

Noncompliant Weld Inspection Techniques

Line 114 Non Destructive Examination Final Report

Issue Date December 5, 2013



Author: Redacted
Sr. Compliance Engineer

Reviewers: Jane Yura, *Vice President*
Gas Operations Asset and Risk Management

Kirk Johnson, *Vice President*
Gas Transmission Maintenance Construction

Table of Contents

Synopsis	3
Chronology.....	3
Results of Job Observation on L-114.....	4
Corrective Actions.....	5
Results of Re-Inspection	6
Conclusion.....	8
Attachments	
Attachment 1: TCI NDE Procedure.....	10
Attachment 2: 3 rd Party Review of Undercut Notations.....	28
Attachment 3: PG&E Gas Department Contractor NDE Observations.....	31
Attachment 4: L-114 Assessment for RT and UT Indications for L-114 Re-Inspection	117
Attachment 5: Line 114 Assessments Quantitative Analysis of Undercut Notations.....	126

Synopsis

As part of PG&E's Non Destructive Examination (NDE) Process Improvement Initiative, the NDE Services Group of PG&E's Applied Technology Services (ATS) Division was requested to perform job observations of NDE vendors performing inspections across the PG&E system. The NDE job observation administered by PG&E personnel commenced in the third quarter of 2012. During the performance of one of these unannounced job observations for a replacement project on Line 114, the PG&E NDE inspector observed TC Inspection (TCI) performing Radiographic Testing (RT) in a noncompliant manner to both the referenced code (American Petroleum Institute) API 1104, 20th edition¹ and their own method procedure (Attachment 1).

PG&E took immediate action which included terminating all work with TCI and conducting an in-depth review of all weld inspections completed by TCI from 2012-2013². PG&E reviewed 3755 welds and identified 488 welds as having noncompliant inspections. The findings relate to noncompliant weld inspection techniques and not the quality of the welding performed. PG&E has not identified any safety issues or issues with the integrity of any girth welds on the project and has no evidence of any safety issues with any other girth welds inspected by TCI.

Since 2012, PG&E has taken several measures to improve its NDE inspection processes, and continues to enhance this program. Additionally, PG&E is performing further analyses to evaluate the welds that were identified as having inadequate inspections. PG&E has selected a sampling of locations where we will conduct field verifications. Currently, this plan consists of excavating 43 welds. This preliminary plan is being further developed, and with input from SED, PG&E will retain a technically qualified third party to develop a comprehensive Extent of Condition Analysis and Re-Inspection & Remediation Plan.

Chronology

- **Q3 of 2012** – PG&E began a comprehensive review and assessment of its Quality Control (QC) measures related to NDE, and as a result significantly enhanced its NDE QC process.
- **3/26/13** – As part of this enhanced QC program, PG&E discovered third-party contractor, TCI, performing non-compliant RT on a weld on a pipe replacement project (R-134) on transmission Line 114 near Brentwood. Data regarding PG&E's welding program and all analyses of Line 114 conducted to date indicate that the issue is TCI's noncompliant weld inspections; **not** the quality of the underlying welds. The original TCI crew completed inspections on 3/26/13 under the supervision of PG&E NDE staff. PG&E verbally informed the CPUC's third-party auditor, Bureau Veritas (BV), of the issue at the time of the initial identification. The pipeline section was not in service when the weld inspection issues were discovered.
- **3/27/13** – A new TCI crew reported to site and performed code compliant inspections under the continued supervision of PG&E NDE staff. This was the last day TCI conducted inspections on L-114.

¹ API 1104, 20th Edition, Section 11.1.3., Exposure Geometry

² Extent of Condition Film Review of GAS Operations NDE Vendor, submitted to CPUC on September 25, 2013

- **3/28/13** – TCI was replaced with a different NDE service provider, Western Industrial X-Ray (WIX), which performed work under PG&E supervision.
- **4/1/13** – PG&E terminated TCI as a PG&E-approved NDE vendor, and issued a “stop all work” order to TCI.
- **4/1/13** – PG&E requested PG&E’s Sourcing Group to pull all orders and records of projects where TCI performed inspection work.
- **4/12/13** – PG&E began working with a 3rd party consultant, [Redacted] to validate Shaw Pipeline Services tethered Automated Ultrasonic Testing (AUT) system.
- **6/3/13** – PG&E staff began communicating with the SED regarding the inadequate weld inspections on L-114.
- **7/19/13** – PG&E’s third party review validated the AUT system was an acceptable means of validating girth welds on L-114.
- **7/30/13** – PG&E formally communicated the L-114 inadequate weld inspections in the PSEP Quarterly Report³.
- **8/1/13** – PG&E conducted a tailboard meeting for the AUT re-inspection of L-114, and commenced re-inspection work.
- **8/14/13** – The re-inspection of all 142 welds inspected in a non-compliant manner on L-114 was completed.
- **9/26/13** – PG&E weld re-inspection work for L-114 was audited by PHMSA. PHMSA identified 5 questionable welds.
- **9/30/13** – [Redacted] issued formal report finding all 5 welds acceptable after review of radiographic images (Attachment 2).
- **10/11/13** – PG&E removed the welds and reviewed the 5 welds for undercutting.
- **10/16/13** – PG&E and [Redacted] validated that the 5 cut out welds did not show undercutting and were acceptable per API 1104.
- **10/16/13**- PG&E provided data to the CPUC-SED to support request to return line to service.
- **10/17/13** – CPUC-SED notified PG&E that there were no outstanding safety concerns and directed that L-114 could be placed in service.
- **10/19/13** – L-114 was placed in service.

Results of Job Observation on L-114

On January 7, 2013, PG&E commenced work on the PSEP pipe replacement work for L-114. This would tie in approximately 3.71 miles of 24-inch steel main to L-114 at MP 12.68 and MP 16.54, and replace the existing 22-inch and 24-inch steel pipe, in the City of Brentwood. The welding process for L-114 started on January 9, 2013. The RT Contractor, Western Industrial X-Ray (WIX) began performing

³ PSEP Q2 Quarterly Compliance Report, submitted to CPUC on July 30, 2013

radiographic examinations on January 9, 2013. TCI was brought in to complete the RT inspections on L-114, and commenced inspection on February 19, 2013 through to March 28, 2013. TCI inspected a total of 173 welds on L-114.

On March 26, 2013, during the job observation, the PG&E NDE inspector noted the TCI two man RT crew producing double wall exposure/single wall viewing (DWE/SWV) radiographic images with a total of only two exposures and at exposure angles which exceeded the code allowable maximum exposure angle of 120 degrees. This inspection method does not satisfy requirements in the API 1104 20th edition code for a minimum of three exposures separated by 120 degrees and violated TCI RT procedure requirements.

The job observation performed for L-114 revealed several additional areas of non-compliance:

- Film densities outside the acceptable ranges⁴
- Non-Compliant placement of Image Quality Indicators⁵
- Improper film processing techniques
- Missing Weld identification Marker

Upon discovery, PG&E asked TCI to complete inspecting the remaining 2 welds under PG&E's supervision. A new TCI crew arrived on site on March 27, 2013 and completed inspections of 9 welds under the supervision of PG&E. This was the last day that TCI would perform RT inspections on L-114. By March 28, 2013, 310 total welds had been inspected on L-114, of which 173 were inspected by TCI. On April 1, 2013, PG&E terminated TCI as a PG&E-approved NDE vendor, and issued an order to TCI to stop all work. WIX returned to the job site for L-114 and completed all remaining radiographic examinations on this project.

PG&E worked with [Redacted] a third party NDE consultant, to review WIX's personnel qualifications, and NDE procedures to ensure adherence to all applicable codes and standards. Additionally, PG&E's NDE personnel were on site for the remaining RT inspections performed by WIX to oversee the inspections, and reviewing all films (Attachment 3).

Corrective Actions

In response to PG&E's discovery of code non-compliant Radiographic inspection of Line 114 girth welds, re-inspection was performed using API 1104 code compliant Radiography on 41 welds and Automated Ultrasonic Testing (AUT) on 101 welds⁶. PG&E worked with [Redacted] a third party NDE consultant, to verify the inspection capabilities and code adherence of Shaw Pipeline Services tethered AUT system for PG&E's intended use for the evaluation of girth welds from the inside of line pipe.

PG&E contacted Shaw Pipeline Services, located in Houston, Texas, to identify a tool that could perform compliant UT examinations from the inside of the pipe rather than the conventional approach of

⁴ API 1104, 20th Edition, Section 11.1.10.1, Film Density

⁵ API 1104, 20th Edition, Section 11.1.6.1, Film

⁶ 9 re-inspections were not required as the welds were removed as part of locating the insertion points for the AUT tool, 11 inspections of welds were completed by TCI under the direct supervision of PG&E NDE staff and are considered compliant, 2 re-inspections were not required as the welds were previously removed from the pipe due to issues unrelated to TCI inspections, and 9 re-inspections were not required as the inspections by TCI on 8" pipe and are considered compliant.

performing UT from the outer surface of the pipe. UT is an acceptable method for NDE inspection specified by API 1104 20th edition.

To ensure the new inspection method adhered to API 1104 20th edition requirements, PG&E requested that Shaw Pipeline Services provide the following items for qualification of the tool:

- a) Create a detailed procedure that captures all of the requirements of API 1104 11.4.2
- b) Procedure and method shall be developed by an NDE Level III certified in ultrasonic testing
- c) Procedure shall be approved by an NDE Level III
- d) Demonstrate the procedure prior to final written approval
- e) Provide a procedure demonstration report

Shaw Pipeline Services provided a procedure for performing an internal Automated Ultrasonic Testing⁷ inspection to demonstrate the effectiveness of the tool and procedure, PG&E shipped test samples, which were embedded with defects to the Shaw facilities in Houston. To qualify the AUT tool, a test was performed and witnessed at Shaw's facilities in Houston, TX on July 8, 2013. The testing and inspection was observed by [Redacted] On July 19, 2013, [Redacted] determined that the AUT system was capable of detecting the type of defect or imperfection, discriminating between defects and imperfections, and locating the indication within the girth weld.

Results of Re-Inspection

Of the 142 welds re-inspected, PG&E identified 6 welds with potential imperfections or defects (Attachment 4). Four of these welds were re-inspected with AUT by Shaw Pipeline Services and identified as having linear fusion indications. RT identification of linear fusion indications is dependent on the orientation of the indication in relation to the radiation beam, and therefore, is not always detected. PG&E removed these welds as a precautionary measure. Once removed, the 4 welds were re-inspected using RT and found no linear indications.

Three welds, which were re-inspected with RT by WIX, also showed indications of weld imperfections. Weld 162 showed undercut like indication, which is defined as a groove melted into the parent material and left unfilled by weld metal. Weld 162 also displayed an unrelated AUT indication. Out of abundance of caution this weld was removed from the system and replaced. Upon removal, weld 162 was re-inspected in ATS's lab, where it was determined that the undercut like indication was a shadowing effect that appeared in the film due to the geometry of the weld and not actually undercut. This is typical for cases where a high low condition exists. The final two weld films showed a potential burn-through, which occurs when excessive penetration causes a weld puddle to be blown into the pipe. At the time of field inspection, the burn-through indications were interpreted as porosity by WIX in the weld material. Out of an abundance of caution, the indications were repaired in the field and inspected using RT. The RT found these welds to be acceptable to API 1104, 20th edition. The table below summarizes the findings and mitigation.

⁷ SHAW AUT Tool Qualification Report, submitted to the CPUC on September 26, 2013

Table 1: Summary of Re-Inspection on Line 114

Weld #	NDE Performed	Findings	Mitigation
162	AUT/RT	Linear fusion indication(AUT)/Potential Undercut (RT)	Removed
237	AUT	Linear fusion indications not found in original RT performed by TCI.	Removed
259	AUT	Linear fusion indications not found in original RT performed by TCI.	Removed
262	AUT	Linear fusion indications not found in original RT performed by TCI.	Removed
270	RT	Potential burn through.	Repaired
311	RT	Potential burn through.	Repaired

Subsequently, a PHMSA regulatory audit was performed on September 25, 2013 to review the results of the re-inspection work. PHMSA identified 5 welds that they believed to have unacceptable undercut (UC) indications in discrete locations, summarized below. [Redacted] the WIX RT Supervisor, and PG&E personnel did not interpret the indications as undercut. On October 4, 2013, the SED requested PG&E to repair or remove the 5 questionable welds.

Table 2: Summary of Welds with Potential Undercut Interpretation on Line 114

No.	Weld No.	Regulatory - Level III Interpretation	Location In View
1	W-738	External Undercut (EUC)	36-42
2	W-760	Internal Undercut (IUC)	24-27
3	W-770	Internal Undercut (IUC)	36-42
4	W-771	Internal Undercut (IUC)	12-24
5	W-781	Internal Undercut (IUC)	44-49

The five welds were removed on October 11, 2013. A review of the Radiographic & Visual inspection data was conducted by PG&E, who found the weld inspections to be acceptable. PG&E also requested [Redacted] review and interpret the data. These results were compared against the requirements for undercut in section 9.3.11, and section 9.7 of API 1104 20th edition, and found all five welds to be acceptable (Attachment 5).

Conclusion

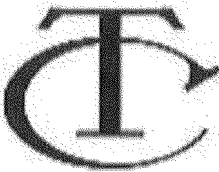
There are no additional activities for L-114. The welds on L-114 were re-inspected via Radiography and Automated Ultrasonic Testing in accordance with the provisions of API 1104, 20th edition. On October 17, 2013, the SED communicated to PG&E that for L-114 they did not have any outstanding safety concerns, and this pipeline could be placed back into service. L-114 was placed into service on October 19, 2013.

PG&E will continue to openly communicate with the SED as the broader Extent of Condition plan develops. PG&E is committed to our overall goal of becoming the safest and most reliable gas operator in America. PG&E continues to take measures to ensure the safe operation of our facilities, and the safety of the public.

Attachments

Attachment 1

TCI NDE Procedure

 T. C. INSPECTION, INC.	Date: July 10, 2009	Page Number 1	of 16
	Document Title: Radiographic Examination of Welds (Reference: API-1104)		
	Doc. # TC-RT-1104	Revision 2	

RADIOGRAPHIC EXAMINATION OF WELDS

(Reference: API-1104)

TC-RT-1104

PREPARED BY:

TITLE: **LEVEL III**

SIGNATURE:

APPROVED BY:

TITLE: **President, T.C. Inspection**

SIGNATURE:

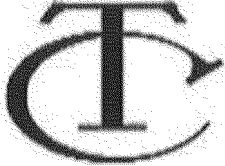
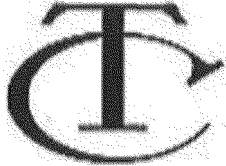
 T. C. INSPECTION, INC.	Date: July 10, 2009	Page Number 2	of 17
	Document Title: Radiographic Examination of Welds (Reference: API-1104)		
	Doc. # TC-RT-1104	Revision 2	

TABLE OF CONTENTS

- 1.0 SCOPE
- 2.0 GENERAL
- 3.0 REFERENCES
- 4.0 PERSONNEL
- 5.0 EQUIPMENT
- 6.0 PROCESS
- 7.0 REPORTS
- 8.0 ACCEPTANCE STANDARDS

 T. C. INSPECTION, INC.	Date: July 10, 2009	Page Number 3	of 17
	Document Title: Radiographic Examination of Welds (Reference: API-1104)		
	Doc. # TC-RT-1104	Revision 2	

REVISION PAGE

MARCH 13, 2009 PG. 8 & 9 – 6.6.1; 6.6.2

MARCH 13, 2009 PG. 10 – 6.6.3.2; 6.6.3.3

JULY 10, 2009 PG. 5- 3.1

JULY 10, 2009 PG.6- 5.7

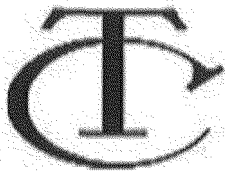
JULY 10, 2009 PG, 7- 5.10

JULY 10, 2009 PG, 8- 6.6.1

JULY 10, 2009 PG, 9- 6.6.2

JULY 10, 2009 PG, 10- 6.6.5
6.8.2

JULY 10, 2009 PG, 12- 6.13.2

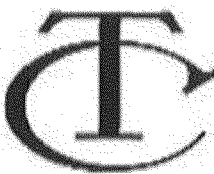
 T. C. INSPECTION, INC.	Date: July 10, 2009	Page Number: 4	of 17
	Document Title: Radiographic Examination of Welds (Reference: API-1104)		
	Doc. # TC-RT-1104	Revision 2	

1.0 SCOPE

- 1.1 This procedure covers the general requirements for radiographic examination of weld as may be required by the client's specifications and by various codes under which a component or system is being designed and manufactured.
- 1.2 This document meets the minimum requirements of API-1104 and any other code or specification referencing the methods for radiographic examination as defined by API-1104.

2.0 GENERAL

- 2.1 The radiographic examination method is a nondestructive examination method. It consists of producing a shadow picture of the test part on radiographic film by passing penetrating radiation through the test part and on to the film. The amount of radiation transmitted through the part and onto the film is dependent on the source of radiation and the material densities and thicknesses through which radiation passes. The denser the material, the less radiation will pass through it and the film will be lighter. The less dense the material, the more radiation will pass through and the film will be darker.
- 2.2 Discontinuities appear on the film as either darker or lighter areas with regard to the density of acceptable test metal as shown on the film.
- 2.2.1 A darker area on the film indicates a discontinuity less dense than the test metal. Such discontinuities include, but are not limited to voids, slag inclusions, cracks, lack of fusion, lack of penetration and undercut.
- 2.2.2 A lighter area on the film indicates a discontinuity more dense than the test metal. Such discontinuities include, but are not limited to tungsten and copper inclusions.
- 2.3 In order to perform radiographic examination of welds to this procedure, it may be necessary for the client to provide the following information.
- 2.3.1 Identity of the welds to be tested. This information should include the project or contract designation, the component or piecemark, the weld joint with respect to location on the component or piece and the site.
- 2.3.2 Designate the extent of testing. This shall include the stage of the welding process during which the examination is to be performed. This will include whether complete or spot examination is to be performed.

 T. C. INSPECTION, INC.	Date: July 10, 2009	Page Number 5	of 17
	Document Title: Radiographic Examination of Welds (Reference: API-1104)		
	Doc. # TC-RT-1104	Revision 2	

- 2.3.2.1 Complete examination shall mean 100% coverage of the designated weld and the heat affected zone for the entire length of the weld.
- 2.3.2.2 When spot examination is designated, the number, location and size of spots will be clearly specified by the client. Spot examination shall mean 100% coverage of designated weld and heat affected zones for the length of the spot.
- 2.3.3 The welding procedure including weld joint configuration with respect to fusion areas, root areas, thicknesses of metal, type of joint, types of material joined and the welding process.
- 2.3.4 The acceptance standards to be used.
- 2.3.5 When applicable, the marking system required.

3.0 REFERENCES

- 3.1 The following documents, of the issue in effect as called out on the purchase order or contract, have been referenced in the preparation of this procedure and are considered a part of this procedure as applicable.

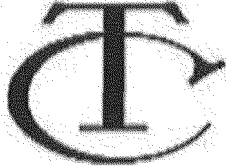
American Petroleum Institute (API)
API-1104 (20th Edition) Standard for Welding Pipelines and Related Facilities

American Society for Testing and Materials (ASTM)
E 94 Recommend Practice for Radiographic Testing

E 142 Controlling Quality of Radiographic Testing

American Society of Nondestructive Testing (ASNT)
SNT-TC-1A Nondestructive Testing Personnel Qualification and Certification

TC Inspection Company
Qualification and Certification of NDE Personnel, Radiation Safety Manual

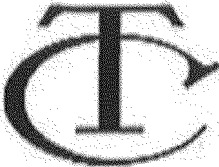
 T. C. INSPECTION, INC.	Date: July 10, 2009	Page Number 6	of 17
	Document Title: Radiographic Examination of Welds (Reference: API-1104)		
	Doc. # TC-RT-1104	Revision 2	

4.0 PERSONNEL

- 4.1 Personnel performing radiographic examination to this procedure shall be qualified and certified in accordance with TC Inspection's Quality Assurance Manual.
(Note: SNT-TC-1A, Sup. A, has been used as a guide in preparation of this procedure.)
- 4.2 Only certified Level II or Level III personnel shall interpret test results to determine acceptability.

5.0 EQUIPMENT

- 5.1 Source of Radiation Either X-Ray or Gamma-Ray radiation may be used. The radiation source and technique used shall be proven satisfactory by demonstration of penetrameter resolution on the minimum thickness of the material radiographed. For X-ray machines operating over 320 kV and less, the focal spot size shall be determined by the pinhole method. For IR-192 sources, the focal spot size shall be determined by the manufactures assembly records as indicated on the source decay chart.
- 5.2 Film - Radiographs shall be made using film equal to or finer grained than type 2 of Recommended Practice ASTM E-94.
- 5.3 Screens - Lead intensifying screens shall be used and shall be in direct contact with the film. These screens shall be free from dirt, scratches, wrinkles, pits and oxide coating. Chemically coated (Fluorescent) intensifying screens shall not be used.
- 5.4 Densitometers - capable of reading film H & D densities from 1.3 to 4.0, shall be used. Density strips, calibrated and traceable to national standards, shall be used.
- 5.5 Film Holders - Shall be light tight, and shall be free of sand, dirt or other foreign particles.
- 5.6 Lead Identification Markers - Shall be a minimum of 1/4" high and 1/16" deep in size and in quantities necessary.
- 5.7 Penetrameters - Shall comply with the design requirements of either ASTM E 747 or ISO 1027 wire IQI. IQI material shall be radiographically similar to the item under examination.
- 5.8 Developing Equipment - Either hand tanks or and automatic processor may be used.

 T. C. INSPECTION, INC.	Date: July 10, 2009	Page Number: 7	of 17
	Document Title: Radiographic Examination of Welds (Reference: API-1104)		
	Doc. # TC-RT-1104	Revision 2	

5.9 Viewing Equipment - Film viewers shall be of the high intensity type with a variable intensity control. They shall produce sufficient illumination to view the maximum film density as required. The viewer shall have provision to prevent light from around the edge of the radiograph or light from lower density portions from interfering with interpretation.

5.10 Penetrameter Shims - Wire IQI shall be used only

6.0 PROCESS

6.1 All radiography shall be performed in accordance with the safety requirements of the Radiation Safety Manual (O E & P).

6.2 Time of Examination - Unless otherwise required, final radiography may be made of welds prior to final heat-treatment or stress-relieved condition. If repair welds are made after final heat-treatment, then the weld shall receive the prescribed heat treatment and only the repaired area and heat affected zones need to be re-radiographed.

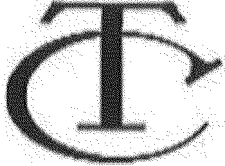
6.3 Surface Preparation - Weld ripples or weld surface irregularities on both the inside (where accessible) and outside shall be removed to such a degree, by the client, so that irregularities cannot mask or be confused with the image of any discontinuity. The finished surface may be flush with the base material or have a uniform crown.

6.4 Film Identification - The job number, weld joint or seam and the manufacturer's identification symbol or name shall be plainly and permanently indicated on each film. If space does not permit, such information shall be supplied in writing with each radiograph.

Welds that cover all of a radiograph may utilize only a control number to minimize the chance of masking defects. The control number will be traceable to the radiographic report containing all pertinent information required. Radiographs of repair welds shall be identified by an "R" for repair, R2, R3, etc., if more than one (1) repair.

6.5 Location Markers

6.5.1 Lead location markers or number belts shall be placed on the object being radiographed and not on the film or film holder and in such a manner that complete coverage and

 T. C. INSPECTION, INC.	Date: July 10, 2009	Page Number 8	of 17
	Document Title: Radiographic Examination of Welds (Reference: API-1104)		
	Doc. # TC-RT-1104	Revision 2	

overlapped film areas are fully identified and the relationship between the film and the object is firmly established.

- 6.5.2 A starting point shall be selected for each weld being radiographed. The direction of numbering or location markers shall be permanently identified by a low stress stamped or etched arrow adjacent to the weld.
- 6.5.3 When permanent stamping or etching is prohibited or impractical, temporary marking shall be made on the surfaces of the component or part. This marking shall be maintained until it has been established that the area under examination is satisfactory. In this case, an accurate sketch of all temporary markings will be made to establish identity with the component or part and the radiograph.
- 6.5.4 Location Markers for Piping - For pipe diameters up to and including 3.5 inches I.D., location view markers or number belts may be used. For pipe diameters over 3.5 inches O.D., a minimum of two (2) location markers shall appear on each film.
- 6.5.5 Location Markers for Other Components - Location markers shall be placed on the part being radiographed so that at least two markers appear on each radiograph.
- 6.6 Penetrameters

Penetrameter shall be a wire type IQI only

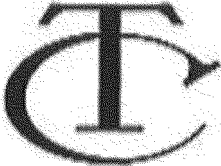
 T. C. INSPECTION, INC.	Date: July 10, 2009	Page Number 9	of 17
	Document Title: Radiographic Examination of Welds (Reference: API-1104)		
	Doc. # TC-RT-1104	Revision 2	

TABLE 1a

Thickness of Pipe Versus Diameter of ASTM E747 Wire Penetrameter

Pipe Wall or Weld Thickness		Essential Wire Diameter		
Inches	Millimeters	Inches	Millimeters	ASTM Set Letters
0-0.250	0-6.4	0.008	0.20	A
>0.250-0.375	>6.4-9.5	0.010	0.25	A or B
>0.375-0.500	>9.5-12.7	0.013	0.33	B
>0.500-0.750	>12.7-19.1	0.016	0.41	B
>0.750-1.000	>19.1-25.4	0.020	0.51	B
>1.000-2.000	>25.4-50.8	0.025	0.64	B

6.6.2 Penetrameter Sensitivity - Radiography shall be performed with a technique of sufficient sensitivity to display the identifying numbers and letters, and the specified wire, all of which are essential indications of the image quality of the radiograph.

6.6.3 Placement of Penetrameters

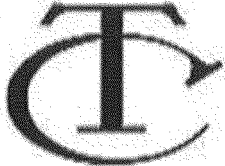
6.6.3.1 The penetrameter shall be placed adjacent to the weld seam in instances except in instances where the weld metal is not radiographically similar to the base material or the geometric configuration makes it impractical, in which case, the penetrameter may be placed over the weld metal. Penetrameters shall be placed perpendicular to the radiation beam where possible.

6.6.3.2 Where inaccessibility prevents placing the penetrameter on the source side, a film side penetrameter shall be placed on the film side of the joint, and a lead letter "F" at least as high as the identification numbers shall be placed adjacent to the penetrameter. When configuration or size prevents placing the penetrameter on the object being radiographed, it may be placed on a separate block as provided in ASTM E-1025.

6.6.3.3 Wire type penetrameters: The number and location of wire type penetrameters shall be the same as described for the hole type penetrameters except that the wires shall be placed across the weld and perpendicular to the weld length.

6.6.4 Number of Penetrameters

6.6.4.1 For welds radiographed with a multiple exposure technique, a penetrameter shall be located within one inch of the end of the film length which is to be interpreted and the other diametrically opposite the source. When a multiple exposure procedure is used

 T. C. INSPECTION, INC.	Date: July 10, 2009	Page Number 10 of 17
	Document Title: Radiographic Examination of Welds (Reference: API-1104)	
	Doc. # TC-RT-1104	Revision 2

and the film length to be interpreted is 5 in. or less one penetrameter shall be located on the film side diametrically opposite the source.

