography at X1.2.

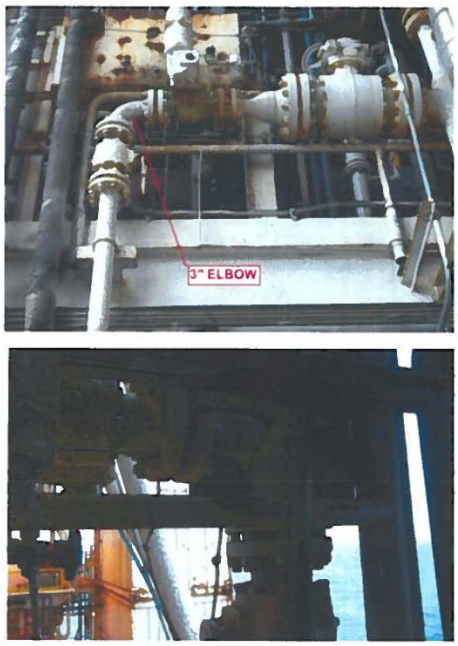

Figure 5: Location of 3" elbow upstream of BDV-V17 (top), and set-up for radiography (bottom) for HD-P-01-15, 3" elbow (TML 11 to be assigned to circuit).

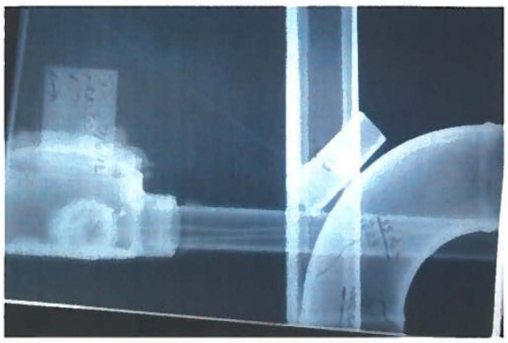

Figure 4: Processed radiographic image at HD-P-01-15, 3" elbow, which shows a minimum (actual) wall thickness of 0.255" at the outside radius and 0.148" near the weld on the inside radius. Indications of internal corrosion have been observed at this inside radius area (X1.2).

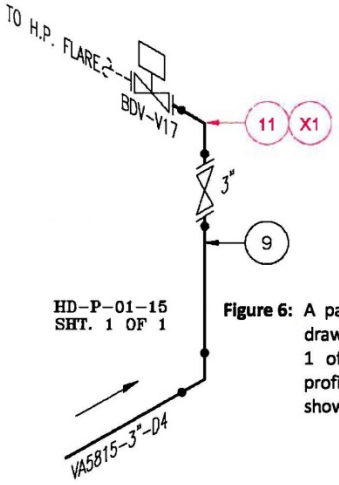

Figure 6: A partial view of isometric drawing HD-P-01-15, sheet 1 of 1. The location of profile radiography (X1) is shown in red.

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TABLE 3: PRODUCED GAS FROM V-9 TO VRU, E-11, V-92, V-71, & V-72

Circuit ID	P&ID	Design	Component Examined	Pressure T-Min	Actual Thk. (UT)		Actual Thk. (RT)
HD-P-01-33	E-SB-11-5351	285 PSIG at 100°F	4" Sch. STD (0.237" W.T.) Pipe	0.032"	0.293"	North	0.283"
					0.290"	East	
					0.299"	South	
					0.304"	West	

Figure 7: Set up for radiography at HD-P-01-33, 4" pipe (TML 4).

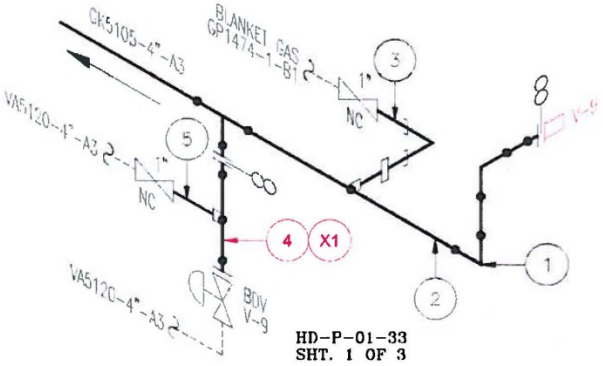

Figure 8: A partial view of isometric drawing HD-P-01-33, sheet 1 of 3. The tie-in to V-9 and location of profile radiography (X1) are shown in red.

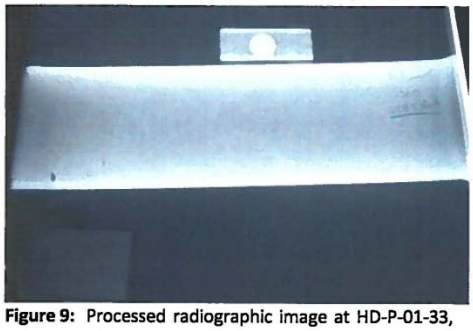

Figure 9: Processed radiographic image at HD-P-01-33, 4" pipe (TML 4), which shows a minimum (actual) wall thickness of 0.283" and no significant indications of erosion or corrosion.

209 Industrial Trace Broussard, LA 70518
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TABLE 4: VENT FROM V-86 TO M-12

Circuit ID	P&ID	Design	Component Examined	Pressure T-Min	Actual Thk. (UT)		Actual Thk. (RT)
HD-P-15-08	E-SB-10350-8A E-SB-11-5337	285 PSIG at 100°F	3" Sch. XH (0.300" W.T.) 90° Elbow	0.020"	0.333"	North	0.328"
					0.330"	Mid	
					0.325"	Bottom	

Notes: 1) Currently, a designated TML is not assigned to this area. **TML 18** shall be incorporated during the next UT inspection.

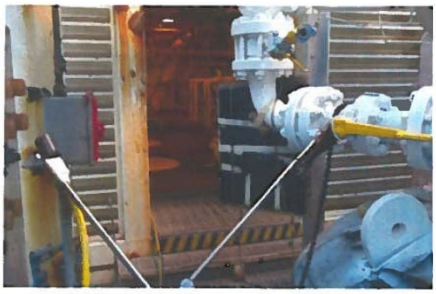

Figure 10: Set up for radiography at HD-P-15-08, 3" pipe (TML 18 to be assigned to circuit).

Figure 12: Processed radiographic image at HD-P-01-33, 4" pipe (TML 11 to be assigned to circuit), which shows a minimum (actual) wall thickness of 0.283" and no significant indications of erosion or corrosion.

