Noncompliant Weld Inspection Techniques

Line 114 Non Destructive Examination Final Report

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Author: Redacted
Sr. Compliance Engineer

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

Kirk Johnson, *Vice President*
Gas Transmission Maintenance Construction

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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 edition[1] 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 2012-2013[2]. 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 has 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.

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[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 Report[3].
- **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.
- **9/3013** – 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 ranges[4]
- Non-Compliant placement of Image Quality Indicators[5]
- 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 welds[6]. 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

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[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 Testing[7] 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

RADIOGRAPHIC EXAMINATION OF WELDS

(Reference: API-1104)

TC-RT-1104

PREPARED BY: Redacted

TITLE: LEVEL III

SIGNATURE: Redacted

APPROVED BY: Redacted

TITLE: President, T.C. Inspection

SIGNATURE: Redacted

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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 though 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.

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

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 that 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.

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

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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-relived 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

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

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

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

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

Material	Iridium 192	Cobalt 60
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 con 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

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.

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 milliampere-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

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.

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

HOLLOW BEAD (Porosity)	1/2	2.0

TABLE 4

DISCONTINUITY	ACCEPTANCE STANDARDS
Porosity, Spherical and Piping (wormhole and spherical)	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.
Porosity, Clusters in Finish Pass Only.	Cluster diameter shall not exceed ½ 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.
Isolated Slag Inclusions Pipe 2 3/8" O.D. and Larger	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.
Isolated Slag Inclusions Pipe Less than 2 3/8 inch O.D.	The maximum width of any isolated slag 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.
Crater Cracks or Star Cracks	The maximum length shall not exceed 5/32 inch.
Other Cracks	None Allowed.
Undercutting	Up to 2 inches in a continuous 12 inch weld length, or 1/6 the weld length, whichever is smaller.

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.

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

Mr. Redacted
Pacific Gas and Electric Company
PG&E Applied Technology Services
3400 Crow Canyon Road
San Ramon, CA 94583

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

DLC/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	Brentwood		Mile Point	N/A
Pipe diameter and thickness	Diameter	24	Thickness	0.375"
Date of Audit	03 26 2013			
Company performing NDT	T C Inspection			
Technician/s Name/s	Redacted			
Certification Level	RT	II	RT	
	MT	II	MT	

Procedures & Equipment

Procedure used	RT	TC-RT-1104 Rev 0 (To API 1104, 19th Ed)			
	MT	N/A			
Procedure available	RT	Yes X	No	Outdated Procedure was available and used	
	MT	Yes	No		
RT Technique	DWSI	X	SWSI		
Radiation type	Ir 192		Se 75	X Ray	
Source or Focal spot physical size	0.142"		Activity or Kv	75.7	
Geometric Unsharpness (Ug)	0.0034"		Exposure time	2:45	
Surface NDT method	None				
Power source	Port. Generator	X	Welding set		Onboard Inverter

Variables

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

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

Surface NDT

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

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**	Redacted	**Assistant**	None	
Source Information	**Exp Device / Model**	INC IR-100	**S/N**	4702	
	Capsule Model	87703	**S/N**	85843B	
General Notes	**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.

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Location of Audit	L-114-2		Mile Point	12.70-16.52	
Pipe diameter and thickness	Diameter	24	Thickness	0.375"	
Date of Audit	03 27 2013				
Company performing NDT	TC Inspection				
Technician/s Name/s	Redacted				
		Exp			Exp
Certification Level	RT	II	Nov-15	RT II	Jul-14
	MT	II	Nov-15	MT II	Oct-13

Procedures & Equipment

Procedure used	RT	TC RT-1104-2 Rev 1 (API 1104 20th Ed)			
	MT	N/A			
Procedure available	RT		Yes X	No	
	MT		Yes X	No	
RT Technique	DWSI	X	SWSI		
Radiation type	Ir 192		Se 75	X Ray	
Source or Focal spot physical size	0.142		Activity or Kv	74.7	
Geometric Unsharpness (Ug)	0.003"		Exposure time	3:45	
Surface NDT method	N/A				
Power source	Port. Generator	X	Welding set	Onboard Inverter	