- 6.6.4.2 When a complete girth weld is radiographed in a single exposure using a source on the inside of the pipe (panoramic technique), four penetrameters equally spaced around the circumference shall be used.
- 6.6.5 Shims Under Penetrameters – Wire IQI will only be used.

6.7 Film Placement

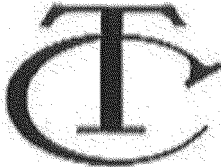
- 6.7.1 Each film shall be placed on the surface to be radiographed in a secure manner so that there is minimum gap between the surface of interest and the film. Where films are overlapped, the image of at least the last reference marker on each end of the film shall be appear on the appropriate adjacent films so as to establish that no part of the weld has been omitted.
- 6.7.2 The number and types of film in a film holder for each radiograph shall consist of one or more, the same or different types.

6.8 Source-to-Film Distances

- 6.8.1 The characteristics that shall govern the minimum source-to-film distance are: Physical size of the radiation source, geometric unsharpness and material thickness.
- 6.8.2 The minimum distance between the source or focal spot and the source side of the object being radiographed is determined by the formula:

$$D = \frac{St}{k}$$

Where S is the effective source or focal spot size; t is thickness of weld including reinforcement plus distance between film side of weld and film. When determining t for SWE/SWV and DWE/SWV procedures, use single wall thickness and its weld reinforcement, for DWE/DWV procedure use OD of weld; that is OD of pipe plus twice the average height of the weld crown. Normally, K is 0.02 in. for 2 in. and thinner

 T. C. INSPECTION, INC.	Date: July 10, 2009	Page Number 11	of 17
	Document Title: Radiographic Examination of Welds (Reference: API-1104)		
	Doc. # TC-RT-1104	Revision 2	

material but final acceptance of each radiograph should be based on the ability to see the prescribed penetrameter image and the specified wire.

6.9 Guide for Selection of Energy of Radiation (non-mandatory)

6.9.1 X-Radiation - Table 2 defines the recommended minimum thickness for which radioactive isotopes should be used. Compliance with Table 2 is not mandatory.

TABLE 2

Minimum Thickness

<u>Material</u>	<u>Iridium 192</u>	<u>Cobalt 60</u>
Steel	0.250 in.	1.50 in.
Copper or High Nickel	0.200 in.	1.30 in.
Aluminum	2.000 in.	----

6.10 Radiographic Technique for Parts, Components and Butt Welds in Tubular Products, Nozzles, Valves, Flanges and Similarly Shaped Cylindrical Objects

6.10.1 Single Wall Exposure / Single Wall View (SWE / SWV)

When a radiographic source can be centered within a butt weld, one exposure is adequate for the radiographic inspection of the complete weld. See Fig. 3 - A

6.10.2 Double Wall Exposure / Single Wall View (DWE / SWV)

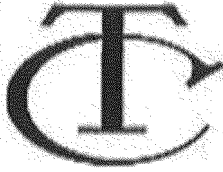
When the radiographic source is outside but not more than 1/2 in. from the weld surface, at least three exposures separated by 120 degrees shall be made for the radiographic inspection of a complete weld. See Fig. 3 - D

6.10.2.1 Double Wall Exposure / Single Wall View (DWE / SWV)

When the radiographic source is outside and more than 1/2 in. from the weld surface at least four exposures separated by 90 degrees shall be made for the radiographic inspection of a complete weld. See Fig. 3 - C

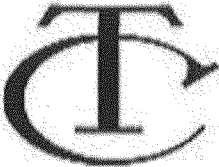
6.10.3 Double Wall Exposure / Double Wall View (DWE / DWV)

When the diameter of the piping containing the weld is 3.5 in. or less, a double wall exposure-double wall viewing procedure may be used. When this procedure is used and the radiation beam is offset so that the source side and film side portions of the weld do not overlap in the areas of the radiograph being evaluated, then at least two exposures

 T. C. INSPECTION, INC.	Date: July 10, 2009	Page Number: 12	of 17
	Document Title: Radiographic Examination of Welds (Reference: API-1104)		
	Doc. # TC-RT-1104	Revision 2	

separated by 90 degrees shall be made for the radiographic inspection of a complete weld. When the source side and film side portions of the weld are superimposed, at least three exposures separated by 60 degrees shall be made for the radiographic inspection of a complete degrees shall be made for the radiographic inspection of a complete weld. See Fig. 3 - F, E.

- 6.10.4 When radiographing smaller diameter, thicker wall pipe, additional exposures should be made to minimize the distortion of discontinuity images at the ends of the radiographs.
- 6.11 Film Storage
- 6.11.1 All unexposed films shall be stored in a clean, dry place where the surrounding conditions will not detrimentally affect the emulsion. If there is any question regarding the condition of the unexposed film, sheets from the front and back of each original role shall be processed in the normal manner without exposure to light or radiation. If this processed film shows fog, the entire box or roll from which the test film was removed shall be discarded, unless additional test films prove that the remaining film in the box or roll is free from pre-exposure fog exceeding 0.30 H & D transmitted density for transparent-based film or 0.05 H & D reflected density for opaque based film.
- 6.12 Film Processing - All film shall be processed in accordance with Part III of ASTM E - 94.
- 6.13 Quality of Radiographs
- 6.13.1 All films shall be free from processing or other defects which would interfere with proper interpretation of the radiograph.
- 6.13.2 Penetrameter Sensitivity - Radiography shall be performed with a technique of sufficient sensitivity to display the identifying numbers and letters, and the essential wire.
- 6.13.3 Film Density - The film density through the area of interest of the radiograph image shall be 1.8 minimum for single viewing and 2.0 minimum for composite viewing of double film exposure and 4.0 maximum for either case. Each radiograph of a composite set shall have a minimum density of 1.0. Composite viewing must be approved by the client.

 T. C. INSPECTION, INC.	Date: July 10, 2009	Page Number 13	of 17
	Document Title: Radiographic Examination of Welds (Reference: API-1104)		
	Doc. # TC-RT-1104	Revision 2	

6.13.4 If the penetrameter image does not show on one radiograph in double film technique but does show in composite viewing, interpretation shall be permitted only by double film viewing. Composite viewing must be approved by the client.

6.13.5 All films rejected on the basis of the above listed defects shall be discarded and the area of interest shall be radiographed again unless the subject areas are interpretable on a second film.

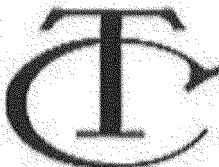
6.14 Radiographic Technique Qualification

6.14.1 For each diameter and wall thickness of pipe to be radiographed in production, the radiographic technique shall be qualified. Technique qualifications shall be submitted to the client for approval.

6.14.2 The following information must be indicated on the Radiographic Technique:

- a) Pipe size (diameter)
- b) Wall Thickness
- c) Radiation Source (x-ray, cobalt, iridium, etc.) and strength of KVP
- d) Type and Thickness of Intensifying Screens (front and back)
- e) Filters or Masks Used, if any
- f) Geometric Relationship (source focal spot size, focal film distance, object to film distance, radiation angle with respect to weld and film)
- g) Film (type and brand, length and width)
- h) Exposure Time (in milliamperes-minutes, millicurie-minutes or curie-minutes)
- i) Processing (time-temperature for development, stop bath or rinse, fixation, washing and drying)

6.15 Interpretation of Radiographs

 T. C. INSPECTION, INC.	Date: July 10, 2009	Page Number: 14	of 17
	Document Title: Radiographic Examination of Welds (Reference: API-1104)		
	Doc. # TC-RT-1104	Revision 2	

6.15.1 An interpretation of the radiographs in accordance with the applicable acceptance standard in part 8.0 shall be provided to the client.

7.0 REPORTS


7.1 A radiographic report shall be prepared and furnished to the client. A standard radiographic report form will be used unless otherwise requested by the client.

7.2 The report, as a minimum, shall contain the following:

- a) Name of the company and the radiographic technician, level of certification, the contract number and the date of exposure.
- b) Weld Identification.
- c) Film interpretation noting unacceptable discontinuities and their location.
- d) Details of radiographic technique.

7.3 The final radiographs shall be submitted to the client for evaluation and acceptance. The client shall review the interpretation of all radiographs and shall have the final authority and responsibility for acceptance or rejection. The final radiographs will be submitted to the client for appropriate storage.

7.4 The required number of report copies will be furnished to the client. A minimum of one report copy will be kept on file at the TC Inspection Company facility.

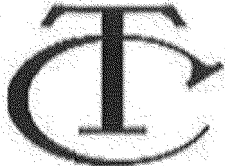
 T. C. INSPECTION, INC.	Date: July 10, 2009	Page Number: 15	of 17
	Document Title: Radiographic Examination of Welds (Reference: API-1104)		
	Doc. # TC-RT-1104	Revision 2	

8.0 ACCEPTANCE STANDARD

8.1 Indications shall be evaluated to the requirements of Tables 3 and 4 and the Note to Tables 3 and 4.

TABLE 3

Discontinuity	Maximum Single Indication Length (Inches)	Total Indication In Any 12" Length (Inches)
INADEQUATE PENETRATION (Without High-Low)	1.0	1.0
INADEQUATE PENETRATION DUE TO HIGH-LOW	2.0	3.0
INCOMPLETE FUSION (at Root or Top of Joint)	1.0	1.0
INCOMPLETE FUSION DUE TO COLD LAP	2.0	2.0
BURN THROUGH (Pipe 2 3/8" O.D. and Larger)	1/4 in. and the density of the BT's image exceeds that of the thinnest adjacent base metal	1/2
BURN THROUGH (Pipe Less than 2 3/8" O.D.)	1/4 in. and the density of the BT's image exceeds that of the thinnest adjacent base metal	N/A
ELONGATED SLAG INCLUSIONS (Pipe 2 3/8" O.D. and Larger)	2.0 and 1/16 wide	2.0
ELONGATED SLAG INCLUSIONS (Pipe Less than 2 3/8" O.D.)	3 times the thinner wall thickness and width exceeding 1/16 in. length	when exceeding 8% of the weld

 T. C. INSPECTION, INC.	Date: July 10, 2009	Page Number 16	of 17
	Document Title: Radiographic Examination of Welds (Reference: API-1104)		
	Doc. # TC-RT-1104	Revision 2	

HOLLOW BEAD (Porosity)

1/2

2.0

TABLE 4DISCONTINUITYPorosity, Spherical and Piping
(wormhole and spherical)

Porosity, Clusters in Finish Pass Only.

Isolated Slag Inclusions Pipe 2 3/8"
O.D. and Larger

Isolated Slag Inclusions Pipe Less than

Crater Cracks or Star Cracks

Other Cracks

Undercutting

Note following is for Tables 3 and 4.

NOTE: Excluding high-low condition, any accumulation of discontinuities having a total length of more than 2 inches in a continuous weld length of 12 inches or more than 8 percent of a continuous weld length if the total weld length is less than 12 inches is unacceptable. Any accumulation of discontinuities that total more than 8 percent of the weld length associated with an entire joint is unacceptable.

ACCEPTANCE STANDARDS

Maximum dimension of 1/8 inch or 25% of pipe wall thickness whichever is less. Distribution shall not exceed that shown in Figures 7 and 8.

Cluster diameter shall not exceed 1/2 inch with individual pores not to exceed 1/16 inch. Total length in any continuous 12 inch length of weld shall not exceed 1/2 inch.


The maximum width of any isolated slag inclusions shall not exceed 1/8 inch. The total length of isolated slag inclusions in any continuous 12 inch length of weld exceeds 1/2 inch, nor shall there be more than four isolated slag inclusions of the maximum width of 1/8 inch in 12 inches.

The maximum width of any isolated slag 2 3/8 inch O.D. inclusion shall not exceed 1/2 the nominal wall thickness and the total length of such inclusions shall not exceed twice the nominal wall thickness.

The maximum length shall not exceed 5/32 inch.

None Allowed.

Up to 2 inches in a continuous 12 inch weld length, or 1/6 the weld length, whichever is smaller.

 T. C. INSPECTION, INC.	Date: July 10, 2009	Page Number	17	of 17
	Document Title: Radiographic Examination of Welds (Reference: API-1104)			
	Doc. # TC-RT-1104	Revision 2		

Parallel slag lines shall be considered as separate conditions if the width of either of them exceeds 1/32 inch. Individual hollow bead discontinuities, each exceeding 1/4 inch in length, shall be separated by at least 2 inches.

Attachment 2

3rd Party Review of Undercut Notation



Technical Services, Inc.

P. O. Box 721139, Houston, Texas 77272-1139

www.ndttechnicalservices.com

Phone: (281) 389-4304

E-mail: NDTServices@aol.com

September 30, 2013

Redacted

Pacific Gas and Electric Company
PG&E Applied Technology Services

Redacted

Dear Redacted:

As requested, on Monday, September 30, 2013, as an independent NDT Level III consultant I performed a film review of five welds associated with PG&E Line 114, Job Number 41878790. The following are the results of this review:

- Weld #738
 - Noted indication at location markers 36 – 39
 - Indication interpreted to be EU – length 1 1/16”
 - Weld acceptable in accordance with API 1104
- Weld #760
 - Noted indication at location markers 23 – 27
 - Indication interpreted to be a shadow at edge of root bead due to a minor high-low condition
 - Weld acceptable in accordance with API 1104
- Weld #770
 - Noted indication at location markers 39 – 42
 - Indication interpreted to be a shadow at edge of root bead due to a minor high-low condition – length 2 3/8”
 - Weld acceptable in accordance with API 1104
- Weld # 771
 - Noted indication at location markers 12 – 24
 - Indication interpreted to be a shadow at edge of root bead due to a minor high-low condition – length 11”
 - Weld acceptable in accordance with API 1104

- Weld # 781
 - Noted indication at location markers 46 – 49
 - Indication interpreted to be a shadow at edge of root bead due to a minor high-low condition – length 4”
 - Weld acceptable in accordance with API 1104

Let me know should you require any additional information concerning this film review.

Respectfully,

Redacted

President
ASNT Level III – 2820
ACCP Professional Level III

Redacted /pac/Letter Concerning Film Review of Five Welds from PG&E Line 114

cc: Redacted
Peter Kenny

Attachment 3

PG&E Gas Department Contractor NDE Observations
L-114 Brentwood, CA



Applied Technology Services
NDE Services Group
3400 Crow Canyon Rd
San Ramon, CA. 94583

PG&E GAS DEPARTMENT
CONTRACTOR NDE OBSERVATIONS
L-114 BRENTWOOD, CA

ATS Report Number: # 413.61-13-429



Scope of work

PG&E Gas Operations requested PG&E's Applied Technology Services (ATS) group to conduct NDE job observations at the project site L-114 in Brentwood CA. This effort is part of the overall Gas NDE Process Improvement initiative for the PG&E NDE Services Program.

Observation Activities

This report details the NDE activities observed between the dates of March 26, 2013 to May 1, 2013.

There were two NDE vendors observed during this time:

- TC Inspections Inc. (TCI)
- Western Industrial X-Ray (WIX) of Fairfield, CA

Field Observation Plan

PG&E ATS Job observations detail all relevant findings on the following topics:

- Safety (both Industrial Safety and Radiation Safety)
- Procedure use and Adherence for all NDE methods witnessed
- Radiographic Film interpretation (when Radiography is performed)
- Code Compliance
- Overall workmanship of NDE activities and document review

Results

Specific Daily job observation reports have been attached along with this report.

Summary of Results

TC Inspections Inc. (TCI)

These notes are a summary of the field observations performed on this vendor at L-114 on 3/26/13.

- Radiation safety signage was taped to cones and in need of maintenance/replacement.
- Both technicians held RT level II qualification.
- Crew did not perform the inspection per their procedures.
- RT vendor ready for RT when it became available
- The RT film was out of code compliance.
- Crew did not follow the code requirements for RT
- Housekeeping was unsatisfactory
- Crew was not carrying the required shipping papers for source transport.
- RT crew was cooperating with the audit process.



TC Inspections Inc. (TCI)

These notes are a summary of the field observations performed on this vendor at L-114 on 3/27/13.

- Radiation safety no deficiencies found. Established an adequate boundary for inspection.
- Both NDE Technicians held RT level II qualification.
- No deficiencies in regard to procedure use.
- RT vendor was ready for RT when it became available
- Housekeeping was satisfactory.
- Crew was not carrying the required shipping papers for source transport.
- RT crew was cooperating with the audit process.

Western Industrial X-Ray (WIX)

Observations:

These notes are a summary of multiple job observations performed on this vendor at L-114 (March 29, 2013 thru May 1, 2013).

- Radiation safety and site safety was fully implemented with no findings.
- NDE technicians were qualified for the work they were performing.
- Crew was familiar with and followed method procedures.
- RT vendor ready for RT when it became available.
- The RT film interpretation was accurate.
- Crew was following the code requirements for RT.
- Housekeeping within their darkroom was good.
- All their required documentation was available.
- RT crew was cooperating with the audit process.

Location of Audit	<u>Brentwood</u>		<u>Mile Point N/A</u>	
Pipe diameter and thickness	Diameter	<u>24</u>	Thickness	<u>0.375"</u>
Date of Audit	<u>03 26 2013</u>			
Company performing NDT	<u>T C Inspection</u>			
Technician/s Name/s	<u>Redacted</u>			
Certification Level	RT	<u>II</u>	RT	<u> </u>
	MT	<u>II</u>	MT	<u> </u>
<u>Procedures & Equipment</u>				
Procedure used	RT	<u>TC-RT-1104 Rev 0 (To API 1104, 19th Ed)</u>		
	MT	<u>N/A</u>		
Procedure available	RT	Yes	<u>X</u>	No <u> </u>
	MT	Yes	<u> </u>	No <u> </u>
	Outdated Procedure was available and used			
RT Technique	DWSI	<u>X</u>	SWSI	<u> </u>
Radiation type	<u>Ir 192</u>	Se 75	X Ray	<u> </u>
Source or Focal spot physical size	<u>0.142"</u>		Activity or Kv	<u>75.7</u>
Geometric Unsharpness (Ug)	<u>0.0034"</u>		Exposure time	<u>2:45</u>
Surface NDT method	<u>None</u>			
Power source	Port. Generator	<u>X</u>	Welding set	<u> </u>
			Onboard Inverter	<u> </u>

Confidential

Variables

Film used	Manufacturer	<u>Agfa</u>	Speed	<u>D5</u>
Screens	Type	<u>Pb</u>	Thickness	<u>0.005" / 0.005"</u>
Process method	Manual	<u>X</u>	Automatic	<u>CR</u>
Process chemistry condition	New	<u>Aged</u>	Replenished	<u>3 Wks</u>
Process time	Minutes	<u>4:00</u>	Process Temperature F°	<u>Unknown</u>
Darkroom	Clean	<u>X</u>	Need Cleaning	<u>Surfaces</u>
Safelight conditions	Good	<u>X</u>	Cracked	<u>Broken</u>
Film Viewer	Type	<u>Schneeman Elect.</u>	All bulbs working	<u>Y</u>
Bulbs	Photoflood	<u>Y</u>	100W	<u>60W</u>
Rheostat	Working	<u>Y</u>	Foot switch	<u>Working</u>
Suitable for film density	Yes	<u>Y</u>	No	<u></u>
Densitometer	Yes	<u>Y</u>	No	<u></u>
Calibrated	Yes	<u></u>	No	<u>X</u>
Daily check	Yes	<u>X</u>	No	<u></u>
			Type	<u>X-Rite 331 S/N 041379</u>
			Date	<u>Not Calibrated</u>
			By	<u>JS</u>

Technician did not possess a densitometer film strip nor calibration certificate. He was limited to performing the "zero" check by nullifying the machine.

Developed film

IQI	Type	<u>1 ASTM B</u>	Wire required	<u>0.016"</u>	Number Required	<u>8</u>
Density of Film	Weld	<u>1.63-2.20</u>	Parent Material	<u>1.90-2.36</u>		
Number of IQI's		1 <u> </u>	2 <u>X</u>	3 <u> </u>	4 <u> </u>	
Sensitivity	Required	<u>0.016"</u>	Achieved	<u>0.013"</u>		
Artifacts or Process Marks	Yes	<u>Y</u>	No	<u> </u>		
Interpretation	By	<u>Redacted</u>	Level	<u>II</u>		
Interpretation accurate	Yes	<u>Y</u>	No	<u> </u>		
Report	Completed	<u>Y</u>	Required Information	<u> </u>	In-Process	<u> </u>

Surface NDT

Method

Magnetizing Method

Equipment Calibrated

Lift test weight

Test weight weight

Dry Powder

Wet method

Particulate content checked

N/A

Confidential

Radiation Safety

CA License / Letter of Reciprocity	Not Available			
Operating & Emergency Procedures	TC-RSP-1 Rev 0		2001 Revision (Poss Outdated)	
Dosimetry worn	Technician	Y	Assistant	Y
IRRSP or State card available	Technician	IRRSP 111539 Exp 4/14	Assistant	None
Source Information	Exp Device / Model	INC IR-100	S/N	4702
	Capsule Model	87703	S/N	85843B
<u>General Notes</u>	Dimensions	0.118" Dia X 0.079" H X 0.142" Diag	Leak Test	No LT Cert Available

Code Compliance

Improper Technique used: Radiographed DWE/SWV in a manner of two exposures. Ref API-1104 11.1.3.1 requires a min of 3 exposures spaced 120° apart.

Outside of prescribed densities: Film had densities as low as 1.63. Ref API 1104 11.1.10.1 requires a min of 1.8 (max of 4.0)

Weld Identification missing: ID was partially "cut-off" on some images. Ref API 1104 11.1.8

Penetrameter set letter / designation missing: Two views. Ref API 1104 11.1.5

General Presentation: Processing artifacts, blurry images. Ref API 1104 11.1.1

Possessed limited radioisotope documentation - Potential Haz-Mat transportation issues: (Leak Test Cert, Depleted Uranium Cert, Source cert on TC letterhead, not the MFR's letterhead.)

Procedure Binder was not updated: Table of Contents declared TC-RT-1104-2 Rev 1, however Rev 0 (19th Ed) was used.

Technicians not in possession of the vendor's Operating and Emergency Procedure

Densitometer was not calibrated nor able to verify against a certified film strip.

Technician processed film at 4:00, unknown temperature. Should process 5:00 at 68°F.

Safety Compliance

RT Technician was not wearing proper PPE: long-sleeved shirt and safety glasses. He was actively preparing the set-up when I coached him. Returned to work with the proper PPE.

Radiation signage taped to cones are in need of maintenance / replacement. (Items appeared as worn.)

General Notes (Continued)

Environmental

Temporarily blocked street traffic while the exposures were taken to minimize dose to the General Public. (Good Catch)

Best Practices / Recommendations

Connected the guide tube and drive cables to the exposure device on the tailgate of the vehicle and then crossed traffic to the work location. Technician did not establish a RT boundary when he connected the equipment.

Technicians set the exposure device on ground level and used guide tube extensions to deliver the source to location. (Good use of equipment.)

Dismantled the drive cables and guide tubes from the exposure device at the work location prior to removing Radiation Area postings.

Comments

Coached the technicians on the RT Technique. Re-radiographed the weld to the proper technique. Missed approx 2 Inches of coverage on the 2nd set of film. Technicians shot a 3rd series to account for the missing 2 inches of missing coverage.

Coached the technicians after the Work Observation was complete all items declared in this report.

Technician became very defensive and argumentative during the work observation process and began refusal to cooperate.

Confidential

Location of Audit	<u>L-114-2</u>		Mile Point <u>12.70-16.52</u>	
Pipe diameter and thickness	Diameter <u>24</u>	Thickness <u>0.375"</u>		
Date of Audit	<u>03 27 2013</u>			
Company performing NDT	<u>TC Inspection</u>			
Technician/s Name/s	<u>Redacted</u>			
Certification Level	RT <u>II</u> <small>Exp</small> Nov-15	RT <u>II</u> <small>Exp</small> Jul-14		
	MT <u>II</u> Nov-15	MT <u>II</u> Oct-13		
<u>Procedures & Equipment</u>				
Procedure used	RT <u>TC RT-1104-2 Rev 1 (API 1104 20th Ed)</u>			
	MT <u>N/A</u>			
Procedure available	RT Yes <u>X</u> No <u> </u>			
	MT Yes <u>X</u> No <u> </u>			
RT Technique	DWSI <u>X</u> SWSI <u> </u>			
Radiation type	<u>Ir 192</u> Se 75 X Ray			
Source or Focal spot physical size	<u>0.142</u>	Activity or Kv	<u>74.7</u>	
Geometric Unsharpness (Ug)	<u>0.003"</u>	Exposure time	<u>3:45</u>	
Surface NDT method	<u>N/A</u>			
Power source	Port. Generator <u>X</u>	Welding set <u> </u>	Onboard Inverter <u> </u>	

Variables

Film used	Manufacturer	<u>Agfa 3 1/2" X 17"</u>	Speed	<u>D5</u>
Screens	Type	<u>Pb</u>	Thickness	<u>0.005" / 0.010"</u>
Process method	Manual	<u>X</u>	Automatic	<u>CR</u>
Process chemistry condition	New	<u>Aged</u>	Replenished	<u>~1Wk</u>
Process time	Minutes	<u>0:00</u>	Process Temperature F°	<u>68° (Verified)</u>
Darkroom	Clean	<u>X</u>	Need Cleaning	<u>Surfaces</u>
Safelight conditions	Good	<u>X</u>	Cracked	<u>Broken</u>
Film Viewer	Type	<u>Venture</u>	All bulbs working	<u>Y</u>
Bulbs	Photoflood	<u>X</u>	100W	<u>60W</u>
Rheostat	Working	<u>X</u>	Foot switch	<u>Working</u>
Suitable for film density	Yes	<u>X</u>	No	<u></u>
Densitometer	Yes	<u>X</u>	No	<u>Type</u>
Calibrated	Yes	<u></u>	No	<u>X</u>
Daily check	Yes	<u>X</u>	No	<u></u>
			Date	<u>No Cal Cert.</u>
			By	<u>T.P.</u>

Technician declared he uses a film density strip to perform his daily check. The density strip was clean, certified, and 1 week old. Strip Expiration: 3 month of use.