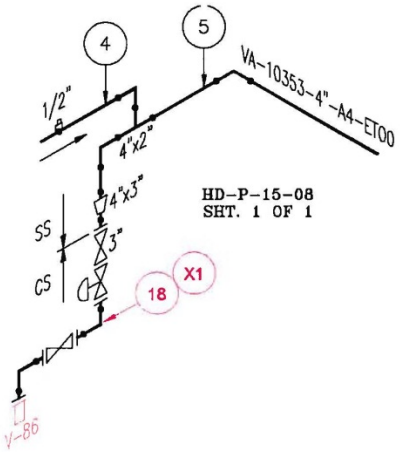

Figure 11: A partial view of isometric drawing HD-P-15-08, sheet 1 of 1. The tie-in to V-86 and location of profile radiography (X1) are shown in red.

209 Industrial Trace Broussard, LA 70518
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TABLE 5: GAS FROM V-20 TO HP FLARE HEADER

Circuit ID	P&ID	Design	Component Examined	Pressure T-Min	Actual Thk. (UT)		Actual Thk. (RT)
N/A	E-SB-11-5357	740 PSIG at 100°F	4" Sch. STD (0.237" W.T.) Pipe	0.082"	0.333"	North	0.240"
					0.330"	East	
					0.330"	South	
					0.330"	West	
			2" Sch. XH (0.218" W.T.) Pipe	0.043"	N/A		0.036"

Notes: 1) Currently, this piping is not part of the annual inspection cycle at Platform Hidalgo.
2) The thickness obtained for the 2" pipe, upstream of BDV-V20, is below the required pressure TMin. Severe active external corrosion is present, as shown in figure x. Technician reports that plans are in place to replace this section of pipe.

Figure 13: Set-up for radiography of 4" pipe near BDV-V20 (item is not part of annual inspection cycle).

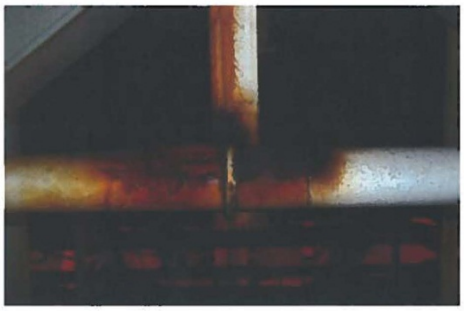

Figure 14: Set-up for radiography of 2" pipe upstream of BDV-V20 (item is not part of annual inspection cycle).

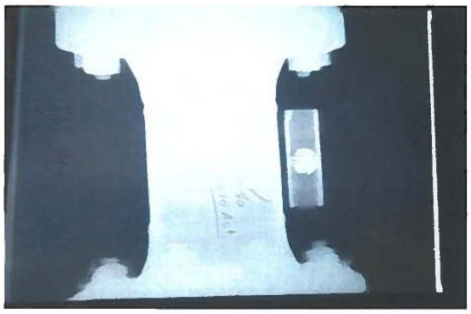

Figure 15: Processed radiographic image for 4" pipe, which shows a minimum (actual) wall thickness of 0.240" and no significant indications of erosion or corrosion.

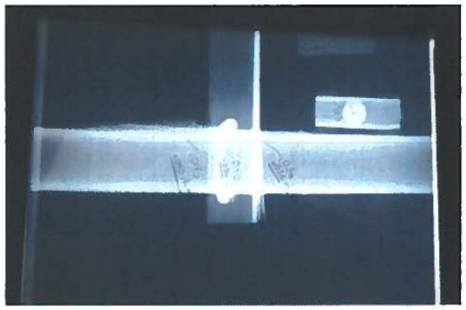

Figure 16: Processed radiographic image for 2" pipe, which shows a minimum (actual) wall thickness of 0.036". Severe external corrosion has been observed.

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Upon review, results indicate a low reading of 0.148" (P-Tmin = 0.115") found on the inside radius of the 3" 90° elbow for V-17 (HD-P-01-15). Additionally, a low reading of 0.036" (P-Tmin = 0.043") has been found on 2" piping from V-20. This item, as well as the 4" pipe, from V-20 is not on the annual inspection cycle at this time. It was reported to the technician by operations that the 2" pipe below the required thickness would be replaced.

All other areas examined during this inspection are above the designed nominal thickness as well as the required structural thickness (structural T-Min = 0.100") and calculated minimum pressure thickness (see tables 1 through 4, Pressure T-Min). Thickness monitoring locations, TML's, will be added to the above components radiographically examined during future ultrasonic thickness inspections if not currently present.

If you have any questions regarding this inspection or need any assistance, please contact me at Accurate NDE: (337) 839-1055.

Best regards,

Nicholas J. Hebert
Accurate NDE & Inspection, LLC
Mechanical Integrity Department

PXP

Platform Hermosa

Produced Gas Piping Components
Profile Radiography Examination

Inspection Report
July 2012

Prepared By:

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Rev	Date	Description
1	07/30/12	Issued for Review

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July 27, 2012

Plains Exploration & Production Company

Re: Platform Hermosa, Profile Radiography Inspection

An Erosion/Corrosion crew traveled to Platform Hermosa on July 7, 2012 to perform *Profile Radiography Examinations* on various produced gas piping circuit components. Included are partial isometric drawings which specify the location of radiography (X#) as well as inspection set-up photographs and processed radiographic images. Ultrasonic thicknesses have also been obtained for each component inspected where possible. The circuits examined during this inspection include:

- **HM-P-01-02:** Produced Gas from K-10, K-11 1st Stage Discharge to E-11
  - 2" Sch. XH 90° Elbow (BDV K-10B)
  - 2" Sch. XH 90° Elbow (BDV K-11B)
- **HM-P-01-05:** Produced Gas from 2nd Stage Discharge K-12, 13, 14 to E-12
  - 4" Sch. STD 90° Tee & 4"x3" Sch. STD Reducer (BDV K-12B)
  - 3" Sch. XH 90° Elbow (BDV K-13B)
  - 3" Sch. XH Pipe (BDV K-14B)
- **HM-P-01-08:** Produced Gas from 3rd Stage Discharge K-12, 13, 14 to E-13
  - 3" Sch. XH 90° Elbow (BDV K-12A)
  - 3" Sch. XH 90° Elbow (BDV K-13A)
  - 3" Sch. XH Tee & 3"x2" Sch. XH Reducer (BDV K-14A)
- **HD-P-01-12:** Produced Gas from V-17 to K-14
  - 2" Sch. XH Pipe (BDV V-17)
- **HM-P-01-15:** Produced Gas from V-86 to E-86
  - 3" Sch. STD 90° Elbow (BDV V-86B)
- **HM-P-01-21:** Produced Gas from V-6, 7, 9, K-10 & K-11 to E-10
  - 3"x2" Sch. XH Reducer (BDV V-9)
  - 2" Sch. XH Pipe (BDV K-11A)
  - 2" Sch. XH 90° Elbow (BDV K-10A)
- **HM-P-20-03:** Sweetened Gas from E-90 to Vapor Recovery
  - 2" Sch. XH 90° Elbow (BDV V-20)

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TABLE 1: (BDV K-10B) PRODUCED GAS FROM K-10, K-11 1ST STAGE DISCHARGE TO E-11

Circuit ID	P&ID	Design	Component Examined	Pressure T-Min	Actual Thk. (UT)		Actual Thk. (RT)	
HM-P-01-02	R-SB-014	740 PSIG at 100°F	2" Sch. XH (0.218" W.T.) 90° Elbow	0.043 in.	0.213 in.	West	0.229 in.	X1.1 (Pipe)
					0.218 in.	Middle	0.221 in.	X1.2 (Elbow)
					0.222 in.	South		

Figure 1: Set up for radiography at HM-P-01-02, 2" elbow (TML 5).