Variables

Film used	Manufacturer	Agfa 3 1/2" X 17"			Speed	D5		
Screens	Type	Pb	Thickness	0.005" / 0.010"			Condition	OK
Process method	Manual	X			Automatic		CR	
Process chemistry condition	New		Aged	~1Wk	Replenished		Bad	
Process time	Minutes	0:00			Process Temperature F°	68° (Verified)		
Darkroom	Clean	X			Need Cleaning		Surfaces	
Safelight conditions	Good	X	Cracked		Broken		Not working	
Film Viewer	Type	Venture					All bulbs working	Y
Bulbs	Photoflood	X			100W		60W	
Rheostat	Working	X			Foot switch		Working	
Suitable for film density	Yes	X		No				
Densitometer	Yes	X		No		Type	Optel J2716	
Calibrated	Yes			No X		Date	No Cal Cert.	
Daily check	Yes	X		No		By	Redacted	

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	1 ASTM B	Wire required	0.016"	Number Required	8		
Density of Film	Weld	2.84	Parent Material	3.01				
Number of IQI's	1		2 X		3		4	
Sensitivity	Required	0.016"		Achieved	0.013"			
Artifacts or Process Marks	Yes			No	X			
Interpretation	By	Redacted			Level	II		
Interpretation accurate	Yes	X		No				
Report	Completed	X	Required Information		In-Process			

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	Redacted	Amendment 79		
Operating & Emergency Procedures	TC-RSP-1 Rev 3 (10/25/2007)			
Dosimetry worn	**Technician**	Y	**Assistant**	Y
IRRSP or State card available	**Technician**	Redacted	**Assistant**	Redacted
Source Information	**Exp Device / Model**	INC IR-100	**S/N**	7018
	Capsule Model	87703	**S/N**	85846B
	Dimensions	0.118" X 0.079" X 0.142" Diag	**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.

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Location of Audit	L-114-2 Redacted, Brentwood		Mile Point	
Pipe diameter and thickness	Diameter 24"		Thickness 0.375"	
Date of Audit	3/28/2013			
Company performing NDT	Western Industrial X-Ray (WIX)			
Technician/s Name/s	Redacted			
Certification Level	RT II		RT Assistant	
	MT		MT	

Procedures & Equipment

Procedure used	RT WIX-RT-6 (Ref API-1104, 20th Ed; Effective 08/06/12)			
	MT			
Procedure available	RT	Yes Y	No	
	MT	Yes	No	
RT Technique	DWSI Y	SWSI		
Radiation type	Ir 192	Se 75	X Ray	
Source or Focal spot physical size	0.116"		Activity or Kv	44 Ci
Geometric Unsharpness (Ug)	0.003"		Exposure time	4:50
Surface NDT method	N/A			
Power source	Port. Generator		Welding set	Onboard Inverter Y

Variables

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

Developed film

IQI	Type	1 ASTM B	Wire required	0.016"	Number Required	8	
Density of Film	Weld	2.27	Parent Material	2.45			
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

N/A

Test weight weight

Dry Powder

Wet method

Particulate content checked

Radiation Safety

CA License / Letter of Reciprocity	CA License	Redacted		
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

No Recommendations. (Currently working on the Yellow Cones)

.

Location of Audit	Line 114-2 [Redacted] 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]			
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	AGFA			Speed	D5	
Screens	Type	PB	Thickness	0.005F / 0.010B	Condition	OK	
Process method	Manual	YES		Automatic		CR	
Process chemistry condition	New	YES	Aged		Replenished		Bad
Process time	Minutes	6:00			Process Temperature F°	69°	
Darkroom	Clean	YES		Need Cleaning		Surfaces	
Safelight conditions	Good	YES	Cracked		Broken		Not working
Film Viewer	Type	VENTURE 87-C1 (M/N)			All bulbs working	YES	
Bulbs	Photoflood	YES		100W		60W	
Rheostat	Working	YES		Foot switch	N/A	Working	
Suitable for film density	Yes	YES	No				
Densitometer	Yes	YES	No		Type	X-RITE 331	
Calibrated	Yes	YES	No		Date	Missing Sticker, But was Calibrated	
Daily check	Yes	YES	No		By	Redacted	
Film Density Strip Available	Yes	YES	No				