Developed film

IQI	Type	<u>1 ASTM B</u>	Wire required	<u>0.016"</u>	Number Required	<u>8</u>
Density of Film	Weld	<u>2.84</u>	Parent Material	<u>3.01</u>		
Number of IQI's		1 <u> </u>	2 <u>X</u>	3 <u> </u>	4 <u> </u>	
Sensitivity	Required	<u>0.016"</u>	Achieved	<u>0.013"</u>		
Artifacts or Process Marks	Yes	<u> </u>	No	<u>X</u>		
Interpretation	By	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Redacted</div>		<u>Level II</u>		
Interpretation accurate	Yes	<u>X</u>	No	<u> </u>		
Report	Completed	<u>X</u>	Required Information	<u> </u>	In-Process	<u> </u>

Surface NDT

Method

Magnetizing Method

Equipment Calibrated

Lift test weight

N/A

Test weight

Dry Powder

Wet method

Particulate content checked

Radiation Safety

CA License / Letter of Reciprocity	<u>5299-07 Amendment 79</u>			
Operating & Emergency Procedures	<u>TC-RSP-1 Rev 3 (10/25/2007)</u>			
Dosimetry worn	Technician	<u>Y</u>	Assistant	<u>Y</u>
IRRSP or State card available	Technician	Redacted	Assistant	Redacted
Source Information	Exp Device / Model	<u>INC IR-100</u>	S/N	<u>7018</u>
	Capsule Model	<u>87703</u>	S/N	<u>85846B</u>
	Dimensions	<u>0.118" X 0.079" X 0.142" Diag</u>	Leak Test	No Documentation

General Notes

Code Compliance

Radiation Safety: No Deficiencies Found
 Film Development: No Deficiencies Found
 Film Interpretation: No Deficiencies Found

Radiosotope Shipping (Haz-Mat): Technicians did not possess isotope leak test cert, depleted Uranium Certification, Decay Chart on TC Inspection Company Letterhead, not on OEM Letterhead as a certificate.

Safety Compliance

Used short orange cones with signs to establish the RT boundary. Recommended use of tall yellow / magenta cones.

General Notes (Continued)

Environmental

Established a very good RT boundary. No deficiencies found

Best Practices / Recommendations

Only recommendation was to consult Radiation Safety Officer regarding transportation of hazardous material training / testing IAW 49 CFR Sec 172.704 for verification that they are trained and why the missing documentation at the job site is not with the source paperwork.

Location of Audit	<u>L-114-2 Fairview Ave, Brentwood</u>	<u>Mile Point</u>
Pipe diameter and thickness	Diameter <u>24"</u>	Thickness <u>0.375"</u>
Date of Audit	<u>3/28/2013</u>	
Company performing NDT	<u>Western Industrial X-Ray (WIX)</u>	
Technician/s Name/s	<u>Redacted</u>	
Certification Level	RT <u>II</u>	RT <u>Assistant</u>
	MT _____	MT _____
<u>Procedures & Equipment</u>		
Procedure used	RT <u>WIX-RT-6 (Ref API-1104, 20th Ed; Effective 08/06/12)</u>	
	MT _____	
Procedure available	RT Yes <u>Y</u> No _____	MT Yes _____ No _____
RT Technique	DWSI <u>Y</u> SWSI _____	
Radiation type	<u>Ir 192</u> Se 75 X Ray	
Source or Focal spot physical size	<u>0.116"</u>	Activity or Kv <u>44 Ci</u>
Geometric Unsharpness (Ug)	<u>0.003"</u>	Exposure time <u>4:50</u>
Surface NDT method	<u>N/A</u>	
Power source	Port. Generator _____	Welding set _____ Onboard Inverter <u>Y</u>

Variables

Film used	Manufacturer	<u>Agfa</u>	Speed	<u>D5</u>
Screens	Type	<u>Pb</u>	Thickness	<u>0.005" / 0.010"</u>
			Condition	<u>OK</u>
Process method	Manual	<u>Y</u>	Automatic	<u>CR</u>
Process chemistry condition	New	<u>Aged</u>	Replenished	<u>~2Wks</u>
			Bad	<u></u>
Process time	Minutes	<u>0:00</u>	Process Temperature F°	<u>68</u>
Darkroom	Clean	<u>Y</u>	Need Cleaning	<u>Surfaces</u>
Safelight conditions	Good	<u>Y</u>	Cracked	<u>Broken</u>
			Not working	<u></u>
Film Viewer	Type	<u>Venture</u>	All bulbs working	<u>Y</u>
Bulbs	Photoflood	<u>Y</u>	100W	<u>60W</u>
Rheostat	Working	<u>Y</u>	Foot switch	<u>N/A</u>
			Working	<u></u>
Suitable for film density	Yes	<u>Y</u>	No	<u></u>
Densitometer	Yes	<u>Y</u>	No	<u></u>
			Type	<u>X-Rite 331</u>
Calibrated	Yes	<u>Y</u>	No	<u></u>
			Date	<u>Missing Sticker, but was calibrated</u>
Daily check	Yes	<u>Y</u>	No	<u></u>
			By	<u>Redacted</u>

Developed film

IQI	Type	<u>1 ASTM B</u>	Wire required	<u>0.016"</u>	Number Required	<u>8</u>
Density of Film	Weld	<u>2.27</u>	Parent Material	<u>2.45</u>		
Number of IQI's	1	<u> </u>	2	<u>X</u>	3	<u> </u>
					4	<u> </u>
Sensitivity	Required	<u>0.016"</u>	Achieved	<u>0.010"</u>		
Artifacts or Process Marks	Yes	<u> </u>	No	<u>X</u>		
Interpretation	By	<u> </u>		<u>Level II</u>		
		<div style="border: 1px solid black; padding: 2px; display: inline-block;">Redacted</div>				
Interpretation accurate	Yes	<u>Y</u>	No	<u> </u>		
Report	Completed	<u> </u>	Required Information	<u> </u>	In-Process	<u>Y</u>

Surface NDT

Method

Magnetizing Method

Equipment Calibrated

Lift test weight

Test weight weight

Dry Powder

Wet method

Particulate content checked

N/A

Radiation Safety

CA License / Letter of Reciprocity

CA License 4424-48 (Rev 48)

Operating & Emergency Procedures

NCT-4424-48 AEOP-1999

Dosimetry worn

Technician

Yes

Assistant

Yes

IRRSP or State card available

Technician

Redacted

Assistant

Redacted

Source Information

Exp Device / Model

T/O 660B

S/N

B3200

Capsule Model

INC 7

S/N

T651

General Notes

Code Compliance

No Issues

Dimensions

0.106" X 0.048" X 0.116"

Leak Test

2/21/2013

Safety Compliance

No Issues.

Crew utilized both RT Cones and "Banner-Guard" Wide RT Ribbon to establish the Radiation Area. ++

General Notes (Continued)

Environmental

No Issues

Best Practices / Recommendations

No Recommendations. (Currently working on the Yellow Cones)

Location of Audit Line 114-2 Fairview Ave, Brentwood Mile Point N/A

Pipe diameter and thickness Diameter 24" Thickness 0.375"

Date of Observation 4/2/2013 Observer Redacted

Company performing NDT WIX (Western Industrial X-Ray)

Technician/s Name/s Redacted Redacted

Certification Level / Expiration
 RT II RT Assistant
 MT _____ MT _____

Procedures & Equipment

Procedure used RT WIX-RT-6 IAW REF API-1104, 20th Edition Effective 08-06-2012
 MT _____ IAW _____

Procedure available RT Yes YES No _____
 MT Yes _____ No _____

RT Technique DWSI YES SWSI _____

Radiation type Ir 192 YES Se 75 _____ X Ray _____

Source or Focal spot physical size 0.116" Activity or Kv 42ci

Geometric Unsharpness (Ug) 0.0024 Exposure time 5:45

Surface NDT method N/A

Power source Port. Generator AS BACKUP Welding set _____ Onboard Inverter YES

Variables

Film used	Manufacturer	<u>AGFA</u>	Speed	<u>D5</u>				
Screens	Type	<u>PB</u>	Thickness	<u>0.005F / 0.010B</u>	Condition	<u>OK</u>		
Process method	Manual	<u>YES</u>	Automatic	<u> </u>	CR	<u> </u>		
Process chemistry condition	New	<u>YES</u>	Aged	<u> </u>	Replenished	<u> </u>	Bad	<u> </u>
Process time	Minutes	<u>6:00</u>	Process Temperature F°	<u>69°</u>				
Darkroom	Clean	<u>YES</u>	Need Cleaning	<u> </u>	Surfaces	<u> </u>		
Safelight conditions	Good	<u>YES</u>	Cracked	<u> </u>	Broken	<u> </u>	Not working	<u> </u>
Film Viewer	Type	<u>VENTURE 87-C1 (M/N)</u>		All bulbs working	<u>YES</u>			
Bulbs	Photoflood	<u>YES</u>	100W	<u> </u>	60W	<u> </u>		
Rheostat	Working	<u>YES</u>	Foot switch	<u>N/A</u>	Working	<u> </u>		
Suitable for film density	Yes	<u>YES</u>	No	<u> </u>				
Densitometer	Yes	<u>YES</u>	No	<u> </u>	Type	<u>X-RITE 331</u>		
Calibrated	Yes	<u>YES</u>	No	<u> </u>	Date	<u>Missing Sticker, But was Calibrated</u>		
Daily check	Yes	<u>YES</u>	No	<u> </u>	By	<u>Redacted</u>		
Film Density Strip Available	Yes	<u>YES</u>	No	<u> </u>				

Developed film

IQI	Type	<u>1 ASTM B</u>	Wire required	<u>0.016"</u>	Number Required	<u>8</u>
IQI Placement	Within 1" from Left Extremity	<u>YES</u>	Center	<u>YES</u>	Within 1" from Right Extremity	<u>YES</u>
Density of Film	Weld	<u>2.71</u>	Parent Material	<u>2.91</u>		
Number of IQI's	1	<u> </u>	2	<u> </u>	3	<u>YES</u>
					4	<u> </u>
Sensitivity	Required	<u>0.016 WIRE</u>	Achieved	<u>YES</u>		
Artifacts or Process Marks	Yes	<u> </u>	No	<u>YES</u>		
Interpretation	By	<u>Redacted</u>		<u>Level II</u>		
Interpretation accurate	Yes	<u>YES</u>	No	<u> </u>		
Report	Completed	<u> </u>	Required Information	<u> </u>	In-Process	<u>YES</u>

Radiation Safety

CA License / Letter of Reciprocity	<u>California License 4424-48</u>	Rev	<u>48</u>
Operating & Emergency Procedures	<u>NCT-4424-48 AEOP-1999</u>	Rev	<u>N/A</u>
10 CFR 19, 20, 34, 49, CCR Title 17	<u>YES</u>		
Shipping Documentation	<u>YES</u>		
MSDS for Radioactive Material	<u>YES</u>		
DOT Regulations	<u>YES</u>		

Dosimetry worn	Technician	<u>YES</u>	Assistant	<u>YES</u>
----------------	-------------------	------------	------------------	------------

IRRSP or State card available	Technician	<div style="border: 1px solid black; width: 100px; height: 80px; display: flex; align-items: center; justify-content: center;">Redacted</div>	Assistant	<div style="border: 1px solid black; width: 100px; height: 80px; display: flex; align-items: center; justify-content: center;">Redacted</div>
	Type		Type	
	Expires		Expires	
	Certification #		Certification #	

Source Information	Exp Device / Model	<u>T/O 660B</u>	S/N	<u>B3200</u>
	Capsule Model	<u>INC 7</u>	S/N	<u>T651</u>
	Dimensions	<u>0.106" X 0.048" X 0.116"</u>	Leak Tested	<u>2/21/2013</u>
	Dep. Uranium Cert	<u>YES</u>		
	OEM Decay Chart	<u>YES</u>		

Boundary Dose rate - maximum dose rate found	<u>0</u> mr/hr	Within legal limits	Yes <u>YES</u>	No <u> </u>
--	----------------	---------------------	----------------	----------------------

General Notes

Code Compliance

Crew is following all applicable codes and regulations.

Safety Compliance

Safety looks good. Crew has all proper PPE and keeps work area clean.

Environmental

No Environmental issues.

Best Practices / Recommendations

Recommend the crew bring up the Radiation Boundary area at the tomorrow mornings safety tailboard meeting. The work site is congested with traffic from equipment and people. Want to make sure everyone at the jobsite is aware of the Radiation Boundary's and what is expected from them when the boundary's are up.

Location of Audit	<u>L-114-2 Fairview Ave, Brentwood</u>	<u>Mile Point</u>
Pipe diameter and thickness	Diameter <u>24"</u>	Thickness <u>0.375"</u>
Date of Audit	<u>3/29/2013</u>	
Company performing NDT	<u>Western Industrial X-Ray (WIX)</u>	
Technician/s Name/s	<u>Redacted</u>	
Certification Level	RT <u>II</u>	RT <u>Assistant</u>
	MT _____	MT _____
<u>Procedures & Equipment</u>		
Procedure used	RT <u>WIX-RT-6 (Ref API-1104, 20th Ed; Effective 08/06/12)</u>	
	MT _____	
Procedure available	RT Yes <u>Y</u> No _____	MT Yes _____ No _____
RT Technique	DWSI <u>Y</u> SWSI _____	
Radiation type	<u>Ir 192</u> Se 75 X Ray	
Source or Focal spot physical size	<u>0.116"</u>	Activity or Kv <u>44 Ci</u>
Geometric Unsharpness (Ug)	<u>0.003"</u>	Exposure time <u>5:15</u>
Surface NDT method	<u>N/A</u>	
Power source	Port. Generator _____	Welding set _____ Onboard Inverter <u>Y</u>

Variables

Film used	Manufacturer	<u>Agfa</u>	Speed	<u>D5</u>
Screens	Type	<u>Pb</u>	Thickness	<u>0.005" / 0.010"</u>
			Condition	<u>OK</u>
Process method	Manual	<u>Y</u>	Automatic	<u>CR</u>
Process chemistry condition	New	<u>Aged</u>	Replenished	<u>~2Wks</u>
			Bad	<u></u>
Process time	Minutes	<u>0:00</u>	Process Temperature F°	<u>68</u>
Darkroom	Clean	<u>Y</u>	Need Cleaning	<u>Surfaces</u>
Safelight conditions	Good	<u>Y</u>	Cracked	<u>Broken</u>
			Not working	<u></u>
Film Viewer	Type	<u>Venture 87-C1 (M/N)</u>		All bulbs working <u>Y</u>
Bulbs	Photoflood	<u>Y</u>	100W	<u>60W</u>
Rheostat	Working	<u>Y</u>	Foot switch	<u>N/A</u>
Suitable for film density	Yes	<u>Y</u>	No	<u></u>
Densitometer	Yes	<u>Y</u>	No	<u></u>
			Type	<u>X-Rite 331</u>
Calibrated	Yes	<u>Y</u>	No	<u></u>
			Date	<u>Missing Sticker, but was calibrated</u>
Daily check	Yes	<u>Y</u>	No	<u></u>
			By	<u>Redacted</u>

Developed film

IQI Type 1 ASTM B Wire required 0.016" Number Required 8
 Density of Film Weld 2.6 Parent Material 2.8
 Number of IQI's 1 2 X 3 4
 Sensitivity Required 0.016" Achieved 0.010"
 Artifacts or Process Marks Yes No X
 Interpretation By Redacted Level II
 Interpretation accurate Yes Y No
 Report Completed Required Information In-Process Y

Surface NDT

Method
 Magnetizing Method
 Equipment Calibrated
 Lift test weight
 Test weight weight
 Dry Powder
 Wet method
 Particulate content checked

N/A

Radiation Safety

CA License / Letter of Reciprocity

CA License 4424-48 (Rev 48)

Operating & Emergency Procedures

NCT-4424-48 AEOP-1999

Dosimetry worn

Technician

Yes

Assistant

Yes

IRRSP or State card available

Technician

Redacted

Assistant

Redacted

Source Information

Exp Device / Model

T/O 660B

S/N

B3200

Capsule Model

INC 7

S/N

T651

Dimensions

0.106" X 0.048" X 0.116"

Leak Test

2/21/2013

General Notes

Code Compliance

No Issues

Safety Compliance

No Issues.

Crew utilized both RT Cones and "Banner-Guard" Wide RT Ribbon to establish the Radiation Area. ++

General Notes (Continued)

Environmental

No Issues

Best Practices / Recommendations

(Currently working on the Yellow Cones)

Newer Darkroom: Lots of new LED lighting within the darkroom. (LED Ambient lighting and LED Safelights for film processing.)

Location of Audit Line 114-2 Fairview Ave, Brentwood Mile Point N/A

Pipe diameter and thickness Diameter 24" Thickness 0.375"

Date of Observation 4/3/2013 Observer Redacted

Company performing NDT WIX (Western Industrial X-Ray)

Technician/s Name/s Redacted Redacted

Certification Level / Expiration
 RT II RT Assistant
 MT _____ MT _____

Procedures & Equipment

Procedure used RT WIX-RT-6 IAW REF API-1104, 20th Edition Effective 08-06-2012
 MT _____ IAW _____

Procedure available RT Yes YES No _____
 MT Yes _____ No _____

RT Technique DWSI YES SWSI _____

Radiation type Ir 192 YES Se 75 _____ X Ray _____

Source or Focal spot physical size 0.116" Activity or Kv 42ci

Geometric Unsharpness (Ug) 0.0024 Exposure time 5:45

Surface NDT method N/A

Power source Port. Generator AS BACKUP Welding set _____ Onboard Inverter YES

Variables

Film used	Manufacturer	<u>AGFA</u>	Speed	<u>D5</u>				
Screens	Type	<u>PB</u>	Thickness	<u>0.005F / 0.010B</u>	Condition	<u>OK</u>		
Process method	Manual	<u>YES</u>	Automatic	<u> </u>	CR	<u> </u>		
Process chemistry condition	New	<u>YES</u>	Aged	<u> </u>	Replenished	<u> </u>	Bad	<u> </u>
Process time	Minutes	<u>5:30</u>	Process Temperature F°	<u>69°</u>				
Darkroom	Clean	<u>YES</u>	Need Cleaning	<u> </u>	Surfaces	<u> </u>		
Safelight conditions	Good	<u>YES</u>	Cracked	<u> </u>	Broken	<u> </u>	Not working	<u> </u>
Film Viewer	Type	<u>VENTURE 87-C1 (M/N)</u>			All bulbs working	<u>YES</u>		
Bulbs	Photoflood	<u>YES</u>	100W	<u> </u>	60W	<u> </u>		
Rheostat	Working	<u>YES</u>	Foot switch	<u>N/A</u>	Working	<u> </u>		
Suitable for film density	Yes	<u>YES</u>	No	<u> </u>				
Densitometer	Yes	<u>YES</u>	No	<u> </u>	Type	<u>X-RITE 331</u>		
Calibrated	Yes	<u>YES</u>	No	<u> </u>	Date	<u>Missing Sticker, But was Calibrated</u>		
Daily check	Yes	<u>YES</u>	No	<u> </u>	By	<div style="border: 1px solid black; padding: 2px;">Redacted</div>		
Film Density Strip Available	Yes	<u>YES</u>	No	<u> </u>				

Developed film

IQI	Type	<u>1 ASTM B</u>	Wire required	<u>0.016"</u>	Number Required	<u>8</u>
IQI Placement	Within 1" from Left Extremity	<u>YES</u>	Center	<u>YES</u>	Within 1" from Right Extremity	<u>YES</u>
Density of Film	Weld	<u>2.6</u>	Parent Material	<u>2.89</u>		
Number of IQI's	1	<u> </u>	2	<u> </u>	3	<u>YES</u>
					4	<u> </u>
Sensitivity	Required	<u>0.016 WIRE</u>	Achieved	<u>YES</u>		
Artifacts or Process Marks	Yes	<u> </u>	No	<u>YES</u>		
Interpretation	By	<u>Redacted</u>	Level	<u>II</u>		
Interpretation accurate	Yes	<u>YES</u>	No	<u> </u>		
Report	Completed	<u> </u>	Required Information	<u> </u>	In-Process	<u>YES</u>

Radiation Safety

CA License / Letter of Reciprocity California License 4424-48 Rev 48

Operating & Emergency Procedures NCT-4424-48 AEOP-1999 Rev N/A

10 CFR 19, 20, 34, 49, CCR Title 17 YES

Shipping Documentation YES

MSDS for Radioactive Material YES

DOT Regulations YES

Dosimetry worn **Technician** YES **Assistant** YES

IRRSP or State card available **Technician** Redacted **Assistant** Redacted
Type
Expires
Certification #

Source Information **Exp Device / Model** T/O 660B **S/N** B3200
Capsule Model INC 7 **S/N** T651
Dimensions 0.106" X 0.048" X 0.116" **Leak Tested** 2/21/2013
Dep. Uranium Cert YES
OEM Decay Chart YES

Boundary Dose rate - maximum dose rate found 0 mr/hr Within legal limits Yes YES No

General Notes

Code Compliance

Good Knowledge of the Code and Requirments, Referencess the code when reading film. Good Practice ++

Safety Compliance

Redacted

spoke about the radiation boundarys at this morinings safety tailboard and expressed the importance of being aware of the boundary and saying away from the boundary while the radiograpy is being performed.

Environmental

No Environmental issues.

Best Practices / Recommendations

No recommendations were needed.

Location of Audit Line 114-2 Fairview Ave, Brentwood Mile Point N/A

Pipe diameter and thickness Diameter 24" Thickness 0.375"

Date of Observation 4/4/2013 Observer Redacted

Company performing NDT WIX (Western Industrial X-Ray)

Technician/s Name/s Redacted Redacted

Certification Level / Expiration
 RT II RT Assistant
 MT _____ MT _____

Procedures & Equipment

Procedure used RT WIX-RT-6 IAW REF API-1104, 20th Edition Effective 08-06-2012
 MT _____ IAW _____

Procedure available RT Yes YES No _____
 MT Yes _____ No _____

RT Technique DWSI YES SWSI _____

Radiation type Ir 192 YES Se 75 _____ X Ray _____

Source or Focal spot physical size 0.116" Activity or Kv 40ci

Geometric Unsharpness (Ug) 0.0024 Exposure time 6:00

Surface NDT method N/A

Power source Port. Generator AS BACKUP Welding set _____ Onboard Inverter YES

Variables

Film used	Manufacturer	<u>AGFA</u>	Speed	<u>D5</u>				
Screens	Type	<u>PB</u>	Thickness	<u>0.005F / 0.010B</u>	Condition	<u>OK</u>		
Process method	Manual	<u>YES</u>	Automatic	<u> </u>	CR	<u> </u>		
Process chemistry condition	New	<u>YES</u>	Aged	<u>2 Days old</u>	Replenished	<u> </u>	Bad	<u> </u>
Process time	Minutes	<u>5:30</u>		Process Temperature F°	<u>69°</u>			
Darkroom	Clean	<u>YES</u>	Need Cleaning	<u> </u>	Surfaces	<u> </u>		
Safelight conditions	Good	<u>YES</u>	Cracked	<u> </u>	Broken	<u> </u>	Not working	<u> </u>
Film Viewer	Type	<u>VENTURE 87-C1 (M/N)</u>		All bulbs working	<u>YES</u>			
Bulbs	Photoflood	<u>YES</u>	100W	<u> </u>	60W	<u> </u>		
Rheostat	Working	<u>YES</u>	Foot switch	<u>N/A</u>	Working	<u> </u>		
Suitable for film density	Yes	<u>YES</u>	No	<u> </u>				
Densitometer	Yes	<u>YES</u>	No	<u> </u>	Type	<u>X-RITE 331</u>		
Calibrated	Yes	<u>YES</u>	No	<u> </u>	Date	<u>Missing Sticker, But was Calibrated</u>		
Daily check	Yes	<u>YES</u>	No	<u> </u>	By	<u>Redacted</u>		
Film Density Strip Available	Yes	<u>YES</u>	No	<u> </u>				

Developed film

IQI	Type	<u>1 ASTM B</u>	Wire required	<u>0.016"</u>	Number Required	<u>8</u>
IQI Placement	Within 1" from Left Extremity	<u>YES</u>	Center	<u>YES</u>	Within 1" from Right Extremity	<u>YES</u>
Density of Film	Weld	<u>2.2</u>	Parent Material	<u>2.57</u>		
Number of IQI's	1	<u> </u>	2	<u> </u>	3	<u>YES</u>
		<u> </u>		<u> </u>	4	<u> </u>
Sensitivity	Required	<u>0.016 WIRE</u>	Achieved	<u>YES</u>		
Artifacts or Process Marks	Yes	<u> </u>	No	<u>YES</u>		
Interpretation	By	<u>Redacted</u>		<u>Level II</u>		
Interpretation accurate	Yes	<u>YES</u>	No	<u> </u>		
Report	Completed	<u> </u>	Required Information	<u> </u>	In-Process	<u>YES</u>

Radiation Safety

CA License / Letter of Reciprocity	<u>California License 4424-49</u>	Rev	<u>49</u>
Operating & Emergency Procedures	<u>NCT-4424-48 AEOP-1999</u>	Rev	<u>2</u>
10 CFR 19, 20, 34, 49, CCR Title 17	<u>YES</u>		
Shipping Documentation	<u>YES</u>		
MSDS for Radioactive Material	<u>YES</u>		
DOT Regulations	<u>YES</u>		

Dosimetry worn	Technician	<u>YES</u>	Assistant	<u>YES</u>
IRRSP or State card available	Technician	<u>Redacted</u>	Assistant	<u>Redacted</u>
	Type	<u>RA</u>	Type	<u>RA</u>
	Expires	<u>Redacted</u>	Expires	<u>Redacted</u>
	Certification #	<u>Redacted</u>	Certification #	<u>Redacted</u>

Source Information	Exp Device / Model	<u>T/O 660B</u>	S/N	<u>B3200</u>
	Capsule Model	<u>INC 7</u>	S/N	<u>T651</u>
	Dimensions	<u>0.106" X 0.048" X 0.116"</u>	Leak Tested	<u>2/21/2013</u>
	Dep. Uranium Cert	<u>YES</u>		
	OEM Decay Chart	<u>YES</u>		

Boundary Dose rate - maximum dose rate found 0 mr/hr Within legal limits Yes YES No

General Notes

Code Compliance

A rejectable weld was found by Redacted referenced the code and made the correct decision.

Safety Compliance

No Safety issue found today.

Environmental

No Environmental issues.

Best Practices / Recommendations

Note the crew seemed to be more aware of the RT boundaries today.