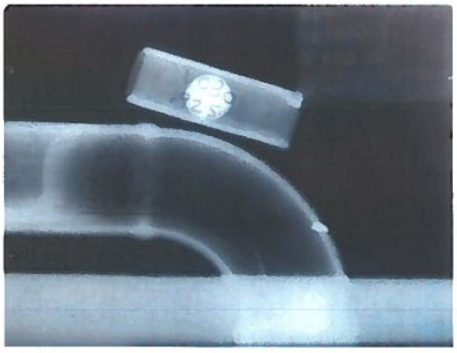

Figure 3: Processed radiographic image at HM-P-01-02, 2" elbow (TML 5), which shows a minimum (actual) wall thickness of 0.221". A thickness of 0.229" (X1.1) has also been observed at the adjoined 2" pipe. No significant indications of erosion or corrosion have been found.

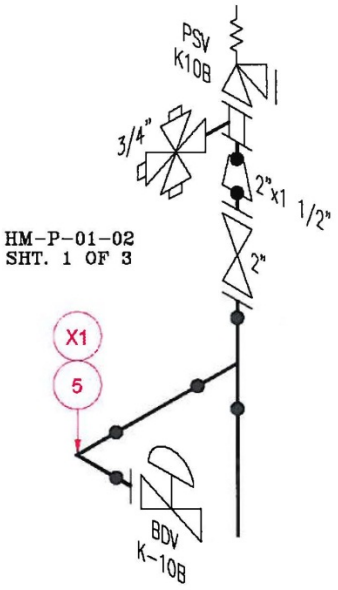

Figure 2: A partial view of isometric drawing HM-P-01-02, sheet 1 of 3. The location of profile radiography (X1) is shown in red.

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TABLE 2: (BDV K-11B) PRODUCED GAS FROM K-10, K-11 1ST STAGE DISCHARGE TO E-11

Circuit ID	P&ID	Design	Component Examined	Pressure T-Min	Actual Thk. (UT)		Actual Thk. (RT)	
HM-P-01-02	R-SB-014	740 PSIG at 100°F	2" Sch. XH (0.218" W.T.) 90° Elbow	0.043 in.	0.222 in.	West	0.203 in.	X1.1 (Pipe)
					0.220 in.	Middle	0.238 in.	X1.2 (Elbow)
					0.227 in.	South		

Figure 4: Set up for radiography at HM-P-01-02, 2" elbow (TML 10).

Figure 6: Processed radiographic image at HM-P-01-02, 2" elbow (TML 10), which shows a minimum (actual) wall thickness of 0.238". A thickness of 0.203" (X1.1) has also been observed at the adjoined 2" pipe. No significant indications of erosion or corrosion have been found.

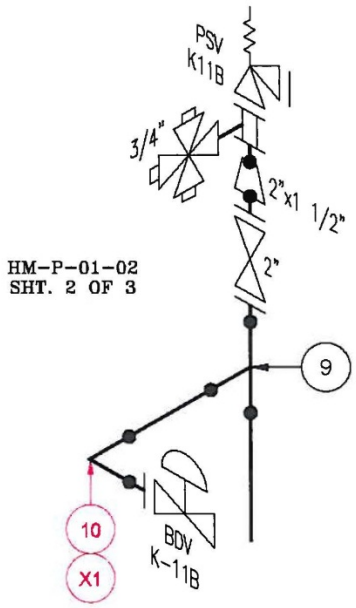

Figure 5: A partial view of isometric drawing HM-P-01-02, sheet 2 of 3. The location of profile radiography (X1) is shown in red.

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TABLE 3: (BDV K-12B) PRODUCED GAS FROM 2ND STAGE DISCHARGE K-12, 13, 14 TO E-12

Circuit ID	P&ID	Design	Component Examined	Pressure T-Min	Actual Thk. (UT)		Actual Thk. (RT)	
HM-P-01-05	R-SB-014	740 PSIG at 100°F	4" Sch. STD (0.237" W.T.) Tee	0.082 in.	0.255 in.	Top	0.232 in.	X1.1 (Pipe)
					0.277 in.	Middle	0.231 in.	X1.2 (Tee)
					0.248 in.	Bottom		
			4"x3" Sch. STD (0.237" W.T.) Reducer	0.082 in.	0.253 in.	North	0.244 in.	X1.3 (Red.)
					0.247 in.	South		
					0.258 in.	East		
					0.250 in.	West		

Note: TML numbers 27 and 28 shall be assigned to the 4" tee and 4"x3" reducer, respectively, during the next scheduled UT inspection.

Figure 7: Set up for radiography at HM-P-01-05; 4" tee (TML 27 to be assigned) and 4"x3" reducer (TML 28 to be assigned).

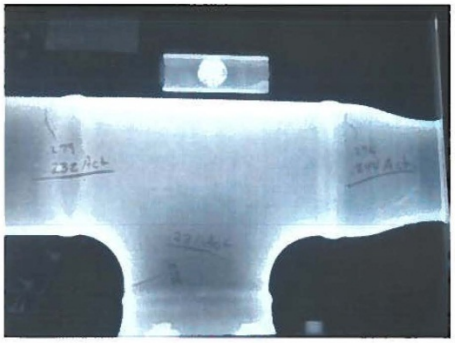

Figure 9: Processed radiographic image at HD-P-01-05, 4" tee (TML 27 to be assigned), which shows a minimum (actual) wall thickness of 0.231" and no significant indications of erosion or corrosion. Thicknesses of 0.232" (X1.1) and 0.244" (X1.3, TML 28 to be assigned) have also been noted on the adjoined pipe and reducer, respectively.