Developed film

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

Radiation Safety

CA License / Letter of Reciprocity	California License [Redacted]	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	RA	**Type**	RA
	Expires	12/16	**Expires**	12/16
	Certification #	[Redacted]	**Certification #**	[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 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

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	L-114-2 Redacted	Brentwood	Mile Point	
Pipe diameter and thickness	Diameter 24"		Thickness 0.375"	
Date of Audit	3/29/2013			
Company performing NDT	Western Industrial X-Ray (WIX)			
Technician/s Name/s	Redacted			
Certification Level	RT II		RT Assistant	
	MT		MT	

Procedures & Equipment

Procedure used	RT WIX-RT-6 (Ref API-1104, 20th Ed; Effective 08/06/12)			
	MT			
Procedure available	RT	Yes Y	No	
	MT	Yes	No	
RT Technique	DWSI Y	SWSI		
Radiation type	Ir 192	Se 75	X Ray	
Source or Focal spot physical size	0.116"		Activity or Kv	44 Ci
Geometric Unsharpness (Ug)	0.003"		Exposure time	5:15
Surface NDT method	N/A			
Power source	Port. Generator		Welding set	Onboard Inverter Y

Variables

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

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

N/A

Test weight weight

Dry Powder

Wet method

Particulate content checked

Radiation Safety

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

Developed film

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

Radiation Safety

CA License / Letter of Reciprocity	California License [Redacted]	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	RA	**Type**	RA
	Expires	12/16	**Expires**	12/16
	Certification #	[Redacted]	**Certification #**	[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 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 [redacted] 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]			
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	AGFA			Speed	D5	
Screens	Type	PB	Thickness	0.005F / 0.010B	Condition	OK	
Process method	Manual	YES		Automatic		CR	
Process chemistry condition	New	YES	Aged	2 Days old	Replenished		Bad
Process time	Minutes	5:30			Process Temperature F°	69°	
Darkroom	Clean	YES		Need Cleaning		Surfaces	
Safelight conditions	Good	YES	Cracked		Broken		Not working
Film Viewer	Type	VENTURE 87-C1 (M/N)			All bulbs working	YES	
Bulbs	Photoflood	YES		100W		60W	
Rheostat	Working	YES		Foot switch	N/A	Working	
Suitable for film density	Yes	YES	No				
Densitometer	Yes	YES	No		Type	X-RITE 331	
Calibrated	Yes	YES	No		Date	Missing Sticker, But was Calibrated	
Daily check	Yes	YES	No		By	Redacted	
Film Density Strip Available	Yes	YES	No				

Developed film

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

Radiation Safety

CA License / Letter of Reciprocity	California License [Redacted]	Rev	49
Operating & Emergency Procedures	NCT-4424-48 AEOP-1999	Rev	2
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	RA	**Type**	RA
	Expires	12/16	**Expires**	12/16
	Certification #	[Redacted]	**Certification #**	[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 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

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

Safety Compliance

No Safety issuse found today.

Environmental

No Environmental issues.

Best Practices / Recommendations

Note the crew seamed to be more aware of the RT boundarys today.

Location of Audit	L-114 [Redacted] Brentwood		Mile Point	
Pipe diameter and thickness	Diameter 24"		Thickness 0.375	
Date of Observation	4/5/2013		Observer [Redacted]	
Company performing NDT	W.I.X (Western Industrial X-Ray)			
Technician/s Name/s	[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	AGFA			Speed	D5	
Screens	Type	Lead (Pb)	Thickness	0.005/0.010	Condition	Good	
Process method	Manual	X		Automatic		CR	
Process chemistry condition	New	X	Aged	3 Days	Replenished		Bad
Process time	Minutes	5:30			Process Temperature F°	69.5	
Darkroom	Clean	X		Need Cleaning		Surfaces	Very Clean
Safelight conditions	Good	X	Cracked		Broken	Not working	
Film Viewer	Type	Venture (87-C1) S/N 9739			All bulbs working	X	
Bulbs	Photoflood	X		100W		60W	
Rheostat	Working	X		Foot switch		Working	
Suitable for film density	Yes	X	No				
Densitometer	Yes	X	No		Type	X-Rite	
Calibrated	Yes	X	No		Date	Missing Sticker, But calibrated	
Daily check	Yes	X	No		By	Redacted	
Film Density Strip Available	Yes	X	No				