Location of Audit L-114 Fairview Ave. Brentwood Mile Point

Pipe diameter and thickness Diameter 24" Thickness 0.375

Date of Observation 4/5/2013 Observer Aaron Scholes

Company performing NDT W.I.X (Western Industrial X-Ray)

Technician/s Name/s Redacted Redacted

Certification Level / Expiration
 RT II RT I
 MT _____ MT _____

Procedures & Equipment

Procedure used RT WIX-RT-6 IAW Ref API 1104 20th Edition, Effective 08/06/2012
 MT _____ IAW _____

Procedure available RT Yes X No _____
 MT Yes _____ No _____

RT Technique DWSI X SWSI _____

Radiation type Ir 192 X Se 75 _____ X Ray _____

Source or Focal spot physical size 0.116 Activity or Kv 41

Geometric Unsharpness (Ug) 0.0024 Exposure time 6:00

Surface NDT method N/A

Power source Port. Generator Backup Welding set _____ Onboard Inverter X

Variables

Film used	Manufacturer	<u>AGFA</u>	Speed	<u>D5</u>				
Screens	Type	<u>Lead (Pb)</u>	Thickness	<u>0.005/0.010</u>	Condition	<u>Good</u>		
Process method	Manual	<u>X</u>	Automatic	<u> </u>	CR	<u> </u>		
Process chemistry condition	New	<u>X</u>	Aged	<u>3 Days</u>	Replenished	<u> </u>	Bad	<u> </u>
Process time	Minutes	<u>5:30</u>	Process Temperature F°	<u>69.5</u>				
Darkroom	Clean	<u>X</u>	Need Cleaning	<u> </u>	Surfaces	<u>Very Clean</u>		
Safelight conditions	Good	<u>X</u>	Cracked	<u> </u>	Broken	<u> </u>	Not working	<u> </u>
Film Viewer	Type	<u>Venture (87-C1) S/N 9739</u>		All bulbs working	<u>X</u>			
Bulbs	Photoflood	<u>X</u>	100W	<u> </u>	60W	<u> </u>		
Rheostat	Working	<u>X</u>	Foot switch	<u> </u>	Working	<u> </u>		
Suitable for film density	Yes	<u>X</u>	No	<u> </u>				
Densitometer	Yes	<u>X</u>	No	<u> </u>	Type	<u>X-Rite</u>		
Calibrated	Yes	<u>X</u>	No	<u> </u>	Date	<u>Missing Sticker, But calibrated</u>		
Daily check	Yes	<u>X</u>	No	<u> </u>	By	<u>Redacted</u>		
Film Density Strip Available	Yes	<u>X</u>	No	<u> </u>				

Developed film

IQI	Type	<u>1 ASTM B</u>	Wire required	<u>0.016</u>	Number Required	<u>8</u>
IQI Placement	Within 1" from Left Extremity	<u>X</u>	Center	<u>X</u>	Within 1" from Right Extremity	<u>X</u>
Density of Film	Weld	<u>2.45</u>	Parent Material	<u>2.6</u>		
Number of IQI's	1	<u>1</u>	2	<u>X</u>	3	<u>3</u>
Sensitivity	Required	<u>0.016</u>	Achieved	<u>X</u>	4	<u>4</u>
Artifacts or Process Marks	Yes	<u> </u>	No	<u>X</u>		
Interpretation	By	<u>Redacted</u>	Level	<u>II</u>		
Interpretation accurate	Yes	<u>X</u>	No	<u> </u>		
Report	Completed	<u> </u>	Required Information	<u> </u>	In-Process	<u>X</u>

Radiation Safety

CA License / Letter of Reciprocity	<u>CA-4424-48</u>	Rev	<u>49</u>
Operating & Emergency Procedures	<u>NCT-4424-48 AEOP-1999</u>	Rev	<u>2</u>
10 CFR 19, 20, 34, 49, CCR Title 17	<u>Yes</u>		
Shipping Documentation	<u>Yes</u>		
MSDS for Radioactive Material	<u>Yes</u>		
DOT Regulations	<u>Yes</u>		

Dosimetry worn	Technician	<u>Yes</u>	Assistant	<u>Yes</u>
IRRSP or State card available	Technician	<u>Redacted</u>	Assistant	<u>Redacted</u>
	Type	<u>RA</u>	Type	<u>RA</u>
	Expires	<u>Redacted</u>	Expires	<u>Redacted</u>
	Certification #	<u>Redacted</u>	Certification #	<u>Redacted</u>

Source Information	Exp Device / Model	<u>Tech OPS 660B</u>	S/N	<u>B3200</u>
	Capsule Model	<u>INC 7</u>	S/N	<u>T651</u>
	Dimensions	<u>0.106" x 0.048" x 0.116"</u>	Leak Tested	<u>2/21/2013</u>
	Dep. Uranium Cert	<u>Yes</u>		
	OEM Decay Chart	<u>Yes</u>		

Boundary Doserate - maximum doserate found 10 mr/hr Within legal limits Yes X No _____

General Notes

Code Compliance

Yes

Safety Compliance

Yes

Environmental

Yes

Best Practices / Recommendations

Location of Audit L-114 Fairview Road, Brentwood Mile Point

Pipe diameter and thickness Diameter 24" Thickness 0.375"

Date of Observation 4/9/2013 Observer Redacted

Company performing NDT Western Industrial X-Ray (W.I.X)

Technician/s Name/s Redacted

Certification Level / Expiration
 RT II RT Assistant
 MT _____ MT _____

Procedures & Equipment

Procedure used RT WIX-RT-6 IAW API 1104 20th Ed Effective 08-06-2012
 MT _____ IAW _____

Procedure available RT Yes X No _____
 MT Yes _____ No _____

RT Technique DWSI X SWSI _____

Radiation type Ir 192 X Se 75 _____ X Ray _____

Source or Focal spot physical size 0.116 Activity or Kv 39

Geometric Unsharpness (Ug) 0.0024 Exposure time 6:15

Surface NDT method N/A

Power source Port. Generator Backup Welding set _____ Onboard Inverter X

Variables

Film used	Manufacturer	<u>AGFA</u>	Speed	<u>D5</u>				
Screens	Type	<u>Pb</u>	Thickness	<u>0.005/0.010</u>	Condition	<u>Good</u>		
Process method	Manual	<u>X</u>	Automatic	<u> </u>	CR	<u> </u>		
Process chemistry condition	New	<u>X</u>	Aged	<u>1 Week</u>	Replenished	<u> </u>	Bad	<u> </u>
Process time	Minutes	<u>5:30</u>	Process Temperature F°	<u>69</u>				
Darkroom	Clean	<u>X</u>	Need Cleaning	<u> </u>	Surfaces	<u>Very Clean</u>		
Safelight conditions	Good	<u>X</u>	Cracked	<u> </u>	Broken	<u> </u>	Not working	<u> </u>
Film Viewer	Type	<u>Venture</u>	All bulbs working	<u>X</u>				
Bulbs	Photoflood	<u>X</u>	100W	<u> </u>	60W	<u> </u>		
Rheostat	Working	<u>X</u>	Foot switch	<u> </u>	Working	<u>X</u>		
Suitable for film density	Yes	<u>X</u>	No	<u> </u>				
Densitometer	Yes	<u>X</u>	No	<u> </u>	Type	<u>Speed Master SM-12 (S/N 15251)</u>		
Calibrated	Yes	<u>X</u>	No	<u> </u>	Date	<u>2/6/2013</u>		
Daily check	Yes	<u>X</u>	No	<u> </u>	By	<u>Redacted</u>		
Film Density Strip Available	Yes	<u>X</u>	No	<u> </u>				

Developed film

IQI	Type	<u>ASTM 1 B</u>	Wire required	<u>0.016</u>	Number Required	<u>2</u>
IQI Placement	Within 1" from Left Extremity	<u>X</u>	Center	<u>X</u>	Within 1" from Right Extremity	<u>X</u>
Density of Film	Weld	<u>2.86</u>	Parent Material	<u>3.05</u>		
Number of IQI's	1	<u>1</u>	2	<u>2</u>	3	<u>X</u>
Sensitivity	Required	<u>0.016</u>	Achieved	<u>X</u>	4	<u>4</u>
Artifacts or Process Marks	Yes	<u> </u>	No	<u>X</u>		
Interpretation	By	<u>Redacted</u>	Level	<u>II</u>		
Interpretation accurate	Yes	<u>X</u>	No	<u> </u>		
Report	Completed	<u> </u>	Required Information	<u> </u>	In-Process	<u>X</u>

Radiation Safety

CA License / Letter of Reciprocity	<u>CA-4424-48</u>	Rev	<u>49</u>
Operating & Emergency Procedures	<u>NCT-4424-48 AEOP-1999</u>	Rev	<u>2</u>
10 CFR 19, 20, 34, 49, CCR Title 17	<u>X</u>		
Shipping Documentation	<u>X</u>		
MSDS for Radioactive Material	<u>X</u>		
DOT Regulations	<u>X</u>		

Dosimetry worn	Technician	Redacted	Assistant	Redacted
IRRSP or State card available	Technician		Assistant	
	Type		Type	
	Expires		Expires	
	Certification #		Certification #	

Source Information	Exp Device / Model	<u>Tech Ops 660B</u>	S/N	<u>B3200</u>
	Capsule Model	<u>CA-7</u>	S/N	<u>T-651</u>
	Dimensions	<u>0.106" x 0.048" x 0.116"</u>	Leak Tested	<u>2/21/2013</u>
	Dep. Uranium Cert	<u>X</u>		
	OEM Decay Chart	<u>X</u>		

Boundary Doserate - maximum doserate found	<u><10</u> mr/hr	Within legal limits	Yes <u>X</u>	No <u> </u>
--	---------------------	---------------------	--------------	--------------------

General Notes

Code Compliance

Yes, All film was in compliance with the code.

Safety Compliance

Very well safety compliant, Boundaries are set at appropriate distances and tech's are very aware of people and moving vehicles. Tech's control the boundaries and consistent on letting traffic move through the area between exposures.

Environmental

Yes

Best Practices / Recommendations

To keep up how they are working in a consistent safe manner.

Location of Audit L-114 Fairview Rd, Brentwood Mile Point _____

Pipe diameter and thickness Diameter 24" Thickness 0.375" Redacted

Date of Observation 4/13/2013 Observer _____

Company performing NDT W.I.X (Western Industrial X-Ray)

Technician/s Name/s Redacted

Certification Level / Expiration
 RT II RT II
 MT _____ MT _____

Procedures & Equipment

Procedure used RT WIX-RT-6 IAW API 1104 20th Ed Effective 08-06-2012
 MT _____ IAW _____

Procedure available RT Yes X No _____
 MT Yes _____ No _____

RT Technique DWSI X SWSI _____

Radiation type Ir 192 X Se 75 _____ X Ray _____

Source or Focal spot physical size 0.116 Activity or Kv 39Ci

Geometric Unsharpness (Ug) 0.0024 Exposure time 6:15

Surface NDT method N/A

Power source Port. Generator Backup Welding set _____ Onboard Inverter X

Variables

Film used	Manufacturer	<u>AGFA</u>	Speed	<u>D5</u>				
Screens	Type	<u>Pb</u>	Thickness	<u>0.005/0.010</u>	Condition	<u>Good</u>		
Process method	Manual	<u>X</u>	Automatic	<u> </u>	CR	<u> </u>		
Process chemistry condition	New	<u>Aged</u>	<u>8 Days</u>	Replenished	<u> </u>	Bad	<u> </u>	
Process time	Minutes	<u>5:00</u>	Process Temperature F°	<u>68</u>				
Darkroom	Clean	<u>X</u>	Need Cleaning	<u> </u>	Surfaces	<u>Good</u>		
Safelight conditions	Good	<u>X</u>	Cracked	<u> </u>	Broken	<u> </u>	Not working	<u> </u>
Film Viewer	Type	<u>Venture</u>	All bulbs working	<u> </u>				
Bulbs	Photoflood	<u>X</u>	100W	<u> </u>	60W	<u> </u>		
Rheostat	Working	<u>X</u>	Foot switch	<u> </u>	Working	<u> </u>		
Suitable for film density	Yes	<u>X</u>	No	<u> </u>				
Densitometer	Yes	<u>X</u>	No	<u> </u>	Type	<u>Speedmaster SM-12 (S/N 15251)</u>		
Calibrated	Yes	<u>X</u>	No	<u> </u>	Date	<u>2/6/2013</u>		
Daily check	Yes	<u>X</u>	No	<u> </u>	By	<u>Redacted</u>		
Film Density Strip Available	Yes	<u>X</u>	No	<u> </u>				

Developed film

IQI	Type	<u>ASTM 1 B</u>	Wire required	<u>0.016</u>	Number Required	<u>8</u>
IQI Placement	Within 1" from Left Extremity	<u>X</u>	Center	<u>X</u>	Within 1" from Right Extremity	<u>X</u>
Density of Film	Weld	<u>2.45</u>	Parent Material	<u>2.95</u>		
Number of IQI's	1	<u>1</u>	2	<u>2</u>	3	<u>X</u>
Sensitivity	Required	<u>0.016</u>	Achieved	<u>X</u>	4	<u>4</u>
Artifacts or Process Marks	Yes	<u> </u>	No	<u>X</u>		
Interpretation	By	<u>Redacted</u>	Level	<u>II</u>		
Interpretation accurate	Yes	<u>X</u>	No	<u> </u>		
Report	Completed	<u> </u>	Required Information	<u> </u>	In-Process	<u>X</u>

Radiation Safety

CA License / Letter of Reciprocity	<u>CA-4424-48</u>	Rev	<u>49</u>
Operating & Emergency Procedures	<u>NCT-4424-48 AEOP-1999</u>	Rev	<u>2</u>
10 CFR 19, 20, 34, 49, CCR Title 17	<u>X</u>		
Shipping Documentation	<u>X</u>		
MSDS for Radioactive Material	<u>X</u>		
DOT Regulations	<u>X</u>		

Dosimetry worn	Technician	<u>Redacted</u>	Assistant	<u>Redacted</u>
IRRSP or State card available	Technician Type	<u>RA</u>	Assistant Type	<u>BO</u>
	Expires Certification #	<u>Redacted</u>	Expires Certification #	<u>Redacted</u>

Source Information	Exp Device / Model	<u>Tech Ops 660B</u>	S/N	<u>B3200</u>
	Capsule Model	<u>CA-7</u>	S/N	<u>T651</u>
	Dimensions	<u>0.106" x 0.048" x 0.116"</u>	Leak Tested	<u>2/21/2013</u>
	Dep. Uranium Cert	<u>X</u>		
	OEM Decay Chart	<u>X</u>		

Boundary Doserate - maximum doserate found <10 mr/hr Within legal limits Yes X No _____

General Notes

Code Compliance

1 reshot do to density being too light on a fitting to pipe joint. Reshot and corrected density.

Safety Compliance

Using a 8 Half Value Layer Colimator

Environmental

None

Best Practices / Recommendations

None

Location and Line #	<u>Line 114 Brentwood</u>	Mile Point	<u>N/A</u>
Pipe diameter and thickness	Diameter <u>6", & 24"</u>	Thickness	<u>6"x0.280" / 24"x0.375"</u>
Date of Observation	<u>4/18/2013</u>	Observer	<input type="text" value="Redacted"/>
Work Order #	<u></u>	Job #	<u></u>
Company performing NDT	<u>Western Industrial X-Ray (WIX)</u>		
Technician/s Name/s	<input type="text" value="Redacted"/>		
Certification Level / Expiration	RT <u>II</u>	RT	<u>Assistant</u>
	MT <u>N/A</u>	MT	<u>N/A</u>
	UT <u>N/A</u>	UT	<u>N/A</u>
<u>Procedures & Equipment</u>			
Procedure used	RT <u>Wix-RT-6 Rev 0</u>	In accordance With	<u>API-1104 20th Edition</u>
	MT <u>N/A</u>	In accordance With	<u>N/A</u>
	UT <u>N/A</u>	In accordance With	<u>N/A</u>
Procedure available	RT Yes <u>X</u>	No	<u></u>
	MT Yes <u>N/A</u>	No	<u>N/A</u>
	UT Yes <u>N/A</u>	No	<u>N/A</u>

Magnetic Particle Inspections

Inspection Performed YES _____ NO X

MT Equipment: Brand: _____ Model _____ S/N _____

Method: AC: _____ DC: _____ Florescent _____ Dry _____

Batch # _____ Concentration: _____

Leg Spacing: _____

Radiometer: Brand: _____ Model: _____ Serial No: _____

Calibration Due: _____ Detector S/N: _____

Visible Light Intensity: _____ Florescent Light Intensity: _____

Test weight: YES _____ NO _____ LBS: _____ S/N _____

Magnetic Field Indicator Used: YES _____ NO _____

Interpretation: Accurate: YES _____ NO _____

Part: Material Thickness: _____ Temp: _____

Comments:

No Magnetic Particle Inspections were Performed on the day of this Observation

UT Thickness Inspections

Inspection Performed YES _____ NO X

Thickness Meter:

Brand: _____

Model: _____ **S/N** _____

Range: _____ **Velocity:** _____ **Gain:** _____

A Scan: _____ **Thickness:** _____

Echo to Echo **On:** _____ **Off:** _____

Spot: _____ **Scan:** _____ **Grid:** _____ **Scan Speed:** _____

Transducer:

Make: _____ **Model:** _____ **S/N** _____

Size: _____ **Frequency:** _____ **Element:** _____

Calibration Block:

Type: _____ **S/N:** _____

Material: _____ **Within 25° of Part:** YES _____ No _____

Couplant:

Type: _____ **Batch No:** _____

Part:

Material Thickness: _____ **Temp:** _____

Comments:

No UT Thickness Inspections were Performed on the day of this Observation

Radiography (Variables)

Film used	Manufacturer	<u>AGFA</u>	Speed	<u>D5/24" & D4/6"</u>
Screens	Type	<u>PB (Lead)</u>	Thickness	<u>.005F / .010B</u>
	Condition	<u>OK</u>		
Process method	Manual	<u>X</u>	Automatic	<u>CR</u>
Process chemistry condition	New	<u>X</u>	Aged	<u>Replenished</u>
	Bad	<u>Bad</u>		
Process time	Minutes	<u>5 MIN</u>	Process Temperature F°	<u>68°</u>
Darkroom	Clean	<u>X</u>	Need Cleaning	<u>Surfaces</u>
Safelight conditions	Good	<u>X</u>	Cracked	<u>Broken</u>
	Not working	<u>Not working</u>		
Film Viewer	Type	<u>Venture</u>	All bulbs working	<u>Yes</u>
Bulbs	Photoflood	<u>X</u>	100W	<u>60W</u>
Rheostat	Working	<u>X</u>	Foot switch	<u>Working</u>
Suitable for film density	Yes	<u>X</u>	No	<u>No</u>
Densitometer	Yes	<u>X</u>	No	<u>No</u>
	Type	<u>X-Rite S/N 022852</u>		
Calibrated	Yes	<u>X</u>	No	<u>No</u>
Daily check	Yes	<u>X</u>	No	<u>No</u>
	By	<u>Redacted</u>		
Film Density Strip Available	Yes	<u>X</u>	No	<u>No</u>
	S/N	<u>Redacted</u>		
Calibrated	Yes	<u>X</u>	No	<u>No</u>

Radiography (Developed film)

IQI	Number of Wires Per View Required By Code: <u>2</u>		
	Type <u>ASTM B</u>	Wire Diameter Required <u>0.013"</u>	Wire Identification # <u>7</u>
	Wire Sensitivity Achieved		YES <u>X</u> NO <u> </u>
IQI Placement	Within 1" from Left Extremity <u>X</u>	Center <u>X</u>	Within 1" from Right Extremity <u>X</u>
Density of Film	Weld <u>2.88</u>	Parent Material <u>3.3</u>	
Number of IQI's used	1 <u> </u>	2 <u> </u>	3 <u>X</u> 4 <u> </u>
Artifacts or Process Marks	Yes <u> </u>	No <u>X</u>	
Interpretation	By <u>Redacted</u>	Level <u>II</u>	
Interpretation accurate	Yes <u>X</u>	No <u> </u>	
Report	Completed <u> </u>	Required Information <u> </u>	In-Process <u>X</u>

Radiation Safety

CA License / Letter of Reciprocity

Ca License # 4424-48

Rev 49

Operating & Emergency Procedures

May be a discrepancy on there OE&P

Rev Rev 3

10 CFR 19, 20, 34, 49, CCR Title 17

Crew had documents at site

Shipping Documentation

Crew had documents at site

MSDS for Radioactive Material

Office working on providing document

DOT Regulations

Crew had documents at site

Dosimetry worn

Technician YES

Assistant YES

IRRSP or State card available

Technician Redacted

Assistant Redacted

Type BO

Type RA

Expires Redacted

Expires Redacted

Certification #

Certification #

Source Information

Exp Device / Model QSA 880 Delta

S/N 026

Capsule Model A424-9

S/N 93667B

Dimensions .106"x.106"x.150"

Leak Tested Yes 04-12-2013

Dep. Uranium Cert YES 04-08-2013

OEM Decay Chart YES

Boundary Doserate - maximum doserate found

0 mr/hr

Within legal limits

Yes X

No _____

General Notes

Code Compliance

Crew is following procedures and Code

Safety Compliance

No Safety Issues Found

Environmental

No Environmental Issues Found

Best Practices / Recommendations

No recommendations

Location and Line #	<u>Line 114</u>	Mile Point	<u>N/A</u>
Pipe diameter and thickness	Diameter <u>24"</u>	Thickness	<u>0.375"</u>
Date of Observation	<u>4/19/2013</u>	Observer	<u>Redacted</u>
Work Order #	<u></u>	Job #	<u></u>
Company performing NDT	<u>Western Industrial X-Ray</u>		
Technician/s Name/s	<u>Redacted</u>	<u>Redacted</u>	<u></u>
Certification Level / Expiration	RT <u>II</u>	RT	<u>Assistant</u>
	MT <u>N/A</u>	MT	<u>N/A</u>
	UT <u>N/A</u>	UT	<u>N/A</u>
<u>Procedures & Equipment</u>			
Procedure used	RT <u>Wix-RT-6 Rev0</u>	In accordance With	<u>API-1104 20th edition</u>
	MT <u>N/A</u>	In accordance With	<u>N/A</u>
	UT <u>N/A</u>	In accordance With	<u>N/A</u>
Procedure available	RT <u>Yes N/A</u>	No	<u>N/A</u>
	MT <u>Yes N/A</u>	No	<u>N/A</u>
	UT <u>Yes N/A</u>	No	<u>N/A</u>

Magnetic Particle Inspections

Inspection Performed YES _____ NO X

MT Equipment: Brand: _____ Model _____ S/N _____

Method: AC: _____ DC: _____ Florescent _____ Dry _____

Batch # _____ Concentration: _____

Leg Spacing: _____

Radiometer: Brand: _____ Model: _____ Serial No: _____

Calibration Due: _____ Detector S/N: _____

Visible Light Intensity: _____ Florescent Light Intensity: _____

Test weight: YES _____ NO _____ LBS: _____ S/N _____

Magnetic Field Indicator Used: YES _____ NO _____

Interpretation: Accurate: YES _____ NO _____

Part: Material Thickness: _____ Temp: _____

Comments:

UT Thickness Inspections

Inspection Performed YES _____ NO X _____

Thickness Meter:

Brand: _____

Model: _____ **S/N** _____

Range: _____ **Velocity:** _____ **Gain:** _____

A Scan: _____ **Thickness:** _____

Echo to Echo **On:** _____ **Off:** _____

Spot: _____ **Scan:** _____ **Grid:** _____ **Scan Speed:** _____

Transducer:

Make: _____ **Model:** _____ **S/N** _____

Size: _____ **Frequency:** _____ **Element:** _____

Calibration Block:

Type: _____ **S/N:** _____

Material: _____ **Within 25° of Part:** YES _____ No _____

Couplant:

Type: _____ **Batch No:** _____

Part:

Material Thickness: _____ **Temp:** _____

Comments:

Radiography

	Inspection Performed	YES <u> X </u>	NO <u> </u>
RT Technique	Double Wall Exposure Single Wall View	<u> X </u>	Single Wall Exposure Single Wall View <u> </u>
Radiation type	Ir 192 <u> X </u>	Se 75 <u> </u>	X Ray <u> </u>
Source or Focal spot physical size	<u> .106x.106x.150 </u>		Activity or Kv <u> 92 Ci </u>
Geometric Unsharpness (Ug)	<u> 0.003</u>		Exposure time <u> 2:30</u>
Power source	Port. Generator <u> X </u>	Welding set <u> </u>	Onboard Inverter <u> </u>
	House Power <u> </u>		

Comments:	Arrived at site at 1:30 no welds were ready to be x-rayed yet. At 4:00 Pm 2
	were ready both welds were x-rayed by 4:30Pm about 15 minutes per weld.
	I looked at weld 416 and 417 both welds are ok.