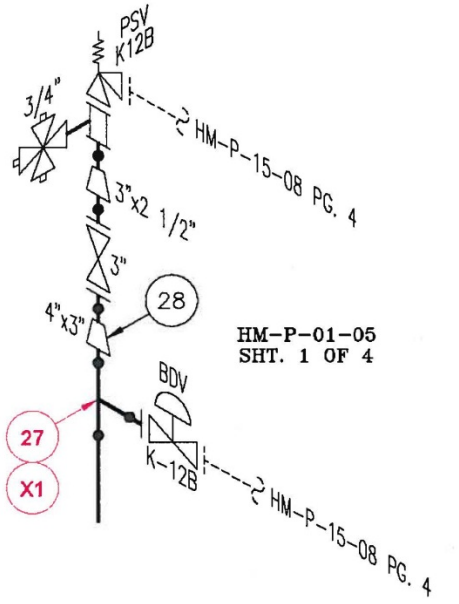

Figure 8: A partial view of isometric drawing HD-P-01-05, sheet 1 of 4. The location of profile radiography (X1) is shown in red.

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TABLE 4: (BDV K-13B) PRODUCED GAS FROM 2ND STAGE DISCHARGE K-12, 13, 14 TO E-12

Circuit ID	P&ID	Design	Component Examined	Pressure T-Min	Actual Thk. (UT)	Actual Thk. (RT)
HM-P-01-05	R-SB-014	740 PSIG at 100°F	3" Sch. XH (0.300" W.T.) 90° Elbow	0.064 in.	N/A (Insulated)	0.304 in. X1.1 (Pipe) 0.265 in. X1.2 (Elbow) 0.283 in. X1.3 (Pipe)

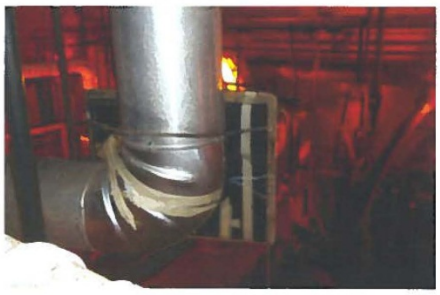

Figure 10: Set up for radiography at HD-P-01-05, 3" elbow (UT not performed due to insulation).

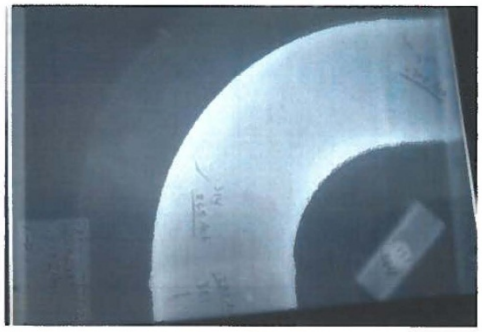

Figure 12: Processed radiographic image at HD-P-01-05, 3" elbow (UT not performed due to insulation), which shows a minimum (actual) wall thickness of 0.265" and no significant indications of erosion or corrosion. Thicknesses of 0.304 (X1.1) and 0.283" (X1.3) have also been observed at the adjoined 3" pipe.

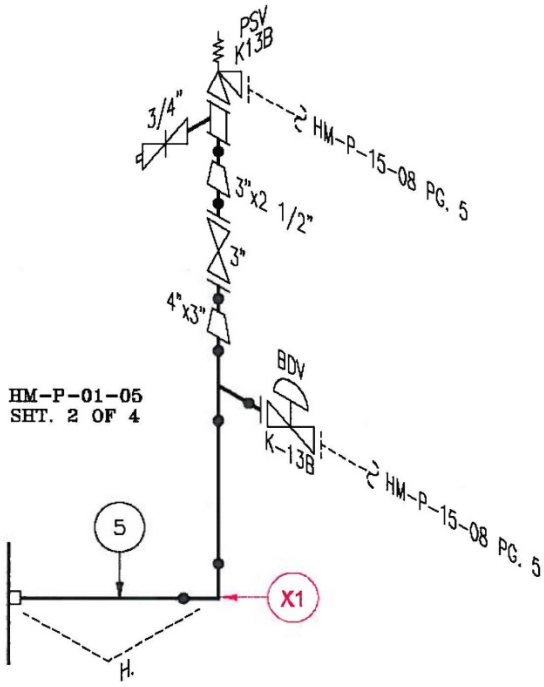

Figure 11: A partial view of isometric drawing HD-P-01-05, sheet 2 of 4. The location of profile radiography (X1) is shown in red.

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TABLE 5: (BDV K-14B) PRODUCED GAS FROM 2ND STAGE DISCHARGE K-12, 13, 14 TO E-12

Circuit ID	P&ID	Design	Component Examined	Pressure T-Min	Actual Thk. (UT)	Actual Thk. (RT)
HM-P-01-05	R-SB-014	740 PSIG at 100°F	3" Sch. XH (0.300" W.T.) Pipe	0.064 in.	N/A (Insulated)	0.295 in. X1 (Pipe)

Figure 13: Set up for radiography at HD-P-01-05, 3" pipe (UT not performed due to insulation).

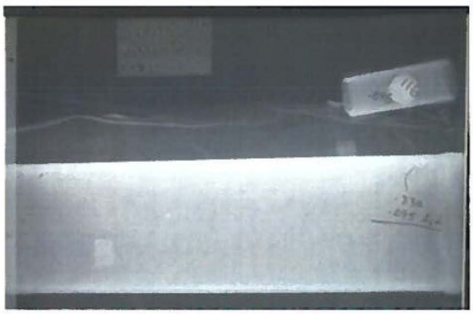

Figure 15: Processed radiographic image at HD-P-01-05, 3" pipe (UT not performed due to insulation), which shows a minimum (actual) wall thickness of 0.295" and no significant indications of erosion or corrosion.

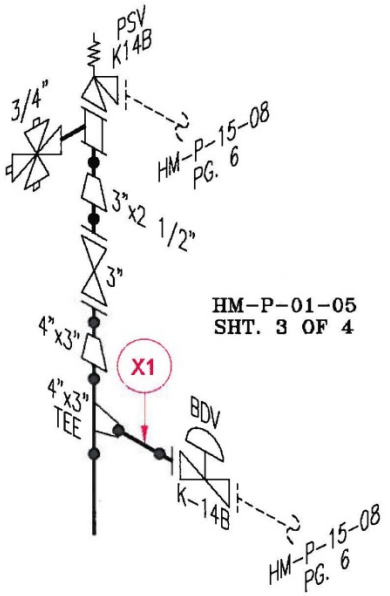

Figure 14: A partial view of isometric drawing HD-P-01-05, sheet 3 of 4. The location of profile radiography (X1) is shown in red.