Developed film

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

Radiation Safety

CA License / Letter of Reciprocity	CA [Redacted]	Rev	49
Operating & Emergency Procedures	NCT-4424-48 AEOP-1999	Rev	2
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	RA	**Type**	RA
	Expires	16-Dec	**Expires**	
	Certification #	[Redacted]	**Certification #**	[Redacted]

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

Developed film

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

Radiation Safety

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

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

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

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

General Notes

Code Compliance

Yes, All film was in compliace 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 consistant safe manor.

Location of Audit	L-114 Redacted Brentwood		Mile Point	
Pipe diameter and thickness	Diameter 24"		Thickness 0.375"	
Date of Observation	4/13/2013		Observer Redacted	
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	AGFA			Speed	D5	
Screens	Type	Pb	Thickness	0.005/0.010	Condition	Good	
Process method	Manual	X		Automatic		CR	
Process chemistry condition	New		Aged	8 Days	Replenished		Bad
Process time	Minutes	5:00			Process Temperature F°	68	
Darkroom	Clean	X		Need Cleaning		Surfaces	Good
Safelight conditions	Good	X	Cracked		Broken		Not working
Film Viewer	Type	Venture			All bulbs working		
Bulbs	Photoflood	X		100W		60W	
Rheostat	Working	X		Foot switch		Working	
Suitable for film density	Yes	X	No				
Densitometer	Yes	X	No		Type	Speedmaster SM-12 (S/N 15251)	
Calibrated	Yes	X	No		Date	2/6/2013	
Daily check	Yes	X	No		By	Redacted	
Film Density Strip Available	Yes	X	No				

Developed film

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

Radiation Safety

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

Dosimetry worn	**Technician**	[Redacted]	**Assistant**	[Redacted]
IRRSP or State card available	**Technician**		**Assistant**	
	Type	RA	**Type**	BO
	Expires	12/16	**Expires**	12/16
	Certification #	[Redacted]	**Certification #**	[Redacted]

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

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 #	Line 114 Brentwood		**Mile Point**	N/A
Pipe diameter and thickness	**Diameter**	6", & 24"	**Thickness**	6"x0.280" / 24"x0.375"
Date of Observation	4/18/2013		**Observer**	Redacted
	Work Order #		**Job #**	
Company performing NDT	Western Industrial X-Ray (WIX)			
Technician/s Name/s	Redacted			
Certification Level / Expiration	**RT**	II	**RT**	Assistant
	MT	N/A	**MT**	N/A
	UT	N/A	**UT**	N/A

Procedures & Equipment

Procedure used	**RT**	Wix-RT-6 Rev 0	**In accordance With**	API-1104 20th Edition
	MT	N/A	**In accordance With**	N/A
	UT	N/A	**In accordance With**	N/A
Procedure available	**RT**	**Yes** X	**No**	
	MT	**Yes** N/A	**No**	N/A
	UT	**Yes** N/A	**No**	N/A

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

Inspection Performed YES X NO

RT Technique Double Wall Exposure Single Wall View X Single Wall Exposure Single Wall View

Radiation type Ir 192 X Se 75 X-Ray

Source or Focal spot physical size 0.106" x 0.106" x 0.150" **Activity or Kv** 92.8 CI

Geometric Unsharpness (Ug) 0.003 for 24", 0.009 for 6" **Exposure time** 2:30 for 24", 15Sec for 6"

Power source Port. Generator Welding set Onboard Inverter

House Power X

Comments:	Looked at welds 401-413 every thing appears to be OK.