Radiography (Variables)

Film used	Manufacturer	<u>AGFA</u>	Speed	<u>D5</u>
Screens	Type	<u>Lead</u>	Thickness	<u>.005x.010</u>
			Condition	<u>New</u>
Process method	Manual	<u>X</u>	Automatic	<u>CR</u>
Process chemistry condition	New	<u>X</u>	Aged	<u>Replenished</u>
				<u>Bad</u>
Process time	Minutes	<u>5 Min</u>	Process Temperature F°	<u>68°</u>
Darkroom	Clean	<u>X</u>	Need Cleaning	<u>Surfaces</u>
Safelight conditions	Good	<u>X</u>	Cracked	<u>Broken</u>
				<u>Not working</u>
Film Viewer	Type	<u>Met Light</u>	All bulbs working	<u>X</u>
Bulbs	Photoflood	<u>X</u>	100W	<u>60W</u>
Rheostat	Working	<u>X</u>	Foot switch	<u>Working</u>
Suitable for film density	Yes	<u>X</u>	No	<u></u>
Densitometer	Yes	<u>X</u>	No	<u>Type X-Rite S/N 022852</u>
Calibrated	Yes	<u>X</u>	No	<u>Date 2/1/2014</u>
Daily check	Yes	<u>X</u>	No	<u>By Redacted</u>
Film Density Strip Available	Yes	<u>X</u>	No	<u>S/N A181270</u>
Calibrated	Yes	<u>X</u>	No	<u></u>

Radiation Safety

CA License / Letter of Reciprocity	<u>4424-48 License CA</u>	Rev	<u>49</u>
Operating & Emergency Procedures	<u>Yes</u>	Rev	<u>Rev 3</u>
10 CFR 19, 20, 34, 49, CCR Title 17	<u>Yes</u>		
Shipping Documentation	<u>Yes</u>		
MSDS for Radioactive Material	<u>Yes</u>		
DOT Regulations	<u>Yes</u>		
Dosimetry worn	Technician <u>Yes</u>	Assistant	<u>Yes</u>
IRRSP or State card available	Technician <u>Redacted</u>	Assistant	<u>Redacted</u>
	Type <u>BO</u>	Type	<u>Ra</u>
	Expires <u>Redacted</u>	Expires	<u>Redacted</u>
	Certification # <u>Redacted</u>	Certification #	<u>Redacted</u>
Source Information	Exp Device / Model	<u>QSA 880 Delta</u>	S/N <u>026</u>
	Capsule Model	<u>A424-9</u>	S/N <u>93667B</u>
	Dimensions	<u>.106x.106x.150</u>	Leak Tested <u>4/12/2013</u>
	Dep. Uranium Cert	<u>4/8/2013</u>	
	OEM Decay Chart	<u>Yes</u>	
Boundary Doserate - maximum doserate found	<u>0</u> mr/hr	Within legal limits	Yes <u>X</u> No <u> </u>

General Notes

Code Compliance

No Issues found

Safety Compliance

No Issues found

Environmental

No Issues found

Best Practices / Recommendations

No Issues found

Location and Line #	<u>Line 114 Brentwood</u>	Mile Point	<u>N/A</u>
Pipe diameter and thickness	Diameter <u>24"</u>	Thickness	<u>24"x0.375"</u>
Date of Observation	<u>4/30/2013</u>	Observer	<u>Redacted</u>
Work Order #	<u></u>	Job #	<u></u>
Company performing NDT	<u>Western Industrial X-Ray (WIX)</u>		
Technician/s Name/s	<u>Redacted</u>		
Certification Level / Expiration	RT <u>II</u>	RT	<u>I</u>
	MT <u>N/A</u>	MT	<u>N/A</u>
	UT <u>N/A</u>	UT	<u>N/A</u>
<u>Procedures & Equipment</u>			
Procedure used	RT <u>Wix-RT-6 Rev 0</u>	In accordance With	<u>API-1104 20th Edition</u>
	MT <u>N/A</u>	In accordance With	<u>N/A</u>
	UT <u>N/A</u>	In accordance With	<u>N/A</u>
Procedure available	RT Yes <u>X</u>	No	<u></u>
	MT Yes <u>N/A</u>	No	<u>N/A</u>
	UT Yes <u>N/A</u>	No	<u>N/A</u>

Magnetic Particle Inspections

Inspection Performed YES _____ NO X _____
MT Equipment: Brand: _____ Model: _____ S/N: _____
Method: AC: _____ DC: _____ Florescent _____ Dry _____
 Batch # _____ Concentration: _____
Leg Spacing: _____
Radiometer: Brand: _____ Model: _____ Serial No: _____
 Calibration Due: _____ Detector S/N: _____
Visible Light Intensity: _____ **Florescent Light Intensity:** _____
Test weight: YES _____ NO _____ LBS: _____ S/N: _____
Magnetic Field Indicator Used: YES _____ NO _____
Interpretation: Accurate: YES _____ NO _____
Part: Material Thickness: _____ Temp: _____

Comments:

No Magnetic Particle Inspections were Performed on the day of this Observation

UT Thickness Inspections

Inspection Performed YES _____ NO X

Thickness Meter:

Brand: _____

Model: _____ S/N _____

Range: _____ Velocity: _____ Gain: _____

A Scan: _____ Thickness: _____

Echo to Echo On: _____ Off: _____

Spot: _____ Scan: _____ Grid: _____ Scan Speed: _____

Transducer:

Make: _____ Model: _____ S/N _____

Size: _____ Frequency: _____ Element: _____

Calibration Block:

Type: _____ S/N: _____

Material: _____ Within 25° of Part: YES _____ No _____

Couplant:

Type: _____ Batch No: _____

Part:

Material Thickness: _____ Temp: _____

Comments:

No UT Thickness Inspections were Performed on the day of this Observation

Radiography (Variables)

Film used	Manufacturer	<u>AGFA</u>	Speed	<u>D5</u>
Screens	Type	<u>PB (Lead)</u>	Thickness	<u>.005F / .005B</u>
			Condition	<u>OK</u>
Process method	Manual	<u>X</u>	Automatic	<u>CR</u>
Process chemistry condition	New	<u> </u>	Aged	<u>1 Week</u>
			Replenished	<u> </u>
			Bad	<u> </u>
Process time	Minutes	<u>4 MIN</u>	Process Temperature F°	<u>72°</u>
Darkroom	Clean	<u>X</u>	Need Cleaning	<u> </u>
			Surfaces	<u> </u>
Safelight conditions	Good	<u>X</u>	Cracked	<u> </u>
			Broken	<u> </u>
			Not working	<u> </u>
Film Viewer	Type	<u>Venture</u>	All bulbs working	<u>Yes</u>
Bulbs	Photoflood	<u>X</u>	100W	<u> </u>
			60W	<u> </u>
Rheostat	Working	<u>X</u>	Foot switch	<u> </u>
			Working	<u> </u>
Suitable for film density	Yes	<u>X</u>	No	<u> </u>
Densitometer	Yes	<u>X</u>	No	<u> </u>
			Type	<u>X-Rite S/N 022852</u>
Calibrated	Yes	<u>X</u>	No	<u> </u>
			Date	<u>Due 02-01-2014</u>
Daily check	Yes	<u>X</u>	No	<u> </u>
			By	<u>Redacted</u>
Film Density Strip Available	Yes	<u>X</u>	No	<u> </u>
			S/N	<u>A181270</u>
Calibrated	Yes	<u>X</u>	No	<u> </u>

Radiation Safety

CA License / Letter of Reciprocity

Ca License # 4424-48

Rev 50

Operating & Emergency Procedures

Crew had documents at site

Rev Rev 3

10 CFR 19, 20, 34, 49, CCR Title 17

Crew had documents at site

Shipping Documentation

Crew had documents at site

MSDS for Radioactive Material

Office working on providing document

DOT Regulations

Crew had documents at site

Dosimetry worn

Technician YES

Assistant YES

IRRSP or State card available

Technician Redacted

Assistant Redacted

Type BO

Type RA

Expires Redacted

Expires Redacted

Certification # Redacted

Certification # Redacted

Source Information

Exp Device / Model QSA 880 Delta

S/N 026

Capsule Model A424-9

S/N 93667B

Dimensions .106"x.106"x.150"

Leak Tested Yes 04-12-2013

Dep. Uranium Cert YES 04-08-2013

OEM Decay Chart YES

Boundary Doserate - maximum doserate found

1 mr/hr

Within legal limits

Yes X

No

General Notes

Code Compliance

Crew is following procedures and Code

Safety Compliance

No Safety Issues Found

Environmental

No Environmental Issues Found

Best Practices / Recommendations

No recommendations

Location and Line #	<u>Line 114 Brentwood</u>	Mile Point	<u>N/A</u>
Pipe diameter and thickness	Diameter <u>24"</u>	Thickness	<u>24"x0.375"</u>
Date of Observation	<u>5/1/2013</u>	Observer	<u>Redacted</u>
Work Order #	<u></u>	Job #	<u></u>
Company performing NDT	<u>Western Industrial X-Ray (WIX)</u>		
Technician/s Name/s	<u>Redacted</u>	<u>Redacted</u>	
Certification Level / Expiration	RT <u>II</u>	RT	<u>I</u>
	MT <u>N/A</u>	MT	<u>N/A</u>
	UT <u>N/A</u>	UT	<u>N/A</u>
<u>Procedures & Equipment</u>			
Procedure used	RT <u>Wix-RT-6 Rev 0</u>	In accordance With	<u>API-1104 20th Edition</u>
	MT <u>N/A</u>	In accordance With	<u>N/A</u>
	UT <u>N/A</u>	In accordance With	<u>N/A</u>
Procedure available	RT Yes <u>X</u>	No	<u></u>
	MT Yes <u>N/A</u>	No	<u>N/A</u>
	UT Yes <u>N/A</u>	No	<u>N/A</u>

Magnetic Particle Inspections

Inspection Performed YES _____ NO X _____
MT Equipment: Brand: _____ Model: _____ S/N: _____
Method: AC: _____ DC: _____ Florescent _____ Dry _____
 Batch # _____ Concentration: _____
Leg Spacing: _____
Radiometer: Brand: _____ Model: _____ Serial No: _____
 Calibration Due: _____ Detector S/N: _____
Visible Light Intensity: _____ **Florescent Light Intensity:** _____
Test weight: YES _____ NO _____ LBS: _____ S/N: _____
Magnetic Field Indicator Used: YES _____ NO _____
Interpretation: Accurate: YES _____ NO _____
Part: Material Thickness: _____ Temp: _____

Comments:

No Magnetic Particle Inspections were Performed on the day of this Observation

UT Thickness Inspections

Inspection Performed YES _____ NO X

Thickness Meter:

Brand: _____

Model: _____ S/N _____

Range: _____ Velocity: _____ Gain: _____

A Scan: _____ Thickness: _____

Echo to Echo On: _____ Off: _____

Spot: _____ Scan: _____ Grid: _____ Scan Speed: _____

Transducer:

Make: _____ Model: _____ S/N _____

Size: _____ Frequency: _____ Element: _____

Calibration Block:

Type: _____ S/N: _____

Material: _____ Within 25° of Part: YES _____ No _____

Couplant:

Type: _____ Batch No: _____

Part:

Material Thickness: _____ Temp: _____

Comments:

No UT Thickness Inspections were Performed on the day of this Observation

Radiation Safety

CA License / Letter of Reciprocity

Ca License # 4424-48

Rev 50

Operating & Emergency Procedures

Crew had documents at site

Rev Rev 3

10 CFR 19, 20, 34, 49, CCR Title 17

Crew had documents at site

Shipping Documentation

Crew had documents at site

MSDS for Radioactive Material

Office working on providing document

DOT Regulations

Crew had documents at site

Dosimetry worn

Technician YES

Assistant YES

IRRSP or State card available

Technician Redacted

Assistant Redacted

Type BO

Type RA

Expires Redacted

Expires Redacted

Certification #

Certification #

Source Information

Exp Device / Model QSA 880 Delta

S/N 026

Capsule Model A424-9

S/N 93667B

Dimensions .106"x.106"x.150"

Leak Tested Yes 04-12-2013

Dep. Uranium Cert YES 04-08-2013

OEM Decay Chart YES

Boundary Doserate - maximum doserate found

1 mr/hr

Within legal limits

Yes X

No

General Notes

Code Compliance

Crew is following procedures and Code

Safety Compliance

No Safety Issues Found

Environmental

No Environmental Issues Found

Best Practices / Recommendations

Crew has good practice with ALARA, 1 person stands at each end of the boundary. Crew uses both survey meters when X-Raying. GOOD BEST PRACTICES

Attachment 4

L-114 Assessment for RT and UT Indications for L-114 Re-Inspection



LINE 114 ASSESSMENTS
ASSESSMENT OF RT AND AUT INDICATIONS FOR
WELDS 162, 237, 259, 262, 270, 311

REPORT 413.61-13.412

Author:

Lloyd Schaefer
Senior Advising NDT Engineer
Applied Technology Services

Reviewed:

Stephen Simon
NDT Supervisor
Applied Technology Services

ATS Report #: 413.61-13.412
Rev 0

Date of Issue: 11/26/13



Index

Section	Content	Page
	Executive Summary	3
1.0	Background	4
2.0	Approach	4
3.0	Assessment/Findings	5
4.0	Conclusions	8



Executive Summary

In response to PG&E's identification of non-code compliant Radiographic testing at Line 114, re-inspection was performed on all related welds utilizing API-1104 compliant inspection methods. The two methods utilized were Radiographic testing (41 welds) and Automated Ultrasonic testing (101 welds).

During Radiographic re-inspection, welds; W162, W270 & W311 were interpreted by an NDE service provider performing the inspections, to be unacceptable to the radiographic acceptance criteria of API-1104. These indications were reviewed in the field by PG&E NDE staff and found to be acceptable. To further confirm the nature of the indications on welds 270 and 311 as acceptable, film digitization and a physical investigation of the welds were performed, validating the original ATS decision for acceptance. During Ultrasonic inspection, welds; W162, W237, W259, & W262, were identified as having Ultrasonic indications unrelated to radiographic findings, which could not be physically verified. Where the exact nature of the ultrasonic indications could not be determined, welds W162, W237, W259 & W262, were removed and replaced. Physical evaluations of the removed welds and comparative film review against original radiographic images for all welds were performed to verify original code acceptance to radiographic criteria.

This report finds that the original radiographic interpretations to accept all 6 welds (W162, W237, W259, W262, W270 and W311) to the requirements of API 1104 were correct.

The approach, findings and results of this report were reviewed and approved by an independent NDE expert Redacted



1.0 Background

- 1.1 A review of Line 114 girth weld radiographic inspection identified instances of under-inspection by a NDT contractor to the requirements of API 1104 and the contractor's own method procedures. Re-inspection has been performed to date on 41 welds by API 1104 compliant Radiography, and 101 welds by API 1104 compliant AUT for welds which were buried/inaccessible for radiography. Six (6) welds were found to have indications requiring further review.
- 1.2 API 1104 states that both radiography and ultrasonic inspection are permitted methods to determine soundness of welds to the code requirements. Each method has its advantages and limitations, and therefore unique sensitivities & probability of detection. It is hence understood that exams of the same weld will routinely yield variation in both calls of actual imperfections, and also other indications arising from metallurgical and geometric characteristics.
- 1.3 This report describes the approach, assessment and conclusions regarding the noted indications from Radiographic and Ultrasonic exams of these six girth welds.

2.0 Approach for Radiographic Indications

- 2.1 Following identification of Radiographic Inspection deficiencies by NDE contractor TCI, PG&E requested NDT contractor, Western Industrial X-ray (WIX), to perform radiography on 41 TCI welds to API-1104 requirements. Their reports indicated potential concerns for porosity or burn through on welds 270 and 311, and an indication of undercut on weld 162.
- 2.2 PG&E NDT Level III personnel reviewed the WIX film interpretations for porosity on Welds 270 & 311 and undercut on Weld 162, and also re-reviewed the original TCI film & interpretations which had coverage in the regions of interest, including a called indication on weld 311 in the WIX region of interest.
- 2.3 ATS performed digital radiographic thickness measurements on Weld 162, using the parent material & image quality indicator (IQI) wires as step calibration. This activity was performed to rule out Machs Bands (Figure 1) severity effects, which can influence the interpretation of undercut, and also to provide ROM estimation of any actual undercut conditions.

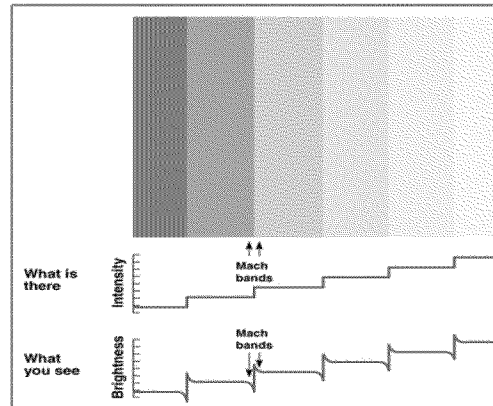


Figure 1 – Machs Bands Effects

- 2.4 Local repairs were performed on welds 270 and 311 to investigate and confirm the cause of the indications. ATS reviewed WIX final radiography of both welds to API 1104 requirements.
- 2.5 For the WIX noted undercut indication on weld 162, following its removal from Line 114, ATS attempted to measure the surface topography in the region of interest (ROIs) using weld undercut gages in addition to calibrated dial indicators.
- 2.6 Where the majority of negative excursions into the parent material were observed to be very superficial, additional Creafom (photogrammetry) imaging was performed to obtain more precise measurements.
- 2.7 The results of the visual, radiographic and dimensional data sets were evaluated and summarized in the findings.
- 2.8 AUT calibrations and reports were reviewed with emphasis on the called indication ROIs. For the AUT findings on welds 162, 237, 259 & 262, additional radiographic images were produced on Class I film.
- 2.9 Reconciliation of the weld surfaces with Radiographic and AUT data-sets was attempted, and the results are documented in the findings.

3.0 Assessment/Findings

- 3.1 Weld 270, digitized in the region of interest is depicted in Figure 2. Here it can be seen, due to low change in density which is less than the adjacent parent material, and the presence of a halo, that the indication is one of Burn-Through (BT), and is acceptable per section 9.3.7 of API-1104. The weld repair process confirmed this result where the indication was found at the root.

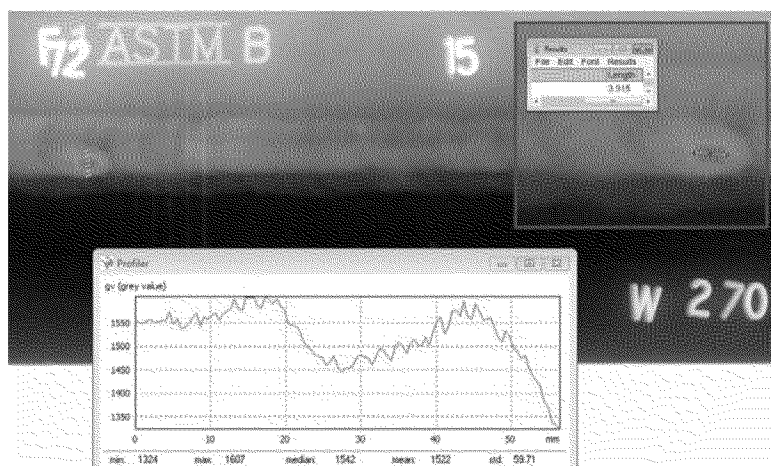


Figure 2 – Weld 270 Indication with measurement inset showing length of 0.157” (3.9mm)

3.2 Weld 311, digitized in the region of interest, is depicted in Figure 3. Similarly we have one indication of burn-through and 3 small pores, all of which are acceptable per sections 9.3.7 & 9.3.9 of API 1104. For both welds 270 and 311, the repair process had to proceed to the root before the indications were eliminated, confirming that they were caused by burn through.

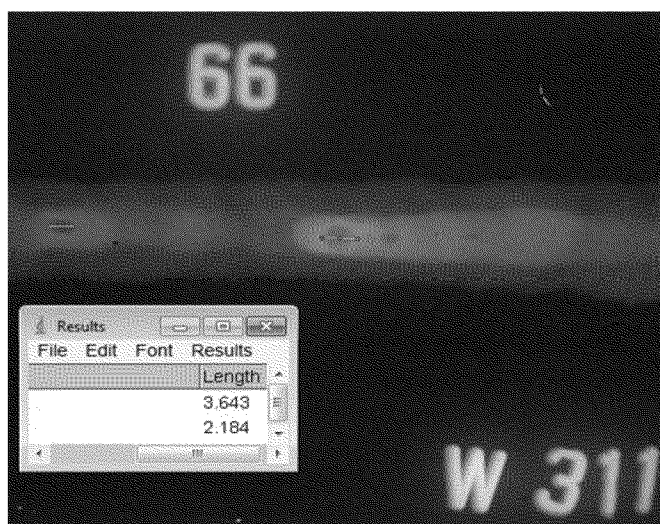


Figure 3 – Weld 311 with acceptable BT length of 0.141” and acceptable small pores

3.3 Weld 162 indication was digitized as shown below in Figure 4. Radiographic density measurements indicate that no portion of the indication has an indication of undercut which is greater than 0.016” deep, indicating that it is acceptable per section 9.3.11& 9.3.7 of API 1104.

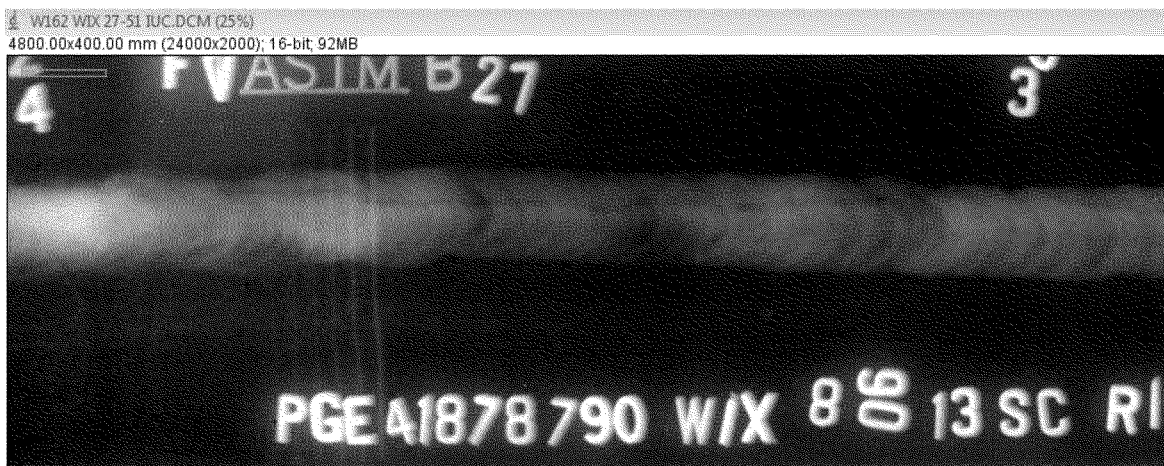


Figure 4 – Weld 162 with acceptable indications of undercut

- 3.4 To validate the digital radiographic measurements, external visual, UC gaging and dial indicator measurements revealed that only small areas within the called ROI (25-29) had bottoms estimated below the adjacent parent material surface. Measurements had thus low repeatability due to topography. This result led to the decision for the Creaform photogrammetry with its calibrated 40 micron spatial resolution and accuracy to within 0.002”.
- 3.5 Creaform photogrammetry results were obtained for the radiographic ROI (25-29 in Figure 4). The measurements confirm that no portion of the indicated area of concern radiographically, has a depth greater than 0.016 inches, and is therefore acceptable per sections 9.3.11 & 9.7. Figure 5 below depicts worst case of 0.0074” in radiographic ROI.

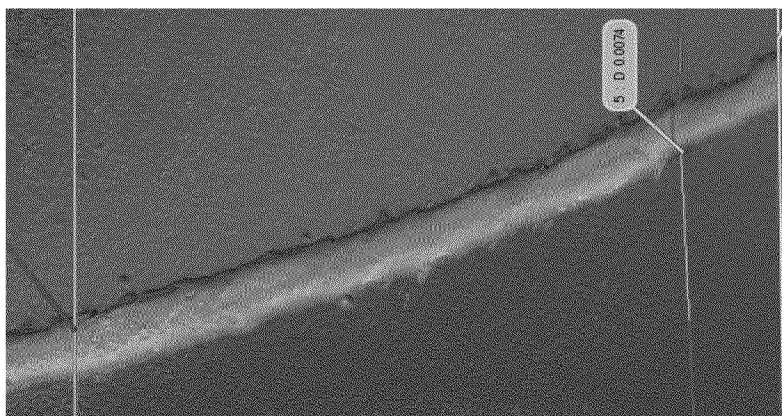


Figure 5 – Measured IUC on W162 depicted in Figure 4



3.6 The welds 162, 237, 259, and 262 regions of interest from the AUT were re-radiographed at PG&E ATS facility using higher sensitivity Class I film. The interpretations of these radiographs are that the 4 welds are acceptable per API 1104 radiographic requirements. Where the AUT exams may be more sensitive and optimized to certain flaw orientations, compared to radiography, we have removed any AUT indicated welds from the system.

4.0 Conclusions

4.1 The radiographic evaluations, visual, and mechanical measurements performed and memorialized in this report, re-confirm the initial decision that welds 162, 237, 259, 262, 270, & 311 are acceptable per API 1104, 20th edition. This was verified by independent NDE expert, Redacted

Attachment 5

Line 114 Assessments Quantitative Analysis of Undercut Notations



LINE 114 ASSESSMENTS
QUANTITATIVE ANALYSIS OF UNDERCUT NOTATIONS
WELDS 760, 770, 771, 781, 738

REPORT 413.61-13.406

Redacted

Author:

Redacted
Senior Advising NDT Engineer
Applied Technology Services

Reviewed:

Redacted

Redacted
10:05:36 -07'00'
NDT Supervisor
Applied Technology Services



Index

Section	Content	Page
	Executive Summary	3
1.0	Background	4
2.0	Approach	4
3.0	Findings	5
4.0	Conclusions	6
Appendix I	Presentation on quantitative analysis of UC	
Appendix II	Independent review of radiography	
Appendix III	WIX report of radiography	



Executive Summary

In response to a regulatory audit, five Line 114 girth welds were identified by the auditor as unacceptable undercut (UC) conditions to (American Petroleum Institute) API 1104 weld quality requirements. A review of the Radiographic & Visual inspection data was accomplished by ATS NDT specialists. The information from this review was then registered to the applicable weld circumferences. A further review of the X-Ray data and interpretation by an outside Level III NDT consultant was requested by ATS and performed by NDT Technical Services. Following extraction of these welds from Line 114, dimensional measurements were made of the regions of interest using high precision, laser based photogrammetry (Creaform). The sum of these (re)assessments indicate that the five welds in question (738, 760, 770, 771, & 781) of Line 114 meet API 1104 code requirements for undercut in the identified regions of interest, and are acceptable.



1.0 Background

- 1.1 A regulatory audit of Line 114 girth welds performed 9/25/2013 resulted in a report of concern for unacceptable undercut (UC) in discrete locations on the five below identified welds.

No.	Weld No.	Regulatory - Level III Interpretation	Location in View
1	W-738	External Undercut (EUC)	36-42
2	W-760	Internal Undercut (IUC)	24-27
3	W-770	Internal Undercut (IUC)	36-42
4	W-771	Internal Undercut (IUC)	12-24
5	W-781	Internal Undercut (IUC)	44-49

- 1.2 This report describes the ATS approach, assessment and conclusions regarding the audit claim of API 1104 code discrepancies for these welds, as well as actions taken following regulatory direction to remove the five welds from service.

2.0 Approach

- 2.1 Upon notification of the audit results, ATS requested the NDT contractor, Western Industrial X-ray (WIX), to perform a second film interpretation review of the audit noted regions of interest.
- 2.2 ATS NDT Level III personnel reviewed the WIX film interpretation. ATS also performed digital radiographic thickness measurements, using the parent material & Image Quality Indicator (IQI) wires as step calibration. This activity was performed to rule out Machs Bands severity effects, depicted in Figure 1, on interpretation, and also provide ROM estimation of any actual undercut conditions.

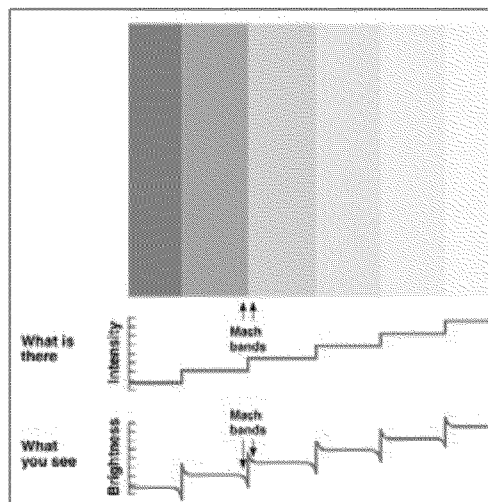


Figure 1 – Machs Bands Effects



- 2.3 A third party Level III NDT consultant [Redacted] of NDT Technical Services was also asked to review the WIX Radiographic interpretation.
- 2.4 Following regulatory direction to remove the five welds from Line 114, visual examination was performed to assess the location & condition of the regions of interest (ROI's).
- 2.5 ATS attempted to measure the surface topography in the ROI's using weld undercut gages in addition to calibrated dial indicators.
- 2.6 Where the majority of negative excursions into the parent material were observed to be very superficial, additional Craform (photogrammetry) imaging was performed to obtain more precise measurements.
- 2.7 The results of the visual, radiographic and dimensional data sets were evaluated and summarized in the Appendix I presentation of this report.

3.0 Findings

- 3.1 Against the requirements for undercut outlined in API 1104 p. 9.3.11, WIX found no non-conformances for any of the five welds in question. The evaluation process and results of which are memorialized in Appendix III. While there are indications acknowledged at the Section 1.1 locations, their interpretation was that no rejectable undercut existed.
- 3.2 ATS reviewed the WIX report, and then submitted the report and film to NDT Technical Services for further review by [Redacted]. His results concluded that against the API 1104 p. 9.3.11 requirements for undercut, no rejectable conditions existed. His interpretation was similar to that of WIX, applying criteria of severity/morphology, and length. The results of the David Culbertson review are memorialized in Appendix II.
- 3.3 Following direction that the five welds be either repaired or removed from Line 114, ATS began preliminary work to digitize the views of interest. From the digitized views, approximate estimates were made for the depth of the indications, relating density to thickness using known values in the image for calibration. These results generally validated the interpretations of WIX and NDT Technical Services, and are reported in Appendix I. While this method is not specifically adopted by the API 1104 code, it is in broad acceptance in the Aerospace and Nuclear industries and the tools are integrated into all current digital imaging platforms.
- 3.4 External visual, UC gaging and dial indicator measurements revealed that only small areas within the called ROI's had depths estimated below the adjacent parent material surface. Measurements had thus low repeatability due to topography. This result led to the decision for the Craform photogrammetry with its calibrated 40 micron spatial resolution and accuracy to within 0.002".