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TABLE 6: (BDV K-12A) PRODUCED GAS FROM 3RD STAGE DISCHARGE K-12, 13, 14 TO E-13

Circuit ID	P&ID	Design	Component Examined	Pressure T-Min	Actual Thk. (UT)	Actual Thk. (RT)
HM-P-01-08	R-SB-014	1350 PSIG at 200°F	3" Sch. XH (0.300" W.T.) 90° Elbow	0.115 in.	N/A (Insulated)	0.298 in. X1.1 (Pipe) 0.259 in. X1.2 (Elbow) 0.298 in. X1.3 (Pipe)

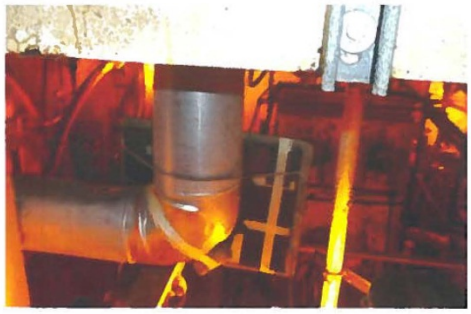

Figure 16: Set up for radiography at HD-P-01-08, 3" elbow (UT not performed due to insulation).

Figure 18: Processed radiographic image at HD-P-01-08, 3" elbow (UT not performed due to insulation), which shows a minimum (actual) wall thickness of 0.259" and no significant indications of erosion or corrosion. Thicknesses of 0.298" (X1.1) and 0.298" (X1.3) have also been observed at the adjoined 3" pipe.

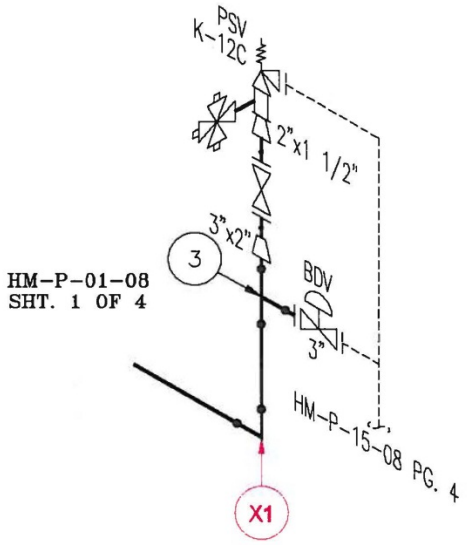

Figure 17: A partial view of isometric drawing HD-P-01-08, sheet 1 of 4. The location of profile radiography (X1) is shown in red.

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TABLE 7: (BDV K-13A) PRODUCED GAS FROM 3RD STAGE DISCHARGE K-12, 13, 14 TO E-13

Circuit ID	P&ID	Design	Component Examined	Pressure T-Min	Actual Thk. (UT)	Actual Thk. (RT)
HM-P-01-08	R-SB-014	1350 PSIG at 200°F	3" Sch. XH (0.300" W.T.) 90° Elbow	0.115 in.	N/A (Insulated)	0.275 in. X1.1 (Pipe) 0.365 in. X1.2 (Elbow) 0.379 in. X1.3 (Pipe)

Figure 19: Set up for radiography at HD-P-01-08, 3" elbow (UT not performed due to insulation).

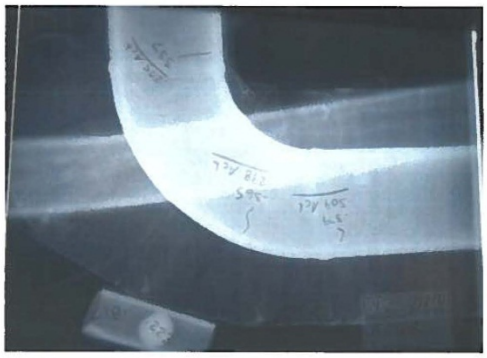

Figure 21: Processed radiographic image at HD-P-01-08, 3" elbow (UT not performed due to insulation), which shows a minimum (actual) wall thickness of 0.365". Thicknesses of 0.275" (X1.1) and 0.379" (X1.3) have also been observed at the adjoined 3" pipe. Light active external corrosion has been noted at the 3" pipe (X1.1).

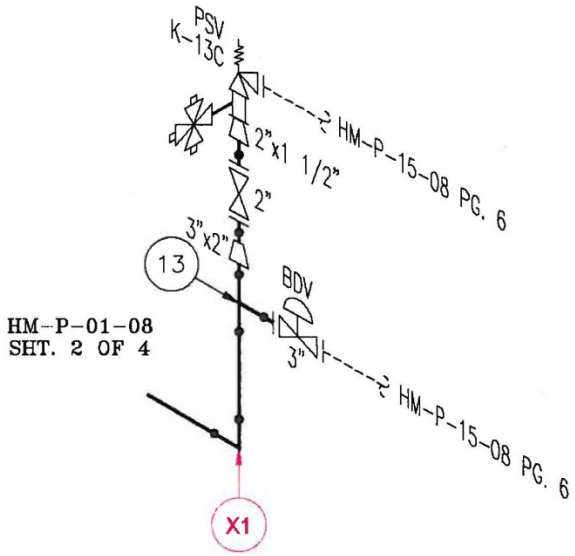

Figure 20: A partial view of isometric drawing HD-P-01-08, sheet 2 of 4. The location of profile radiography (X1) is shown in red.

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TABLE 8: (BDV K-14A) PRODUCED GAS FROM 3RD STAGE DISCHARGE K-12, 13, 14 TO E-13

Circuit ID	P&ID	Design	Component Examined	Pressure T-Min	Actual Thk. (UT)		Actual Thk. (RT)	
HM-P-01-08	R-SB-014	1350 PSIG at 200°F	3" Sch. XH (0.300" W.T.) Tee	0.115 in.	0.348 in.	Top	0.319 in.	X1.1 (Tee)
					0.401 in.	Middle		
					0.357 in.	Bottom		
			3"x2" Sch. XH (0.300" W.T.) Reducer	0.115 in.	0.322 in.	North	0.321 in.	X1.2 (Red.)
					0.348 in.	South		
					0.330 in.	East		
					0.325 in.	West		

Note: TML numbers 31 and 32 shall be assigned to the 3" tee and 3"x2" reducer, respectively, during the next scheduled UT inspection.

Figure 22: Set up for radiography at HM-P-01-08; 3" tee (TML 31 to be assigned) and 3"x2" reducer (TML 32 to be assigned).

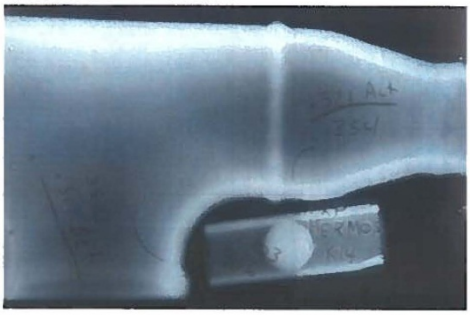

Figure 24: Processed radiographic image at HD-P-01-08, 3" tee (TML 31 to be assigned), which shows a minimum (actual) wall thickness of 0.319". A thickness of 0.321" has also been observed at the 3"x2" reducer (TML 32 to be assigned). No significant indications of erosion or corrosion were noted.