Radiography (Variables)

Film used	**Manufacturer**	AGFA			**Speed**	D5/24" & D4/6"		
Screens	**Type**	PB (Lead)	**Thickness**	.005F / .010B		**Condition**	OK	
Process method	**Manual**	X			**Automatic**		**CR**	
Process chemistry condition	**New**	X	**Aged**		**Replenished**		**Bad**	
Process time	**Minutes**	5 MIN			**Process Temperature F°**	68°		
Darkroom	**Clean**	X	**Need Cleaning**			**Surfaces**		
Safelight conditions	**Good**	X	**Cracked**		**Broken**		**Not working**	
Film Viewer	**Type**	Venture				**All bulbs working**	Yes	
Bulbs	**Photoflood**	X			**100W**		**60W**	
Rheostat	**Working**	X			**Foot switch**		**Working**	
Suitable for film density	**Yes**	X	**No**					
Densitometer	**Yes**	X	**No**		**Type**	X-Rite S/N 022852		
Calibrated	**Yes**	X	**No**		**Date**	Due 02-01-2014		
Daily check	**Yes**	X	**No**		**By**	Redacted		
Film Density Strip Available	**Yes**	X	**No**		**S/N**	A181270		
	Calibrated	**Yes**	X	**No**				

Radiography (Developed film)

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

Radiation Safety

CA License / Letter of Reciprocity	Ca License # Redacted	**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	12-16	**Expires**	12-16
	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 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 #	Line 114		**Mile Point**	N/A
Pipe diameter and thickness	**Diameter**	24"	**Thickness**	0.375"
Date of Observation	4/19/2013		**Observer**	Redacted
	Work Order #		**Job #**	
Company performing NDT	Western Industrial X-Ray			
Technician/s Name/s	Redacted			
Certification Level / Expiration	**RT**	II	**RT**	Assistant
	MT	N/A	**MT**	N/A
	UT	N/A	**UT**	N/A

Procedures & Equipment

Procedure used	**RT**	Wix-RT-6 Rev0	**In accordance With**	API-1104 20th edition
	MT	N/A	**In accordance With**	N/A
	UT	N/A	**In accordance With**	N/A
Procedure available	**RT**	**Yes** N/A	**No** N/A	
	MT	**Yes** N/A	**No** N/A	
	UT	**Yes** N/A	**No** N/A	

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 X NO

RT Technique Double Wall Exposure Single Wall View X Single Wall Exposure Single Wall View

Radiation type Ir 192 X Se 75 X-Ray

Source or Focal spot physical size .106x.106x.150 **Activity or Kv** 92 Ci

Geometric Unsharpness (Ug) 0.003 **Exposure time** 2:30

Power source Port. Generator X Welding set Onboard Inverter

House Power

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

Radiography (Developed film)

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

Radiation Safety

CA License / Letter of Reciprocity	Redacted icense CA	**Rev**	49
Operating & Emergency Procedures	Yes	**Rev**	Rev 3
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	BO	**Type**	Ra
	Expires	12-16	**Expires**	12-16
	Certification #	Redacted	**Certification #**	Redacted

Source Information	**Exp Device / Model**	QSA 880 Delta	**S/N**	026
	Capsule Model	A424-9	**S/N**	93667B
	Dimensions	.106x.106x.150	**Leak Tested**	4/12/2013
	Dep. Uranium Cert	4/8/2013		
	OEM Decay Chart	Yes		

Boundary Doserate - maximum doserate found	0	**mr/hr**	**Within legal limits**	**Yes**	X	**No**

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 #	Line 114 Brentwood		**Mile Point**	N/A
Pipe diameter and thickness	**Diameter**	24"	**Thickness**	24"x0.375"
Date of Observation	4/30/2013		**Observer**	Redacted
	Work Order #		**Job #**	
Company performing NDT	Western Industrial X-Ray (WIX)			
Technician/s Name/s	Redacted			
Certification Level / Expiration	**RT**	II	**RT**	I
	MT	N/A	**MT**	N/A
	UT	N/A	**UT**	N/A