3.5 Creafom photogrammetry results were obtained for all the radiographic ROI's. The criteria applied to these results were API 1104 section 9.7, Table 4, "Maximum Dimensions of Undercutting". Applying the further criteria of depth from this requirement, to the documented radiographic and visual measurement data for length, all welds were found acceptable. Figure 2, from slide 5 in Appendix I, summarizes the typical physical condition for the audit identified indications of concern.

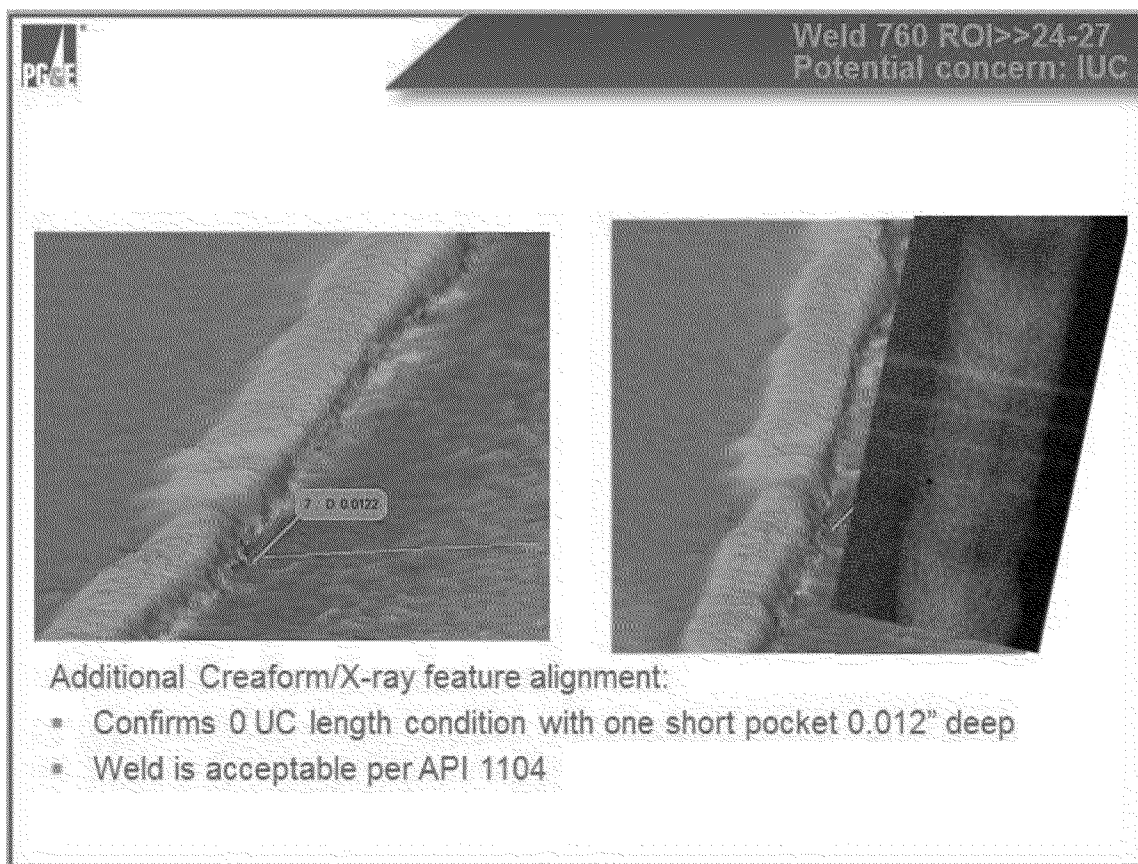


Figure 1 – Assessment of Weld 760 IUC region of interest



4.0 Conclusions

4.1 Against the requirements for undercutting contained in section 9.3.11, and section 9.7 of API 1104 twentieth edition, the findings of this report lead ATS to conclude that Welds 738, 760, 770, 771, 781 of line 114 are acceptable.

No.	Weld No.	Regulatory - Level III Interpretation	Location in View	Final Disposition
1	W-738	External Undercut (EUC)	36-42	Acceptable to API 1104, 20 th edition
2	W-760	Internal Undercut (IUC)	24-27	Acceptable to API 1104, 20 th edition
3	W-770	Internal Undercut (IUC)	36-42	Acceptable to API 1104, 20 th edition
4	W-771	Internal Undercut (IUC)	12-24	Acceptable to API 1104, 20 th edition
5	W-781	Internal Undercut (IUC)	44-49	Acceptable to API 1104, 20 th edition

Appendix I

ATS presentation on quantitative analysis of UC,



Appendix I Line 114
Weld Assessment.pdf

Appendix II

Independent review of radiography by NDT Technical Services,



Appendix II External
Consult PGE Line 114

Appendix III

WIX report of radiography

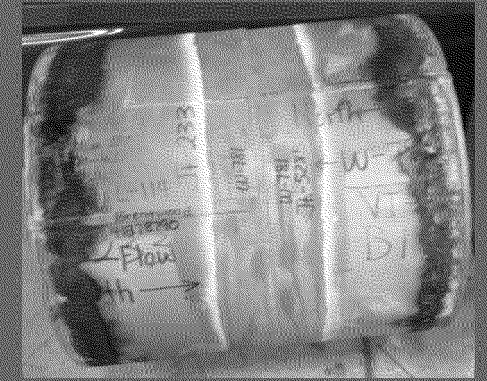
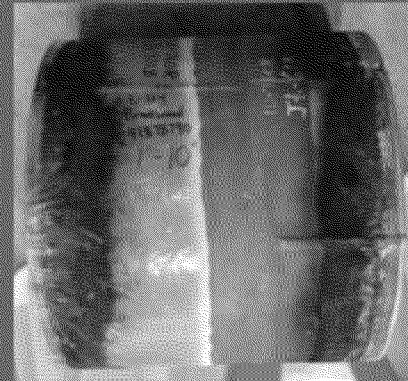
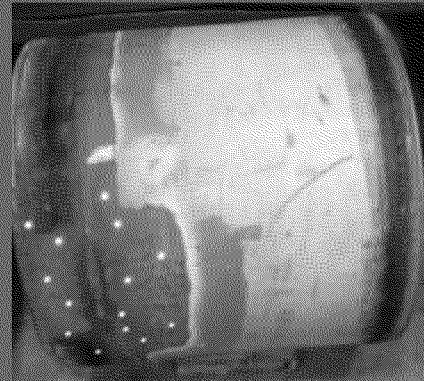
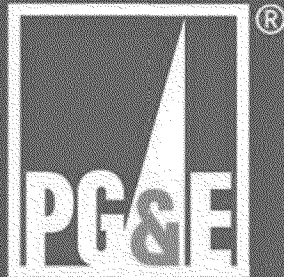
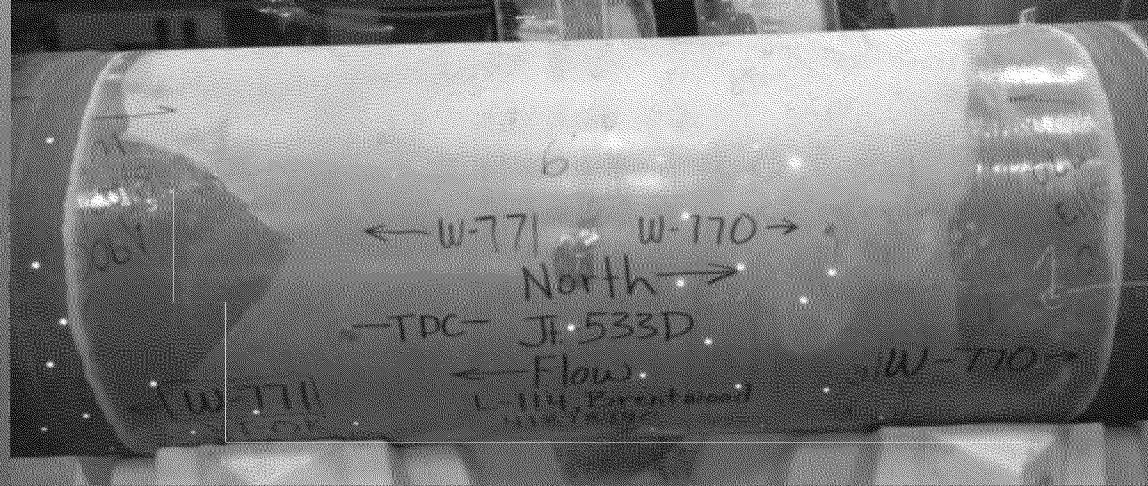


Appendix III Film
Review L114 WIX.pdf

Appendix I

Line 114

Assessment of PHMSA UC concerns on welds 738, 760, 770, 771, 781





Results Summary

This appendix summarizes visual, photogrammetry (Creaform), and digital radiographic assessments performed on indications reported to PG&E/ATS as external and internal undercut, during a 9/25/2013 regulatory (PHMSA) audit

- * The below table summarizes the audit findings
- * Slides 3-18 document the findings from the ATS assessment
- * Results indicate that all five welds are acceptable to API 1104 requirements

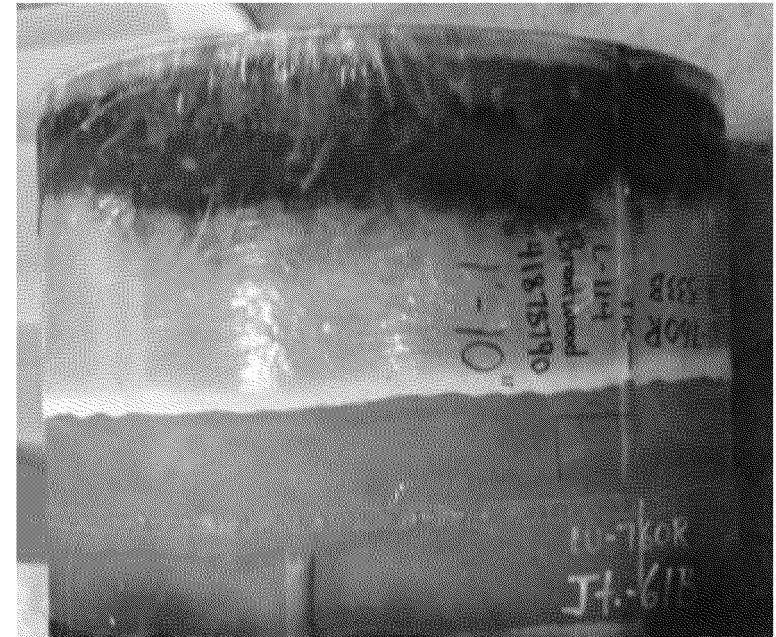
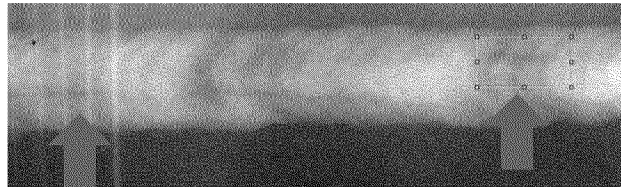
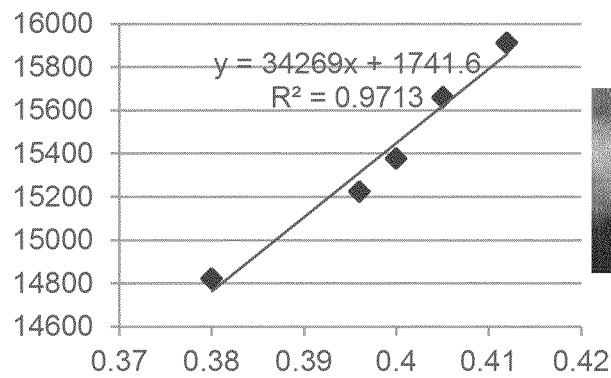
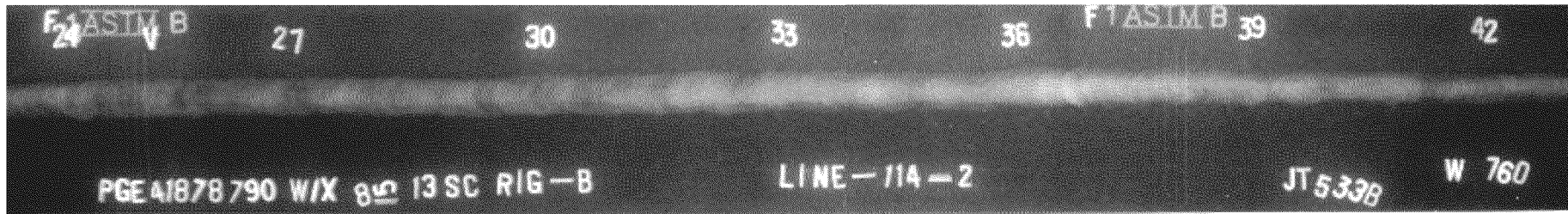
No.	Weld No.	Regulatory Level III Interpretation	Location in View
1	W-738	External Undercut (EUC)	36-42
2	W-760	Internal Undercut (IUC)	24-27
3	W-770	Internal Undercut (IUC)	36-42
4	W-771	Internal Undercut (IUC)	12-24
5	W-781	Internal Undercut (IUC)	44-49



Weld 760 cited for indications of internal undercut from 24-27

Excised weld photo-documented and ROI aligned with weld features

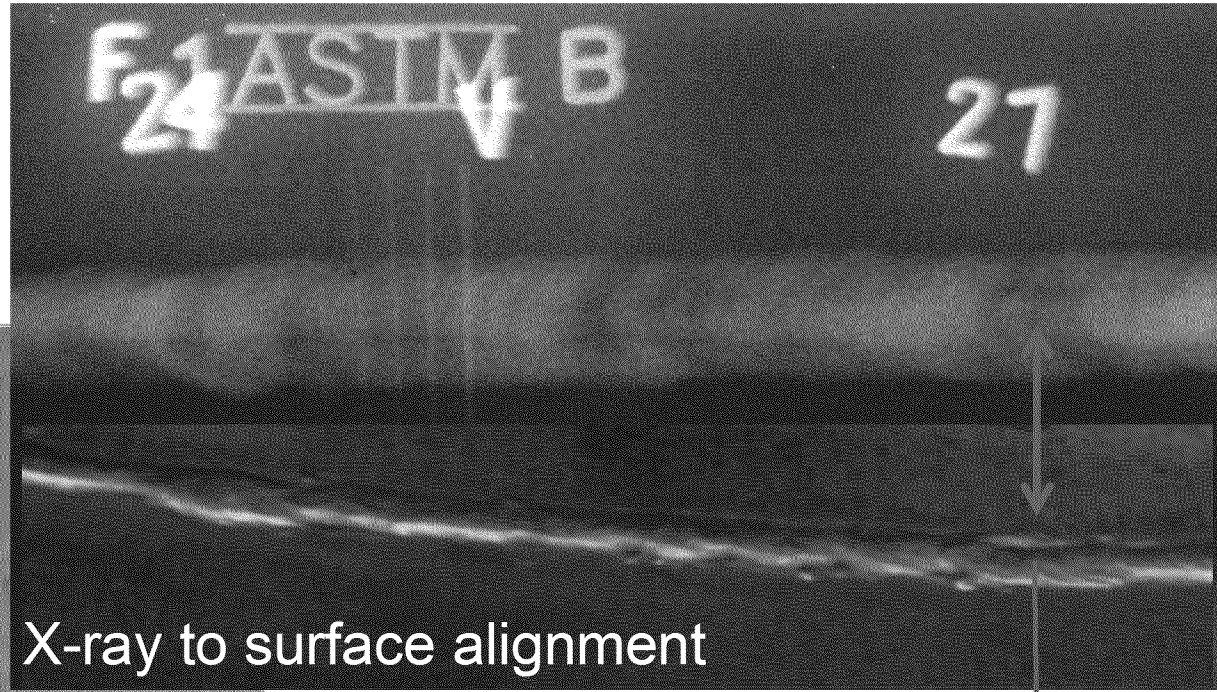
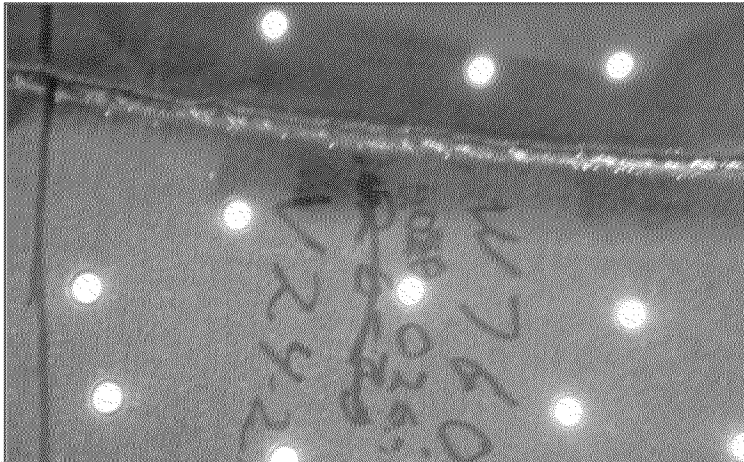
Depth of most severe indications estimated by change in x-ray density



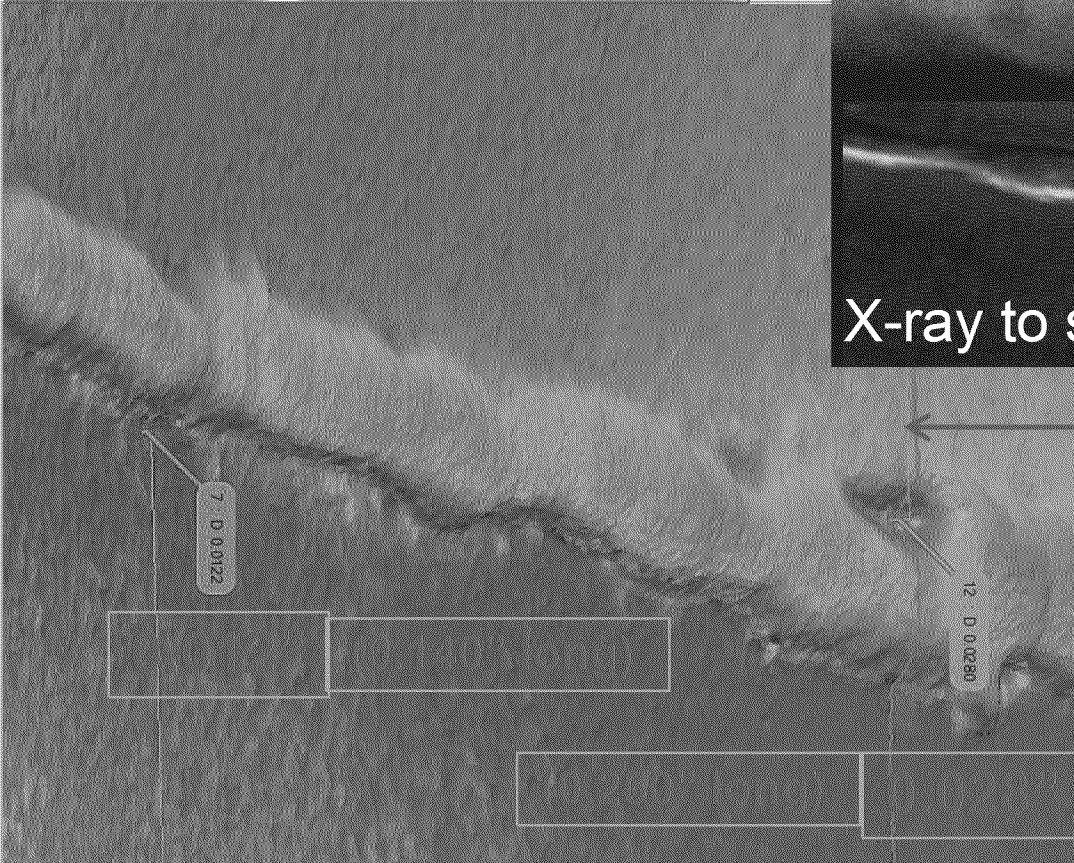
RT estimated depths of 0.012 – 0.028 inches

Further correlation pursued with 3D surface map

Digital surface profile tool alignment



X-ray to surface alignment

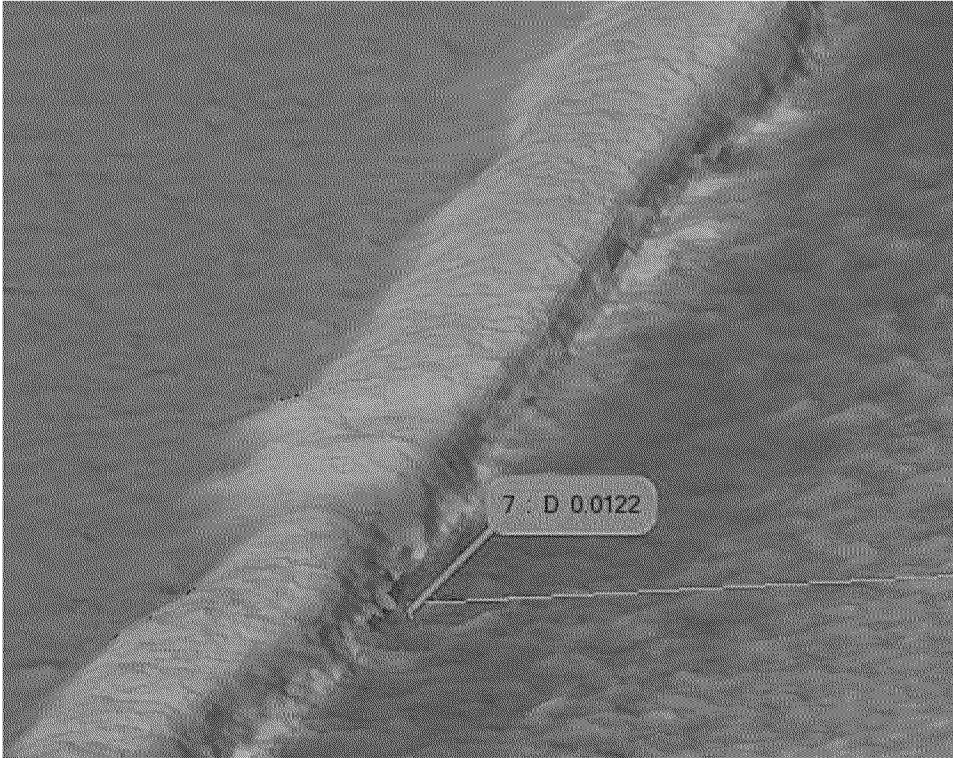


Creaform 3D (+/- 0.002") surface profile:

Confirms indications are mostly diffraction effects on minor hi/lo condition with 0 UC

Two small pockets are 12 and 28 mils deep with greatest length of 0.250"

Weld is acceptable per API 1104



Additional Creaform/X-ray feature alignment:

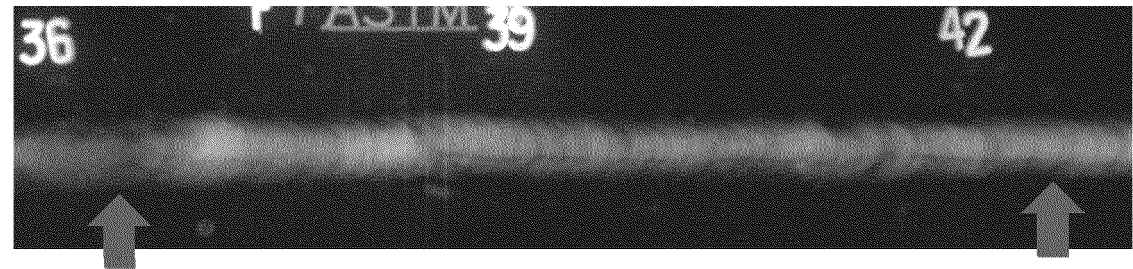
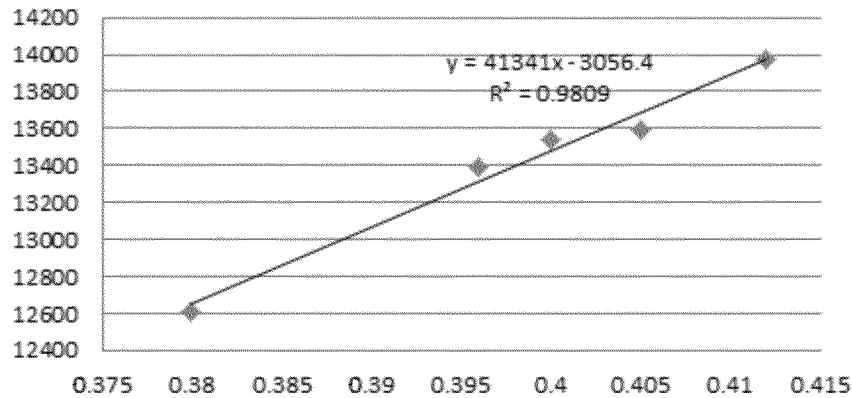
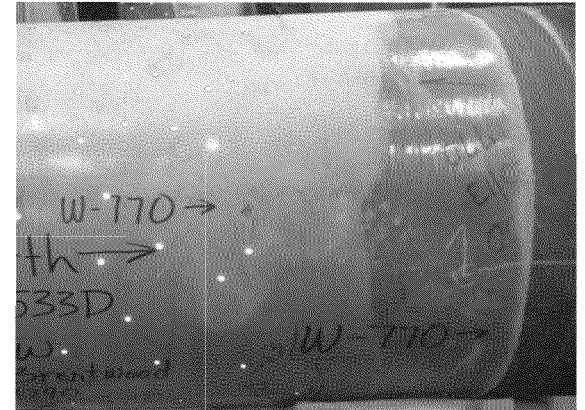
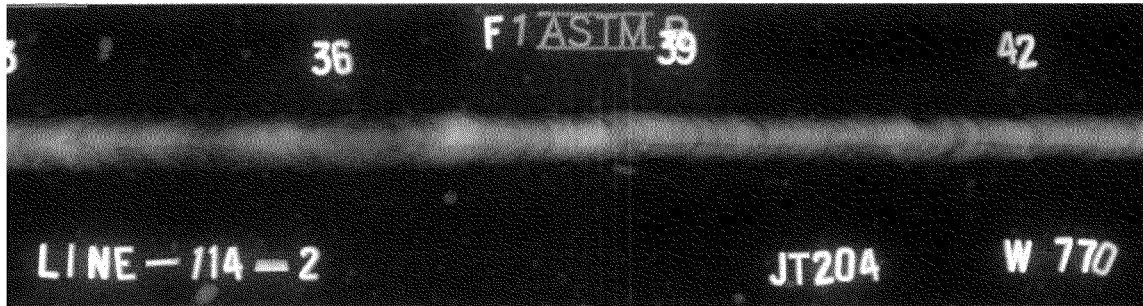
- * Confirms 0 UC length condition with one short pocket 0.012" deep
- * Weld is acceptable per API 1104