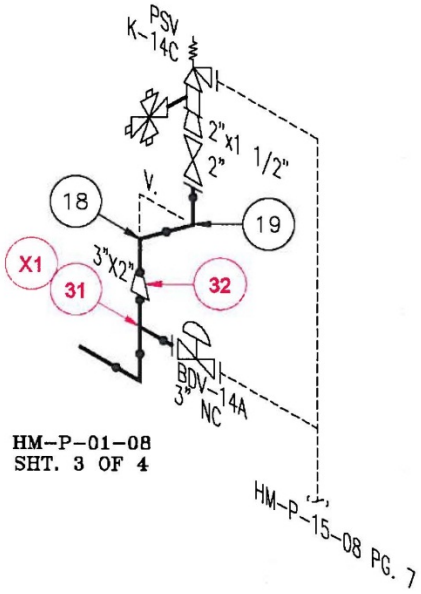

Figure 23: A partial view of isometric drawing HD-P-01-08, sheet 3 of 4. The location of profile radiography (X1) as well as new TML's 31 and 32 are shown in red.

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TABLE 9: (BDV V-17) PRODUCED GAS FROM V-17 TO K-14

Circuit ID	P&ID	Design	Component Examined	Pressure T-Min	Actual Thk. (UT)		Actual Thk. (RT)	
HM-P-01-12	R-SB-015	1350 PSIG at 200°F	2" Sch. XH (0.218" W.T.) Pipe	0.078 in.	0.235 in.	Top	0.252 in.	X1 (Pipe)
					0.228 in.	East		
					0.241 in.	Bottom		
					0.222 in.	West		

Figure 25: Set up for radiography at HM-P-01-12, 2" pipe (TML 1).

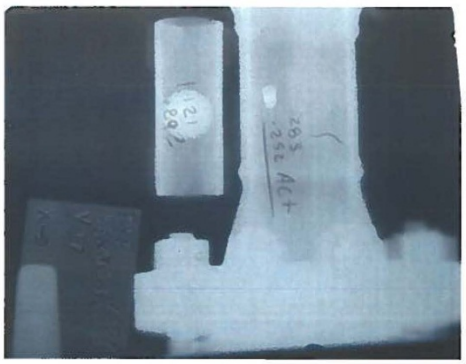

Figure 27: Processed radiographic image at HM-P-01-12, 2" pipe (TML 1), which shows a minimum (actual) wall thickness of 0.252" and no significant indications of erosion or corrosion have been found.

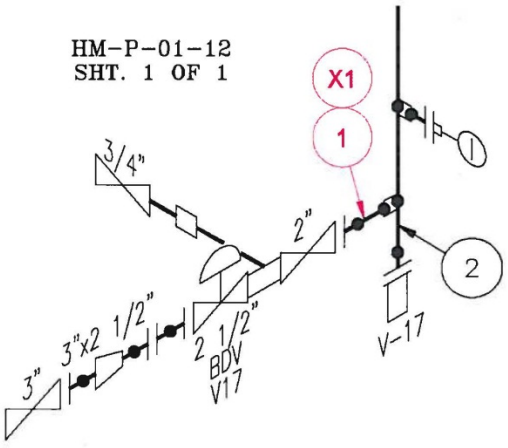

Figure 26: A partial view of isometric drawing HM-P-01-12, sheet 1 of 1. The location of profile radiography (X1) is shown in red.

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TABLE 10: (BDV V-86B) PRODUCED GAS FROM V-86 TO E-86

Circuit ID	P&ID	Design	Component Examined	Pressure T-Min	Actual Thk. (UT)		Actual Thk. (RT)	
HM-P-01-15	E-SB-10337	1350 PSIG at 200°F	3" Sch. STD (0.216" W.T.) 90° Elbow	0.115 in.	0.245 in.	North	0.254 in.	X1 (Elbow)
					0.233 in.	Middle		
					0.249 in.	Bottom		

Note: TML number 14 shall be assigned to the 3" elbow during the next scheduled UT inspection.

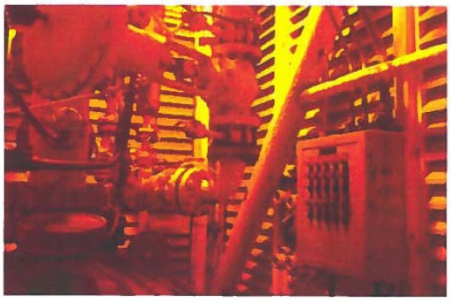

Figure 28: Set up for radiography at HM-P-01-15, 3" elbow (TML 14 to be assigned).

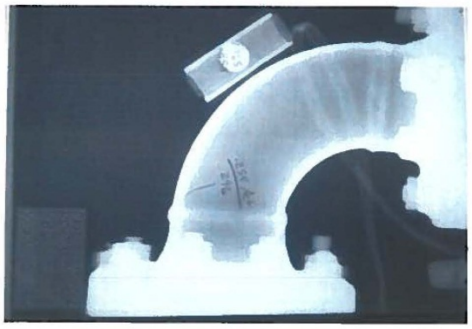

Figure 30: Processed radiographic image at HM-P-01-15, 3" elbow (TML 14 to be assigned), which shows a minimum (actual) wall thickness of 0.254" and no significant indications of erosion or corrosion have been found.

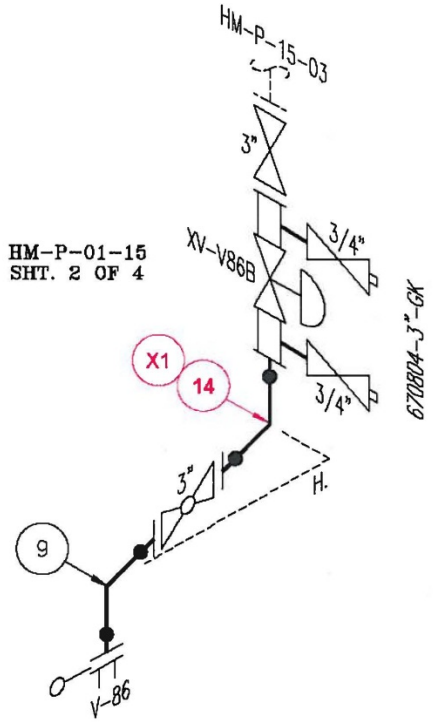

Figure 29: A partial view of isometric drawing HM-P-01-15, sheet 2 of 4. The location of profile radiography (X1) is shown in red.