Procedures & Equipment

Procedure used	**RT**	Wix-RT-6 Rev 0	**In accordance With**	API-1104 20th Edition
	MT	N/A	**In accordance With**	N/A
	UT	N/A	**In accordance With**	N/A
Procedure available	**RT**	**Yes** X	**No**	
	MT	**Yes** N/A	**No**	N/A
	UT	**Yes** N/A	**No**	N/A

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

Inspection Performed YES X NO ____

RT Technique Double Wall Exposure Single Wall View X Single Wall Exposure Single Wall View ____

Radiation type Ir 192 X Se 75 ____ X Ray ____

Source or Focal spot physical size 0.106" x 0.106" x 0.150" **Activity or Kv** 83Cl

Geometric Unsharpness (Ug) 0.003 **Exposure time** 2:40

Power source Port. Generator X Welding set ____ Onboard Inverter ____
House Power ____

Comments:

Radiography (Variables)

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

Radiography (Developed film)

IQI	**Number of Wires Per View Required By Code:**	2					
	Type	ASTM B	**Wire Diameter Required**	0.013"	**Wire Identification #**	7	
	Wire Sensitivity Achieved		**YES**	X	**NO**		
IQI Placement	**Within 1" from Left Extremity**	X	**Center**	X	**Within 1" from Right Extremity**	X	
Density of Film	**Weld**	3.3	**Parent Material**	3.5			
Number of IQI's used	**1**		**2**		**3**	X	**4**
Artifacts or Process Marks	**Yes**		**No**	X			
Interpretation	**By**	Redacted			**Level**	II	
Interpretation accurate	**Yes**	X	**No**				
Report	**Completed**		**Required Information**		**In-Process**	X	

Radiation Safety

CA License / Letter of Reciprocity	Ca License # Redacted	**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	12-16	**Expires**	6-16
	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 #	Line 114 Brentwood		**Mile Point**	N/A
Pipe diameter and thickness	**Diameter**	24"	**Thickness**	24"x0.375"
Date of Observation	5/1/2013		**Observer**	Redacted
	Work Order #		**Job #**	
Company performing NDT	Western Industrial X-Ray (WIX)			
Technician/s Name/s	Redacted			
Certification Level / Expiration	**RT**	II	**RT**	I
	MT	N/A	**MT**	N/A
	UT	N/A	**UT**	N/A

Procedures & Equipment

Procedure used	**RT**	Wix-RT-6 Rev 0	**In accordance With**	API-1104 20th Edition
	MT	N/A	**In accordance With**	N/A
	UT	N/A	**In accordance With**	N/A
Procedure available	**RT**	**Yes** X	**No**	
	MT	**Yes** N/A	**No**	N/A
	UT	**Yes** N/A	**No**	N/A

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

Inspection Performed YES X NO ____

RT Technique Double Wall Exposure Single Wall View X Single Wall Exposure Single Wall View ____

Radiation type Ir 192 X Se 75 ____ X Ray ____

Source or Focal spot physical size 0.106" x 0.106" x 0.150" **Activity or Kv** 82Cl

Geometric Unsharpness (Ug) 0.003 **Exposure time** 2:40

Power source Port. Generator X Welding set ____ Onboard Inverter ____
House Power ____

Comments:

Radiography (Variables)

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

Radiography (Developed film)

IQI	**Number of Wires Per View Required By Code:**	2					
	Type	ASTM B	**Wire Diameter Required**	0.013"	**Wire Identification #**	7	
	Wire Sensitivity Achieved		**YES**	X	**NO**		
IQI Placement	**Within 1" from Left Extremity**	X	**Center**	X	**Within 1" from Right Extremity**	X	
Density of Film	**Weld**	3.3	**Parent Material**	3.5			
Number of IQI's used	**1**		**2**		**3**	X	**4**
Artifacts or Process Marks	**Yes**				**No**	X	
Interpretation	**By**	Redacted			**Level**	II	
Interpretation accurate	**Yes**	X			**No**		
Report	**Completed**		**Required Information**		**In-Process**	X	

Radiation Safety

CA License / Letter of Reciprocity	Ca License # Redacted	**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	12-16	**Expires**	6-16
	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

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: Redacted
Senior Advising NDT Engineer
Applied Technology Services

Reviewed: Redacted
NDT Supervisor
Applied Technology Services

Date of Issue: 11/26/13

ATS Report #: 413.61-13.412
Rev 0

Index

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.