Weld 770 cited for indications of internal undercut from 36-42

Excised weld photo-documented and ROI aligned with weld features

Depth of most severe indications estimated by change in x-ray density

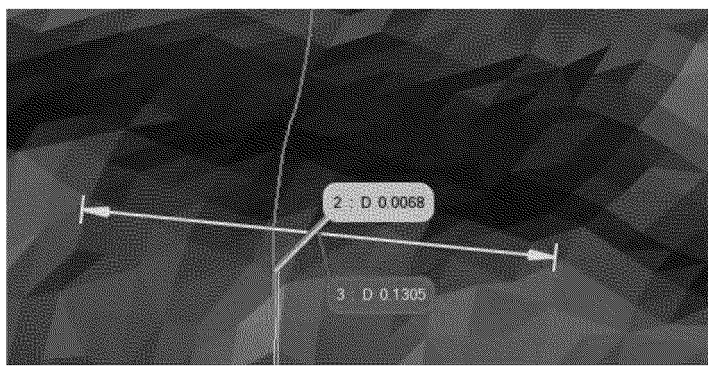
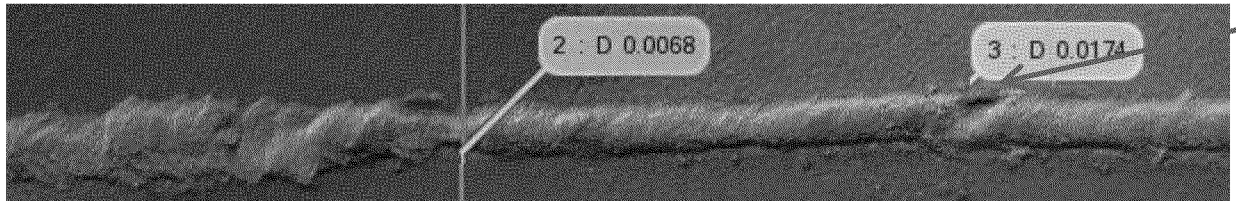
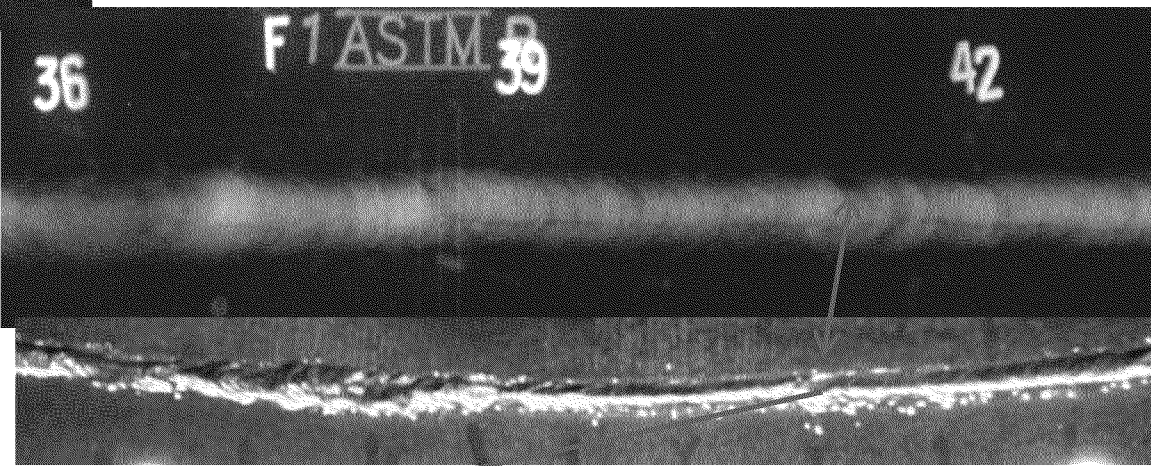
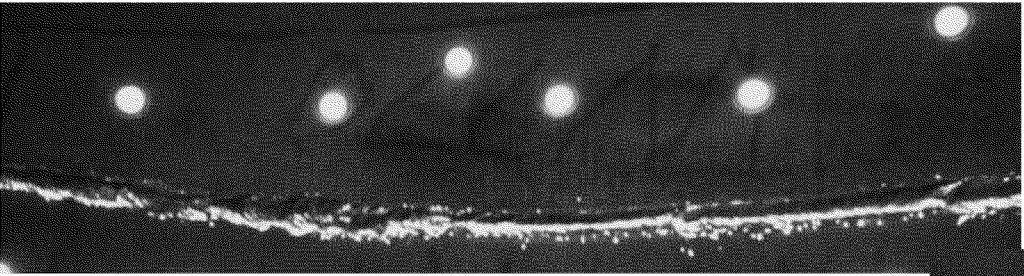


RT estimated depths of up to 0.008 inches

Further correlation pursued with 3D surface map

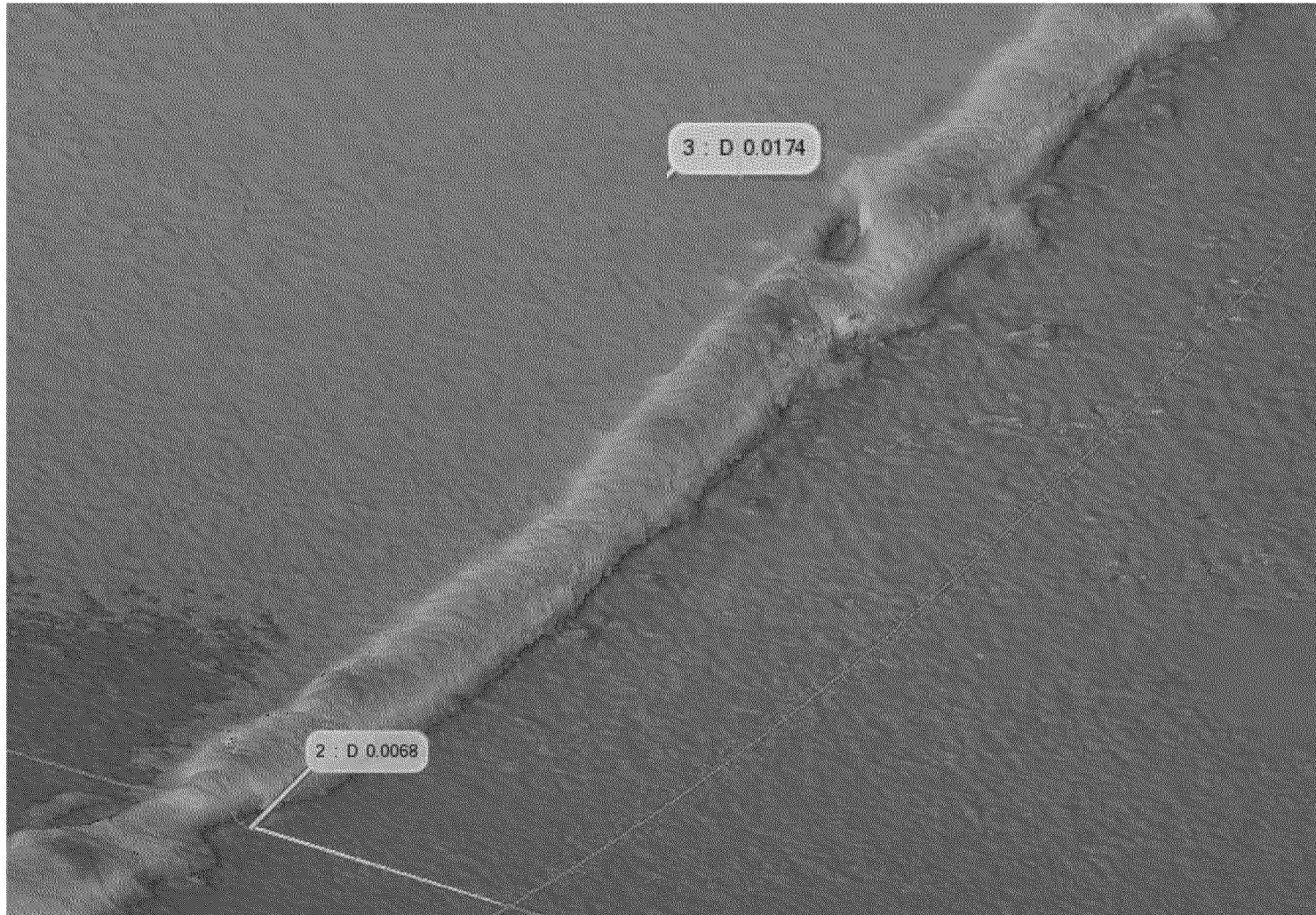


Digital surface profile tool alignment



Creaform 3D (+/- 0.002") surface profile:

- Confirms indications are, in the majority, diffraction effects on minor hi/lo condition with 0 UC
- One small pocket observed at 0.007" deep x 0.130" long
- One unrelated pocket opposite ROI of 0.017" deep x 0.195" long
- Weld is acceptable per API 1104



Additional Creaform/Polyworks perspective of ROI 36-42:

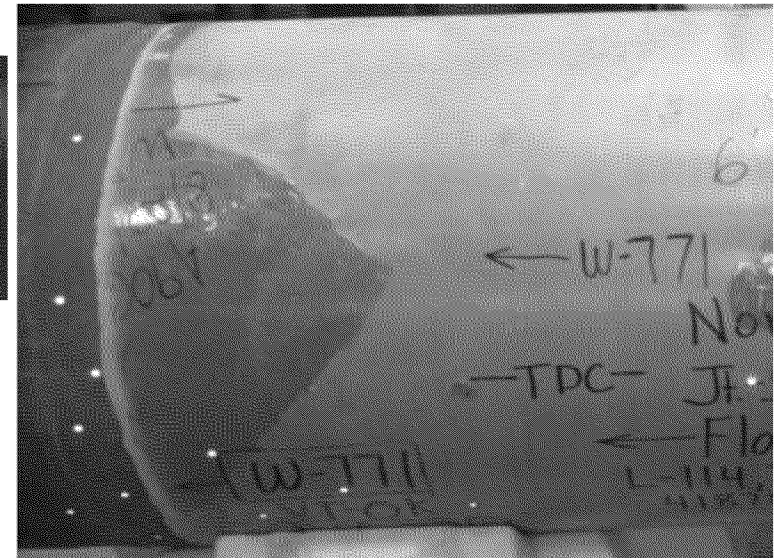
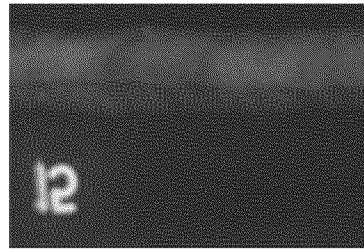
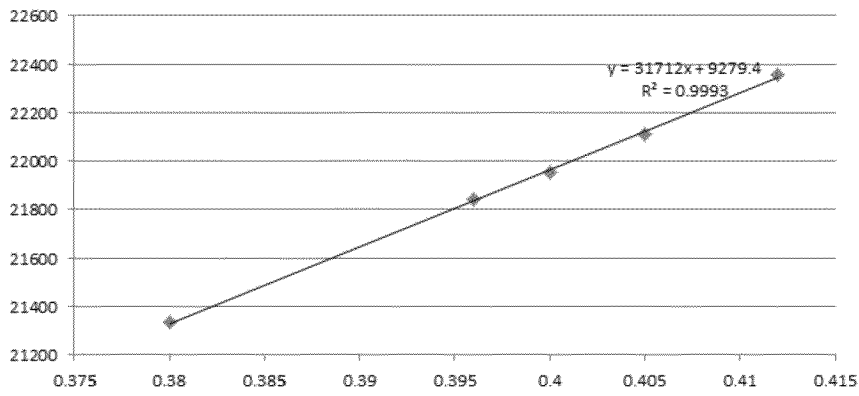
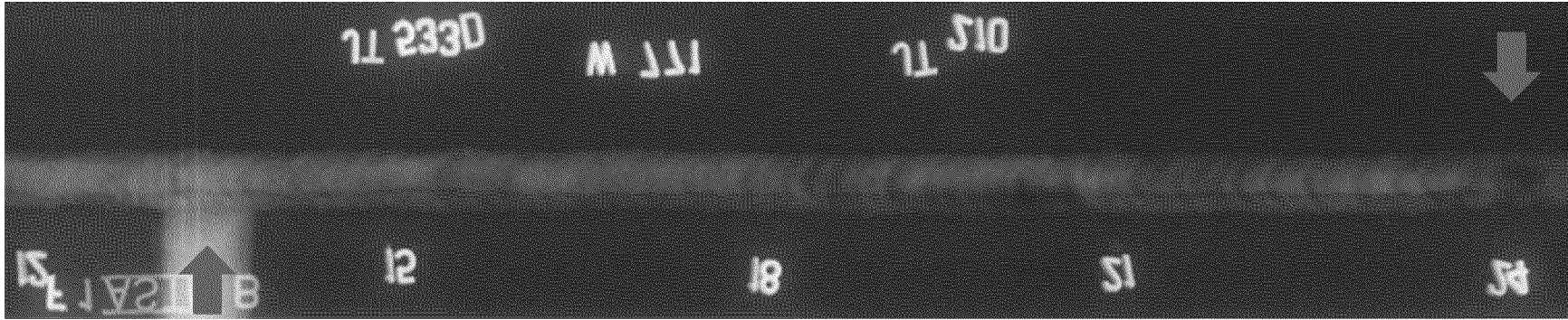
- * Confirms UC indication is diffraction/"shadowing" from high/low condition
- * Weld is acceptable per API 1104



Weld 771 cited for indications of internal undercut from 12-24

Excised weld photo-documented and ROI aligned with weld features

Depth of most severe indications estimated by change in x-ray density

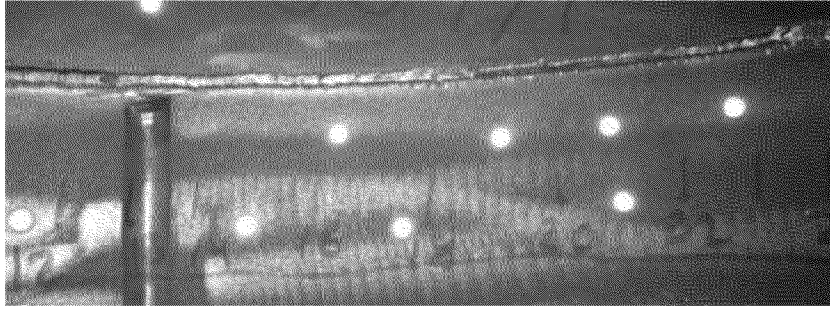


RT estimated depths of up to 0.008 inches

Further correlation pursued with 3D surface map



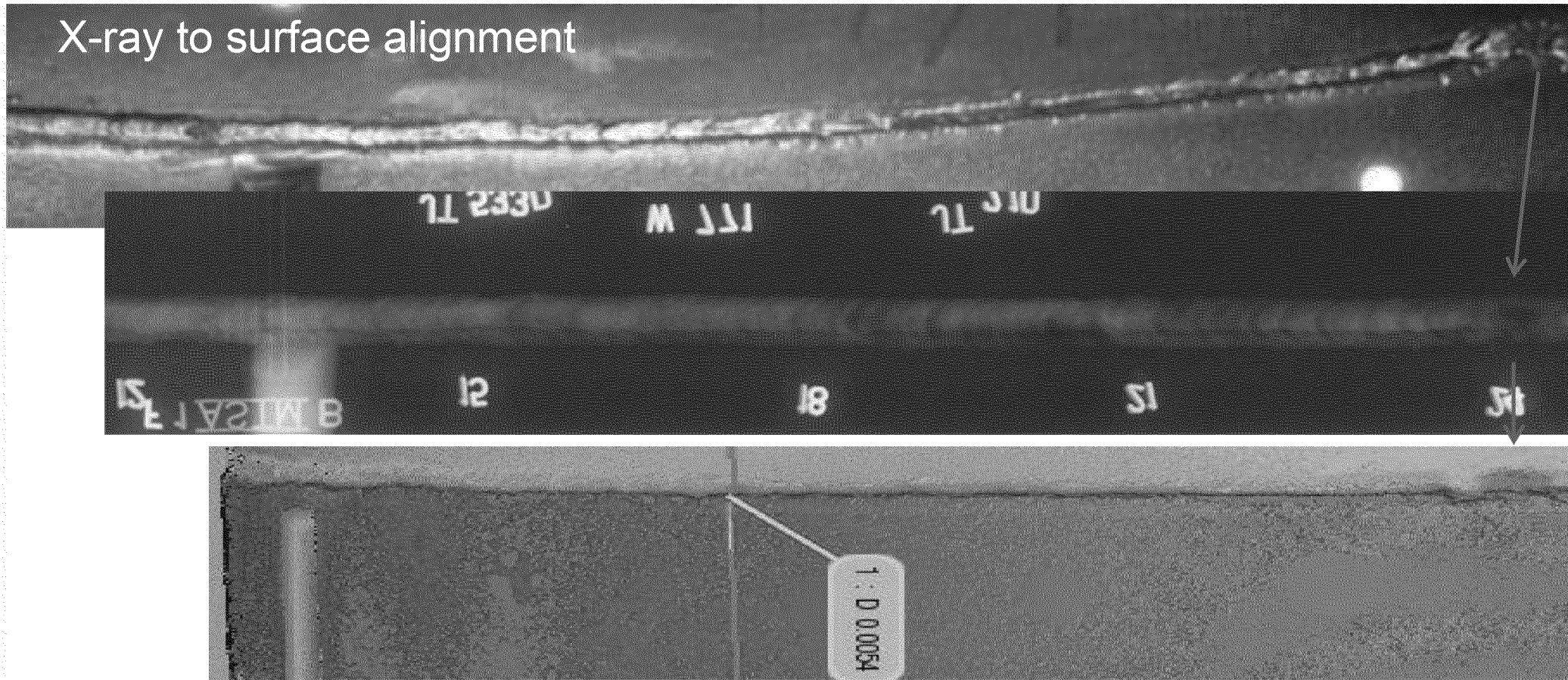
Digital surface profile tool alignment

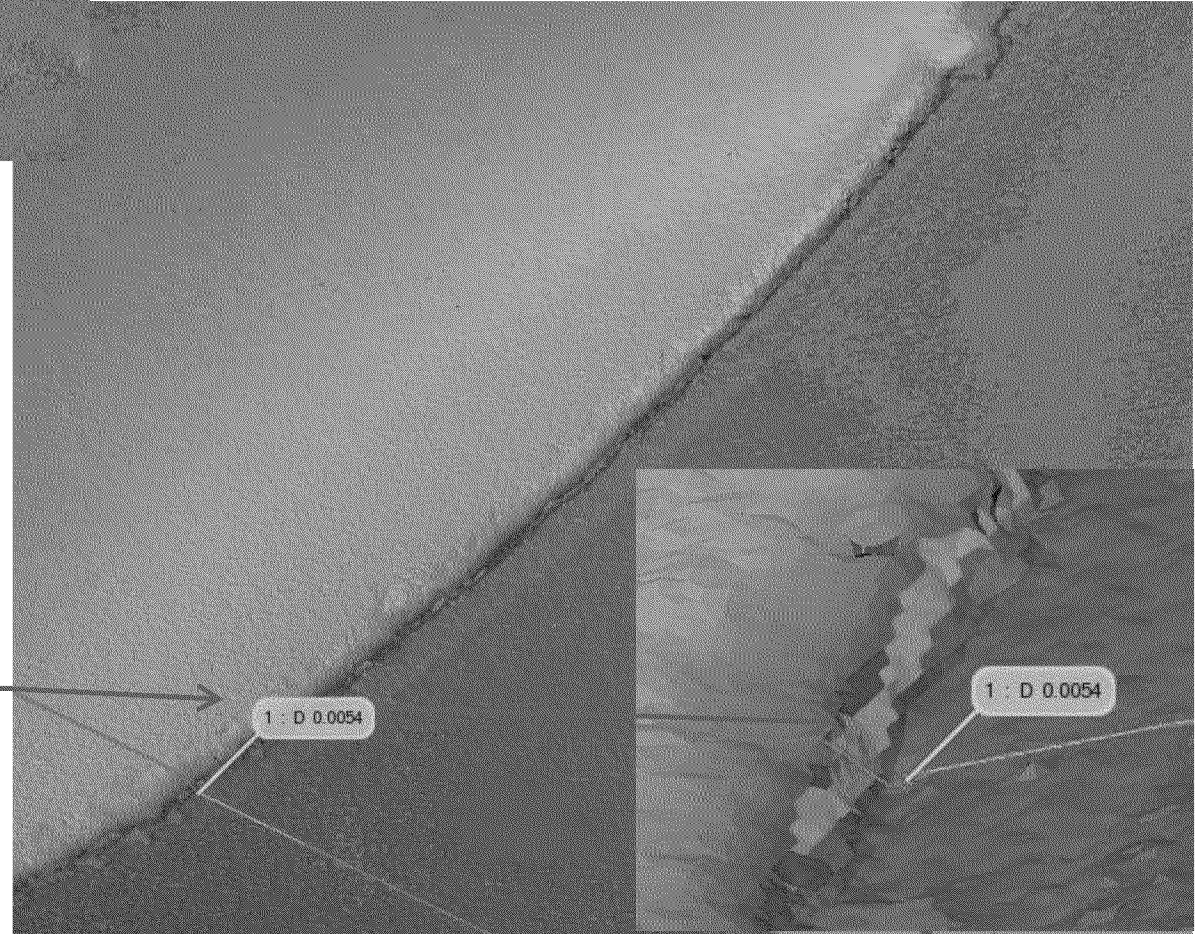
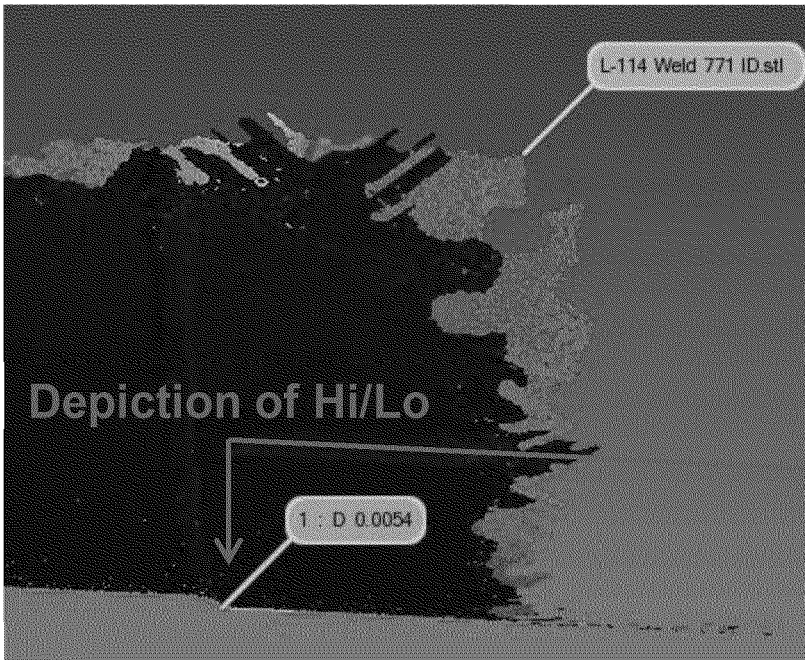
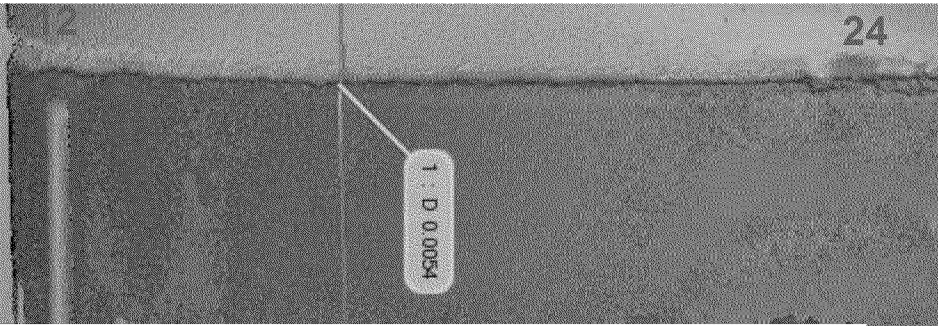


Creaform 3D (+/- 0.002") surface profile:

- Confirms indications are mostly diffraction effects on minor hi/lo condition with 0 UC
- Deepest region along length is 0.006 inches
- Weld is acceptable per API 1104

X-ray to surface alignment





Additional Creaform/Polyworks perspective of ROI 12-24:

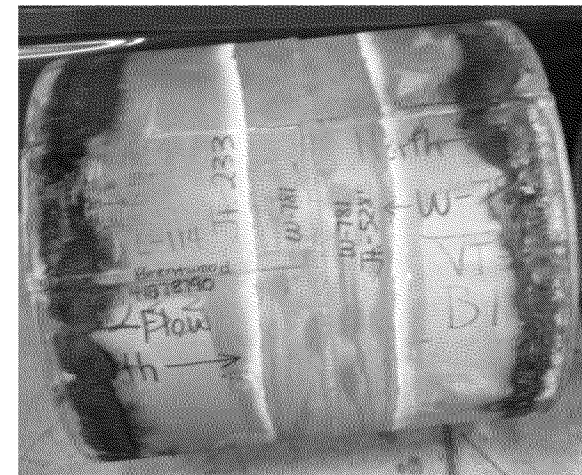
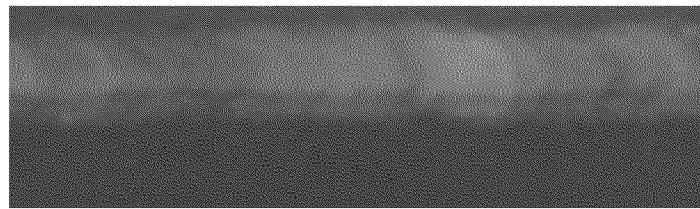
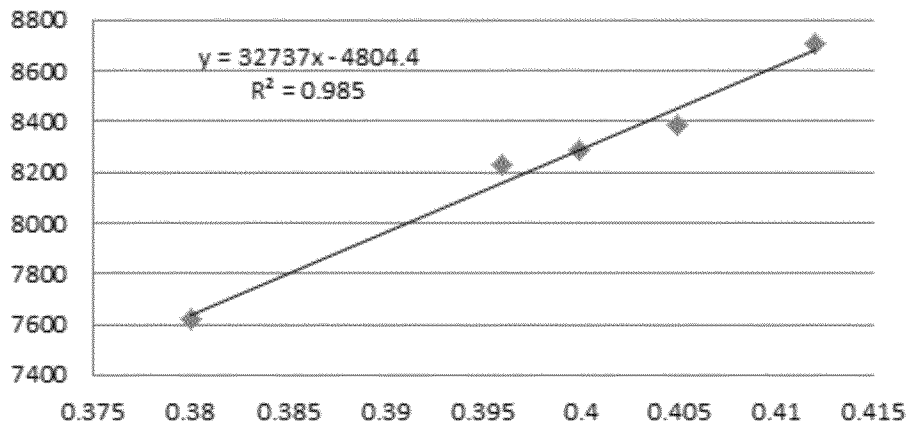
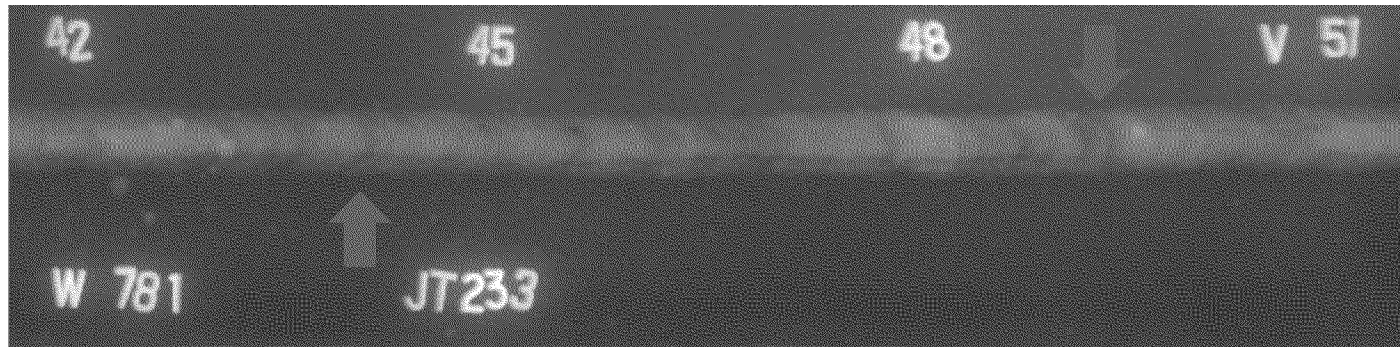
- * Confirms UC indication is diffraction/"shadowing" from high/low condition
- * Weld is acceptable per API 1104