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TABLE 11: (BDV V-9) PRODUCED GAS FROM V-6, 7, 9, K-10 & K-11 TO E-10

Circuit ID	P&ID	Design	Component Examined	Pressure T-Min	Actual Thk. (UT)		Actual Thk. (RT)	
HM-P-01-21	R-SB-012	285 PSIG at 100°F	3"x2" Sch. XH (0.300" W.T.) Reducer	0.025 in.	0.331 in.	Top	0.320 in.	X1 (Red.)
					0.334 in.	North		
					0.327 in.	Bottom		
					0.338 in.	South		

Note: TML number 81 shall be assigned to the 3"x2" reducer during the next scheduled UT inspection.

Figure 31: Set up for radiography at HM-P-01-21, 3"x2" reducer (TML 81 to be assigned).

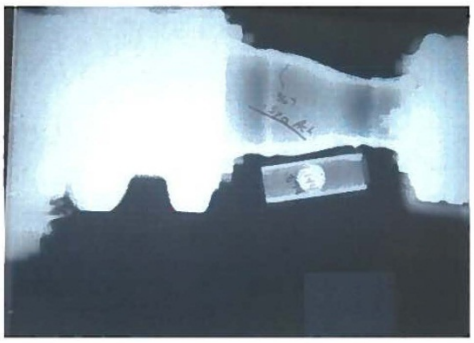

Figure 33: Processed radiographic image at HM-P-01-21, 3"x2" reducer (TML 81 to be assigned), which shows a minimum (actual) wall thickness of 0.320" and no significant indications of erosion or corrosion have been found.

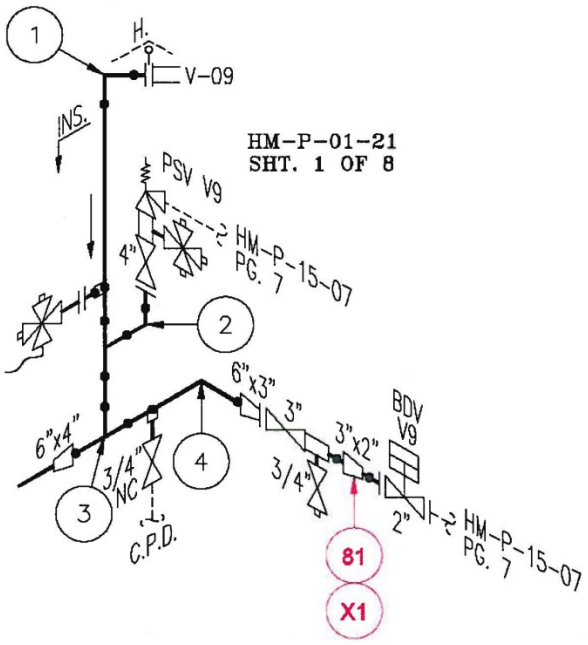

Figure 32: A partial view of isometric drawing HM-P-01-21, sheet 1 of 8. The location of profile radiography (X1) is shown in red.

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TABLE 12: (BDV K-11A) PRODUCED GAS FROM V-6, 7, 9, K-10 & K-11 TO E-10

Circuit ID	P&ID	Design	Component Examined	Pressure T-Min	Actual Thk. (UT)		Actual Thk. (RT)	
HM-P-01-21	R-SB-012	285 PSIG at 100°F	2" Sch. XH (0.218" W.T.) Pipe	0.115 in.	0.220 in.	Top	0.217 in.	X1.1 (Pipe)
					0.222 in.	North		
					0.214 in.	Bottom	0.275 in.	X1.2 (Tee)
					0.218 in.	South	0.233 in.	X1.3 (Pipe)

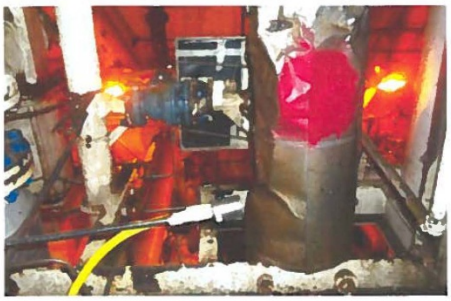

Figure 34: Set up for radiography at HM-P-01-21, 2" pipe (TML 48).

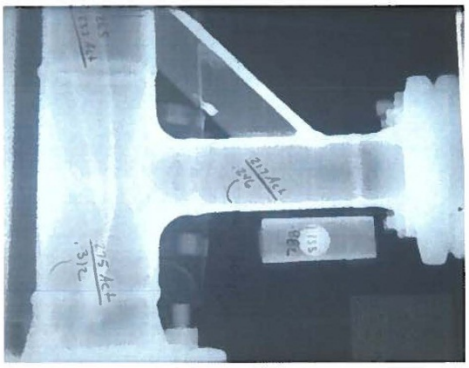

Figure 36: Processed radiographic image at HM-P-01-21, 2" pipe (TML 48), which shows a minimum (actual) wall thickness of 0.217" (X1.1). Thicknesses of 0.275" (X1.2) and 0.233" (X1.3) have also been observed at the 2" tee and pipe, respectively. Light active external corrosion has been noted at the 2" pipe (X1.1).

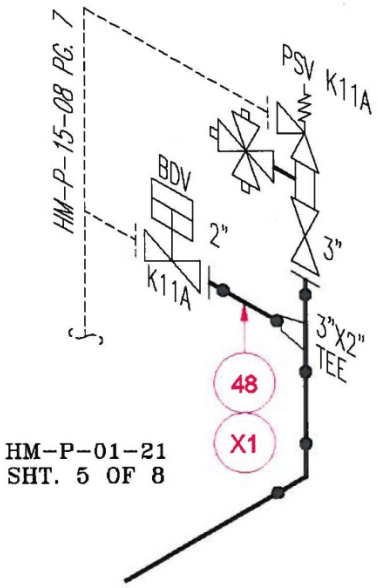

Figure 35: A partial view of isometric drawing HM-P-01-21, sheet 5 of 8. The location of profile radiography (X1) is shown in red.

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TABLE 13: (BDV K-10A) PRODUCED GAS FROM V-6, 7, 9, K-10 & K-11 TO E-10

Circuit ID	P&ID	Design	Component Examined	Pressure T-Min	Actual Thk. (UT)		Actual Thk. (RT)	
HM-P-01-21	R-SB-012	285 PSIG at 100°F	2" Sch. XH (0.218" W.T.) 90° Elbow	0.017 in.	0.221 in.	East	0.261 in.	X1.1 (Pipe)
					0.226 in.	Middle	0.235 in.	X1.2 (Elbow)
					0.214 in.	South		

Figure 37: Set up for radiography at HM-P-01-21, 2" elbow (TML 51).