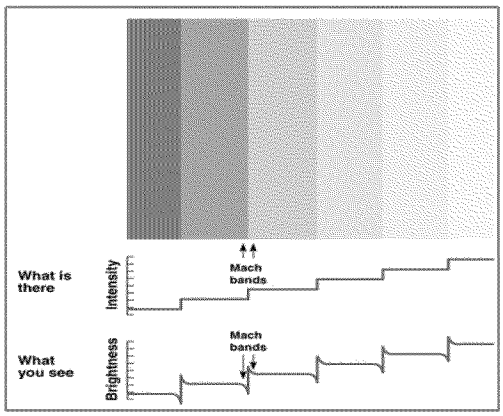


Figure 1 – Machs Bands Effects

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 Creaform (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.

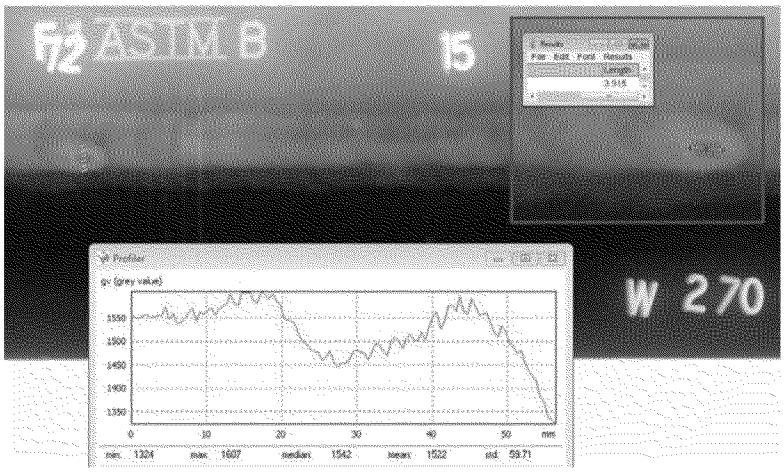


Figure 2 – Weld 270 Indication with measurement inset showing length of 0.157" (3.9mm)

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.

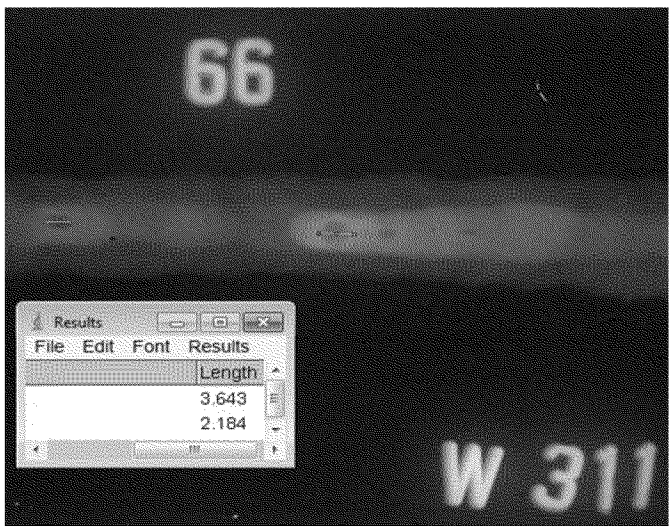


Figure 3 – Weld 311 with acceptable BT length of 0.141" and acceptable small pores

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.