Weld 781 cited for indications of internal undercut from 44-49

Excised weld photo-documented and ROI aligned with weld features

Depth of most severe indications estimated by change in x-ray density



RT estimated depths of up to 0.015 inches

Further correlation pursued with 3D surface map



Digital surface profile tool alignment

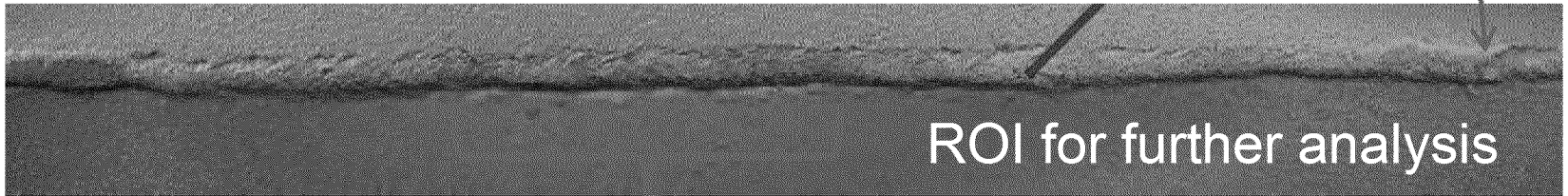


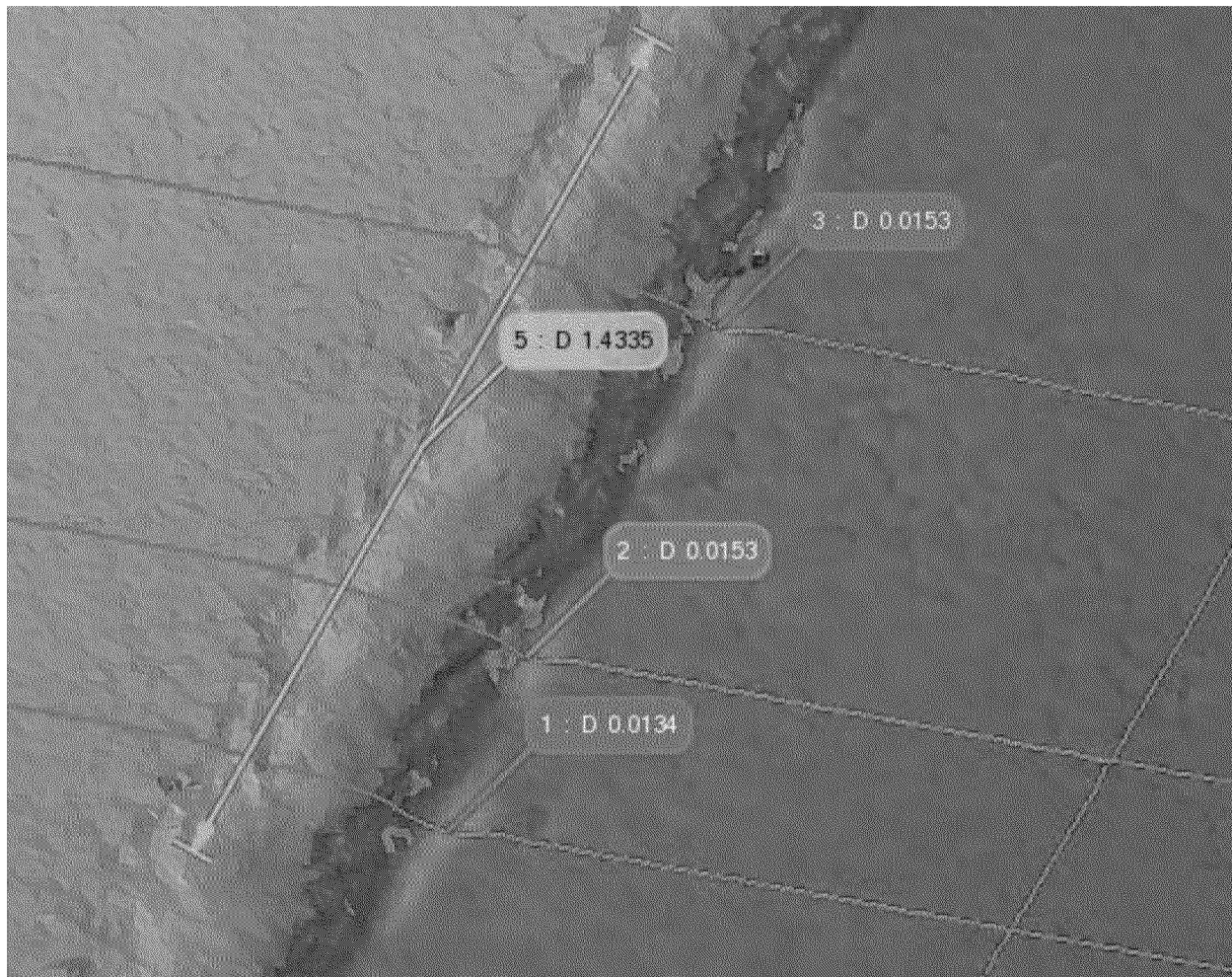
Creaform 3D (+/- 0.002") surface profile:

Confirms indications are mostly diffraction effects on minor hi/lo condition with 0 UC

Largest region is 1.5 long x up to 0.015 inches deep

Weld is acceptable per API 1104





Additional Creafom/Polyworks perspective of ROI 44-49:

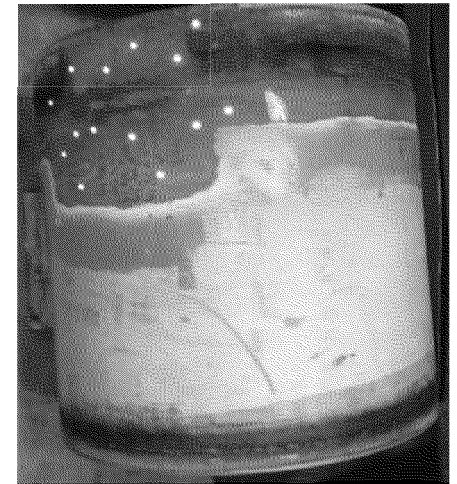
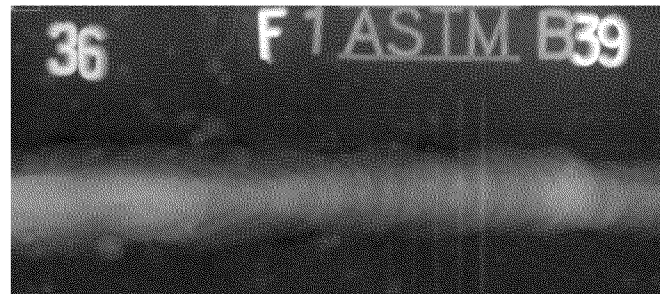
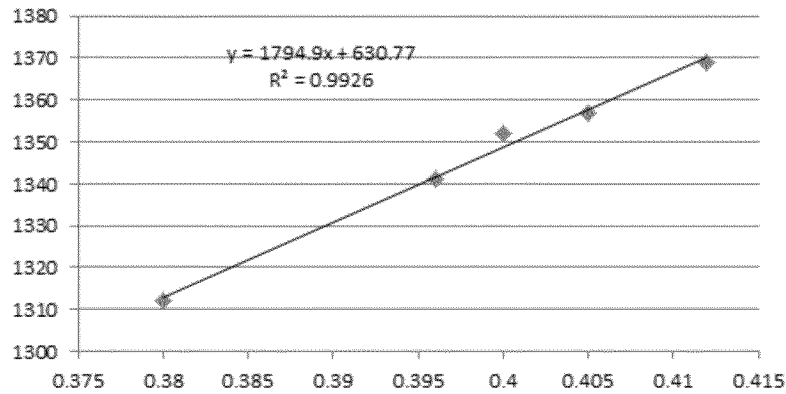
- * Confirms UC indication is, in the majority, diffraction/"shadowing" from high/low condition with less than 2 inches of up to 0.015 inches deep IUC
- * Weld is acceptable per API 1104



Weld 738 cited for indications of external undercut from 36-42

Excised weld photo-documented and ROI aligned with weld features

Depth of most severe indications estimated by change in x-ray density

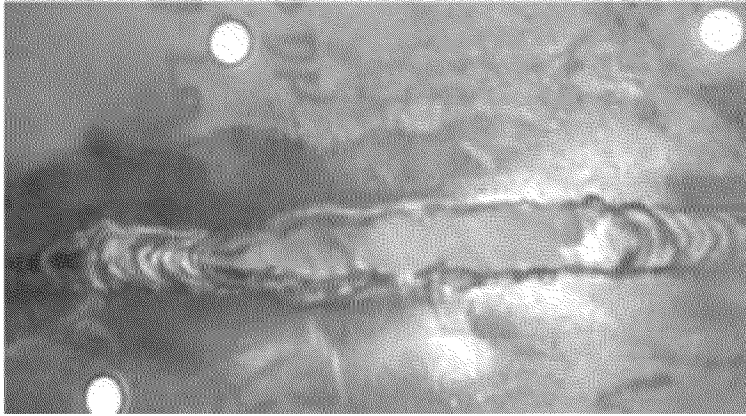


RT estimated depths of up to 0.030 inches

Further correlation pursued with 3D surface map



Digital surface profile tool alignment

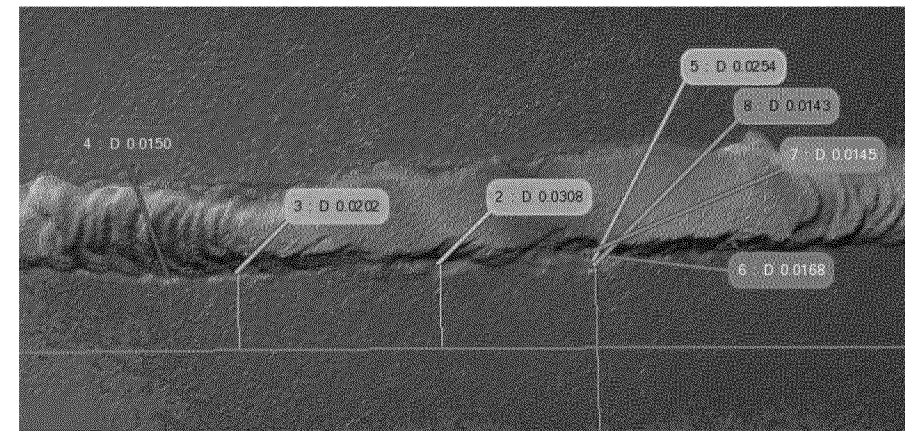
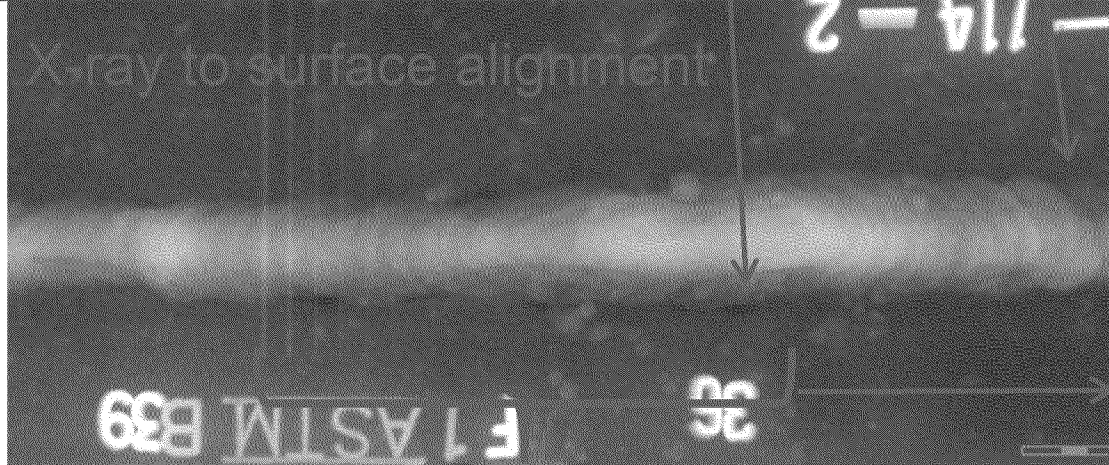
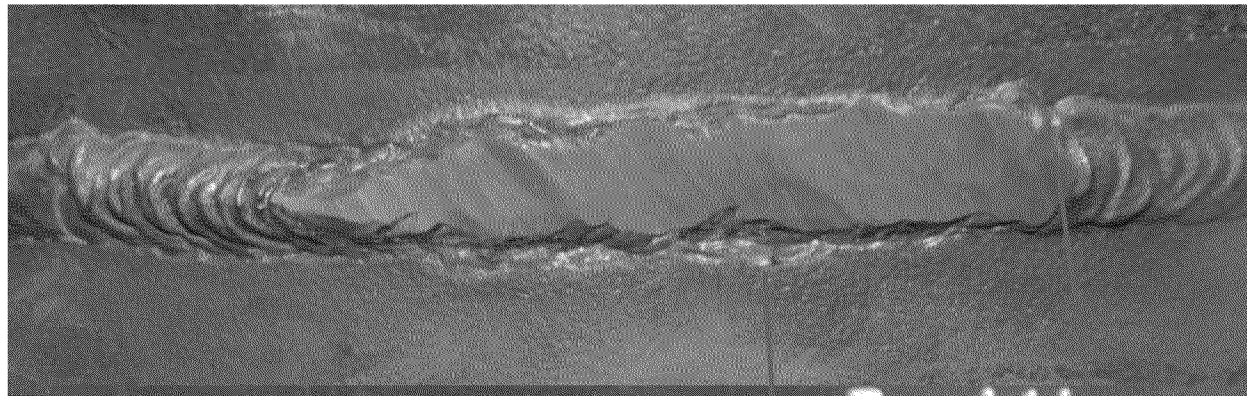


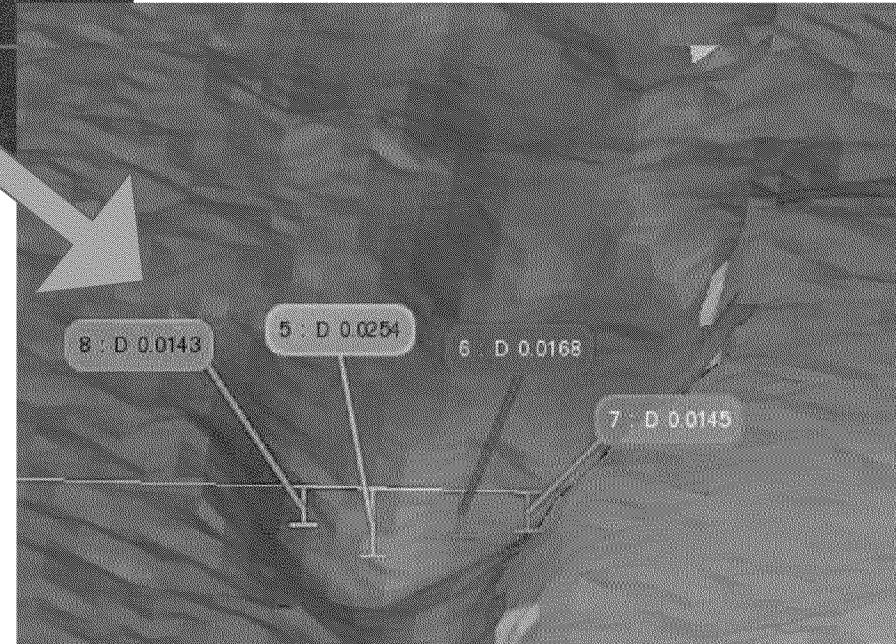
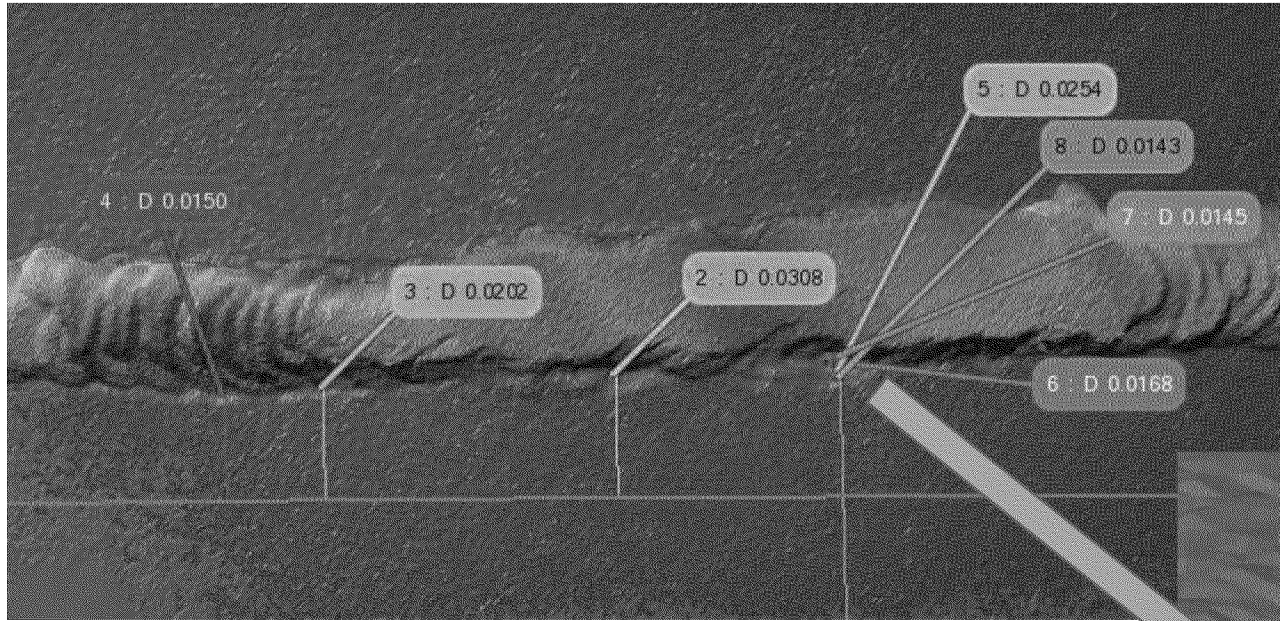
Creaform 3D (+/- 0.002") surface profile:

External undercut identified up to 0.030" deep

Sum of UC lengths < 1.5"

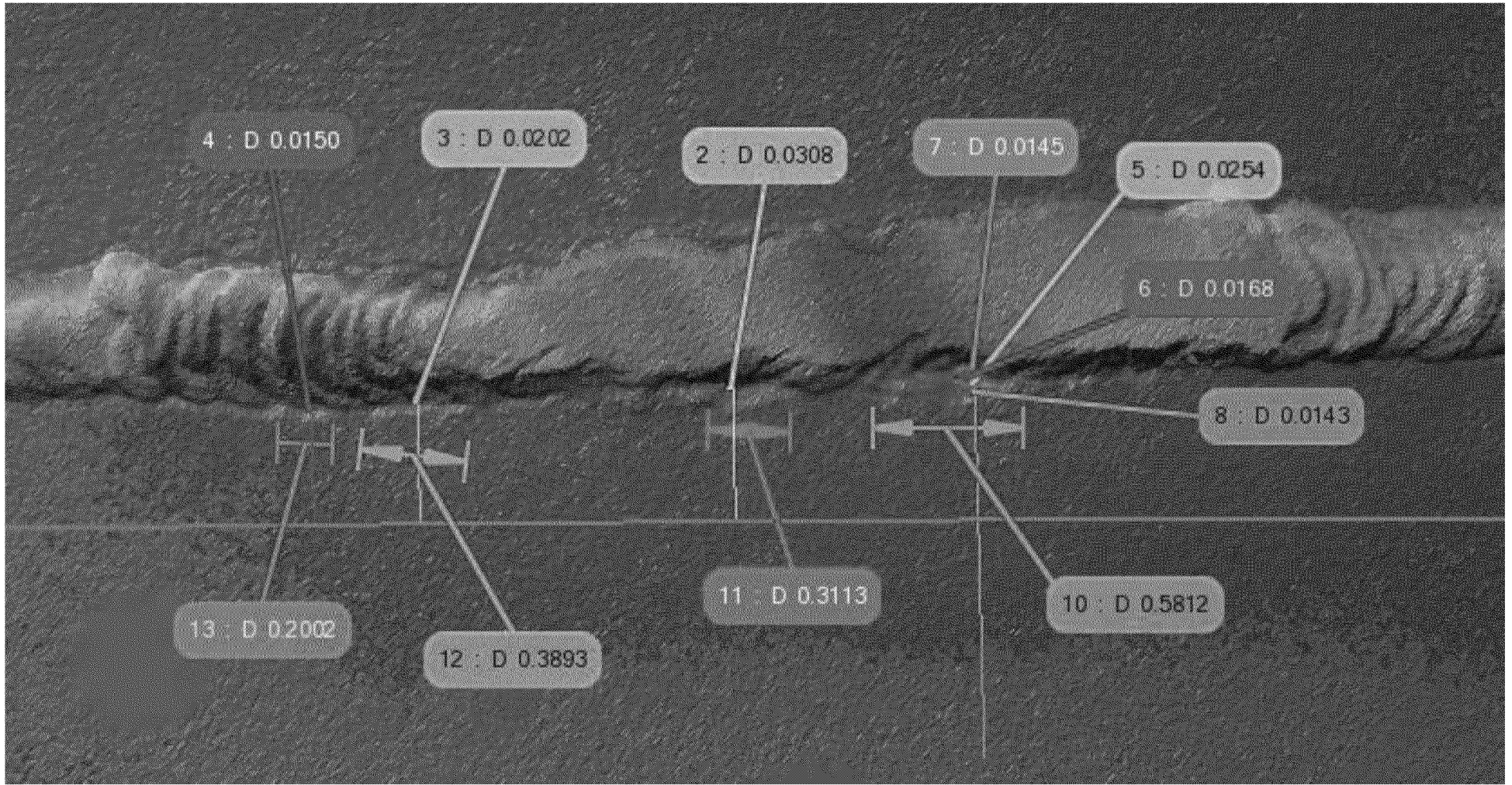
Weld is acceptable per API 1104





Additional Creaform/Polyworks perspective of ROI 36-42:

- * EUC noted in several short segments totaling less than 1.5"
- * Weld is acceptable per API 1104



Additional Creaform/Polyworks perspective of ROI 36-42:

- * EUC noted in several short segments totaling less than 1.5"
- * Weld is acceptable per API 1104



APPENDIX II



Technical Services, Inc.

P. O. Box 721139, Houston, Texas 77272-1139

www.ndttechnicalservices.com

Phone: (281) 389-4304

E-mail: NDTServices@aol.com

September 30, 2013

Redacted

Pacific Gas and Electric Company
PG&E Applied Technology Services

Redacted

Dear Redacted:

As requested, on Monday, September 30, 2013, as an independent NDT Level III consultant I performed a film review of five welds associated with PG&E Line 114, Job Number 41878790. The following are the results of this review:

- * Weld #738
 - Noted indication at location markers 36 – 39
 - Indication interpreted to be EU – length 1 1/16”
 - Weld acceptable in accordance with API 1104
- * Weld #760
 - Noted indication at location markers 23 – 27
 - Indication interpreted to be a shadow at edge of root bead due to a minor high-low condition
 - Weld acceptable in accordance with API 1104
- * Weld #770
 - Noted indication at location markers 39 – 42
 - Indication interpreted to be a shadow at edge of root bead due to a minor high-low condition – length 2 3/8”
 - Weld acceptable in accordance with API 1104
- * Weld # 771
 - Noted indication at location markers 12 – 24
 - Indication interpreted to be a shadow at edge of root bead due to a minor high-low condition – length 11”
 - Weld acceptable in accordance with API 1104

* Weld # 781

- Noted indication at location markers 46 – 49
- Indication interpreted to be a shadow at edge of root bead due to a minor high-low condition – length 4”
- Weld acceptable in accordance with API 1104

Let me know should you require any additional information concerning this film review.

Respectfully

Redacted

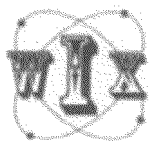
President
ASNT Level III – 2820
ACCP Professional Level III

Redacted
acted/pac/Letter Concerning Film Review of Five Welds from PG&E Line 114

cc: Redacted
Peter Kenny



APPENDIX III



Western Industrial X-ray

1707 Enterprise Dr., Unit F, POBox 238, Fairfield, CA 94533 (707)425-4673 (888) FOR XRAY FAX (707)425-4592

PGE Line 114 JN41878790 – FILM REVIEW

Review performed by [Redacted] Level II Technician and I [Redacted] as Radiography Supervisor.

- Weld #738

View area 36" to 39".

Possible external undercut, less than 2" in 12"

- Weld #760

Area of interest @ 23" to 27". No evidence of indication in adjacent film.

It is an obvious field cut and joint preparation. Area of concern is less than 2" in 12"

False bevel shadow due to HiLo

The density is consistent throughout indication.

Normally the edge closest to bead would be darker on an undercut indication.

Possible cause of the indication could be slight counter bevel during joint preparation.

- Weld #770

Indication @ 38.75" to 49.5"

HiLo present

Indication was interpreted as false counter bevel due to field cut and preparation.

Density is too consistent across indication to call undercut.

- Weld #771

Indication @ 12" to 24"

Indication is shadow due to HiLo.

Indication not consistent with normal undercut. These would be the type of indications that you would find if a grinder was applied to the inside of the joint, for example to remove slag after burning which would appear on film as a slight back bevel.

- Weld #781

Indication @ 46" to 49".

There is no difference in density after shading to call undercut.

It is a field prepared joint.

Our interpretation of these areas is that the above listed welds meet the requirements of API 1104.

Regards,

[Redacted]

Western Industrial X-ray, Inc.
Radiography Supervisor