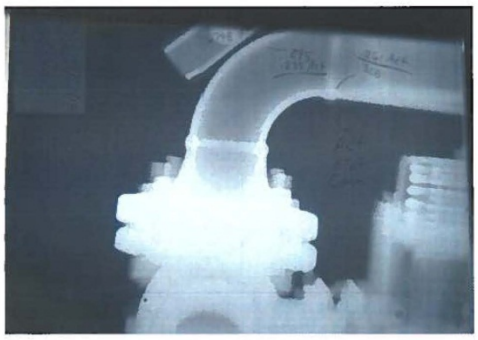

Figure 39: Processed radiographic image at HM-P-01-21, 2" elbow (TML 51), which shows a minimum (actual) wall thickness of 0.235". A thickness of 0.261" (X1.1) has also been observed at the adjoined 2" pipe. Active external corrosion has been noted near the elbow to pipe weld.

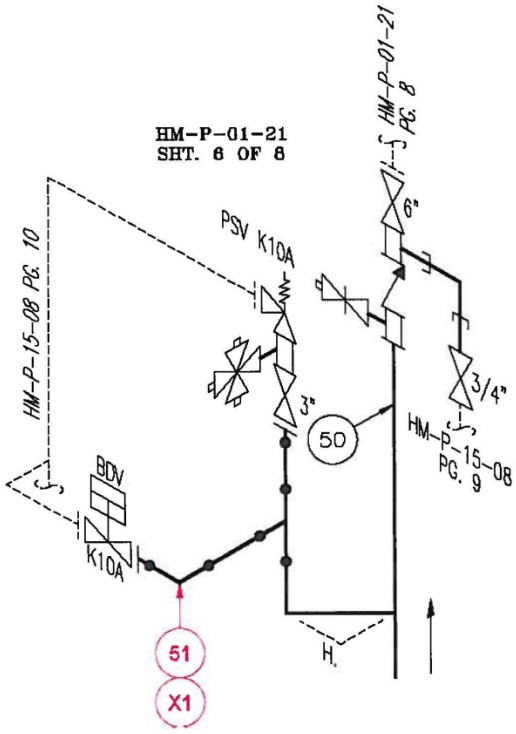

Figure 38: A partial view of isometric drawing HM-P-01-21, sheet 6 of 8. The location of profile radiography (X1) is shown in red.

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TABLE 14: (BDV V-20) SWEETENED GAS FROM E-90 TO VAPOR RECOVERY

Circuit ID	P&ID	Design	Component Examined	Pressure T-Min	Actual Thk. (UT)		Actual Thk. (RT)	
HM-P-20-03	R-SB-016 R-SB-065 E-SB-10517	740 PSIG at 100°F	2" Sch. XH (0.218" W.T.) 90° Elbow	0.043 in.	0.210 in.	Top	0.236 in.	X1 (Elbow)
					0.208 in.	Middle		
					0.204 in.	North		

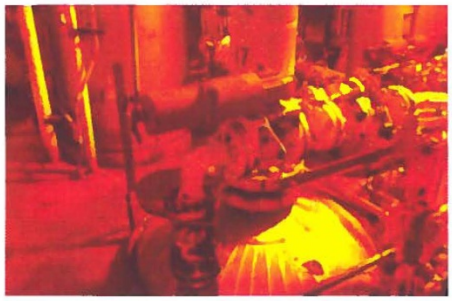

Figure 40: Set up for radiography at HM-P-20-03, 2" elbow (TML 34).

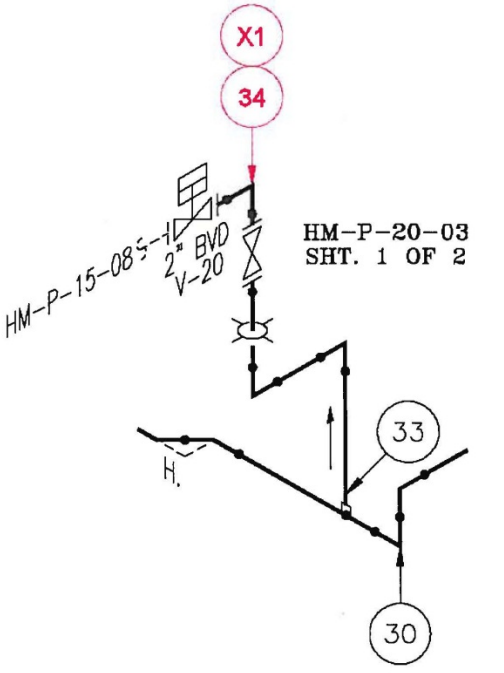

Figure 41: A partial view of isometric drawing HM-P-20-03, sheet 1 of 2. The location of profile radiography (X1) is shown in red.

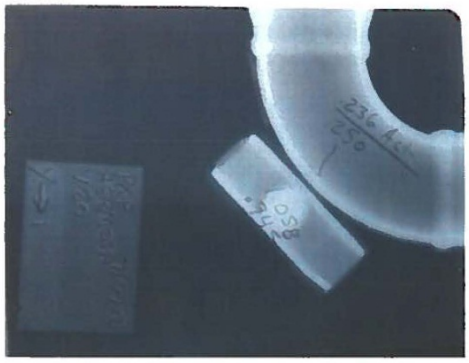

Figure 42: Processed radiographic image at HM-P-20-03, 2" elbow (TML 34), which shows a minimum (actual) wall thickness of 0.236" and no significant indications of erosion or corrosion have been found.

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Upon review, results indicate the areas examined during this inspection are above the required structural thickness (structural T-Min = 0.100") and calculated minimum pressure thickness (see tables 1 through 14, Pressure T-Min). Thickness monitoring locations, TML's, will be added to the above components radiographically examined during future ultrasonic thickness inspections, where possible, if not currently present.

Light active external corrosion has been detected at the 3" elbow of HM-P-01-08 (see table 7 and isometric drawing 2 of 4). A TML is not assigned to this area and UT readings could not be obtained during this inspection because of insulation. Consideration may be given to the addition of an inspection port.

Additionally, light active corrosion was also found at the 2" pipe of HM-P-01-21 (see table and isometric drawing 5 of 8, TML 48) and the 2" elbow of HM-P-01-21 (see table 13 and isometric drawing 6 of 8, TML 51). TML's are currently established at both areas.

If you have any questions regarding this inspection or need any assistance, please contact me at Accurate NDE: (337) 839-1055.

Best regards,

Nicholas J. Hebert
Accurate NDE & Inspection, LLC
Mechanical Integrity Department