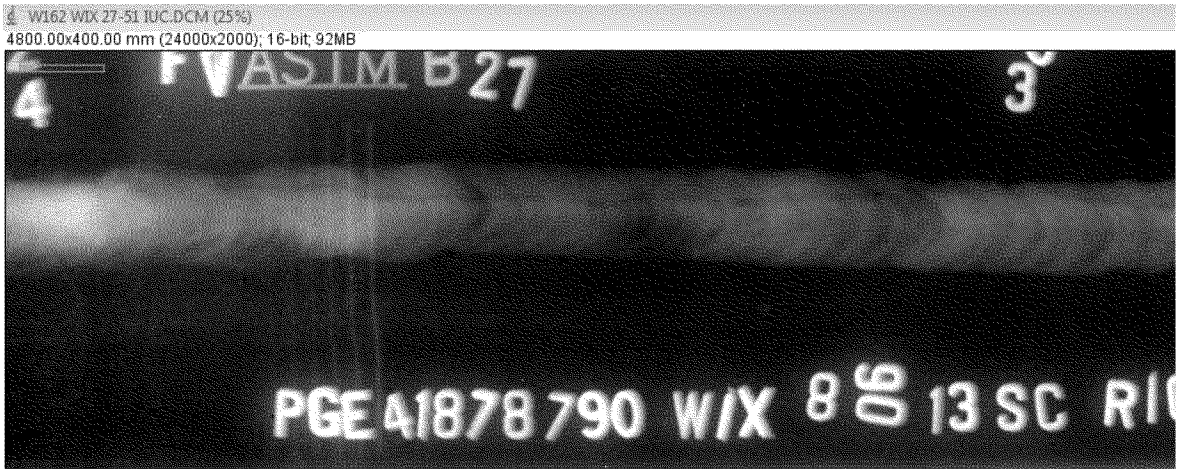


Figure 4 – Weld 162 with acceptable indications of undercut

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.

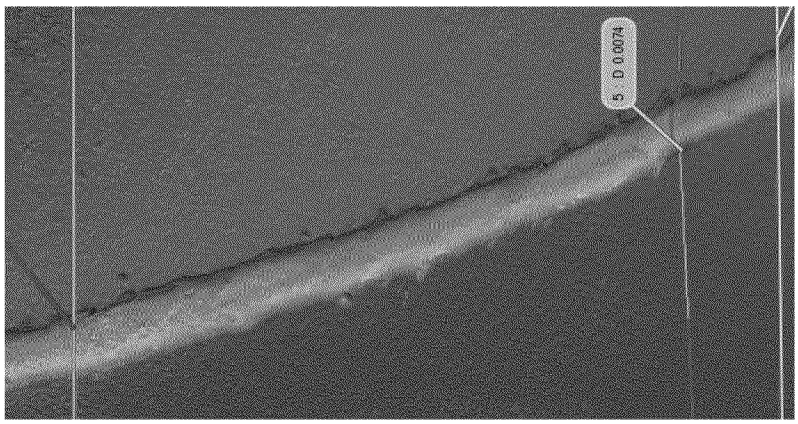


Figure 5 – Measured IUC on W162 depicted in Figure 4

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

Author: Redacted

Senior Advising NDT Engineer
Applied Technology Services

Reviewed: Redacted

NDT Supervisor
Applied Technology Services

Index

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.

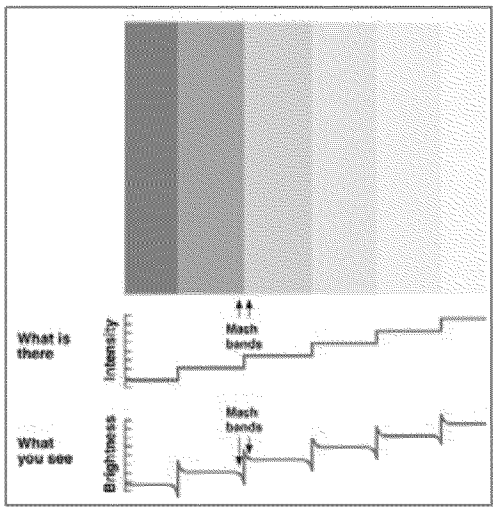


Figure 1 – Machs Bands Effects

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 Creaform (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 Redacted Redacted 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 Creaform photogrammetry with its calibrated 40 micron spatial resolution and accuracy to within 0.002".

3.5 Creaform 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.

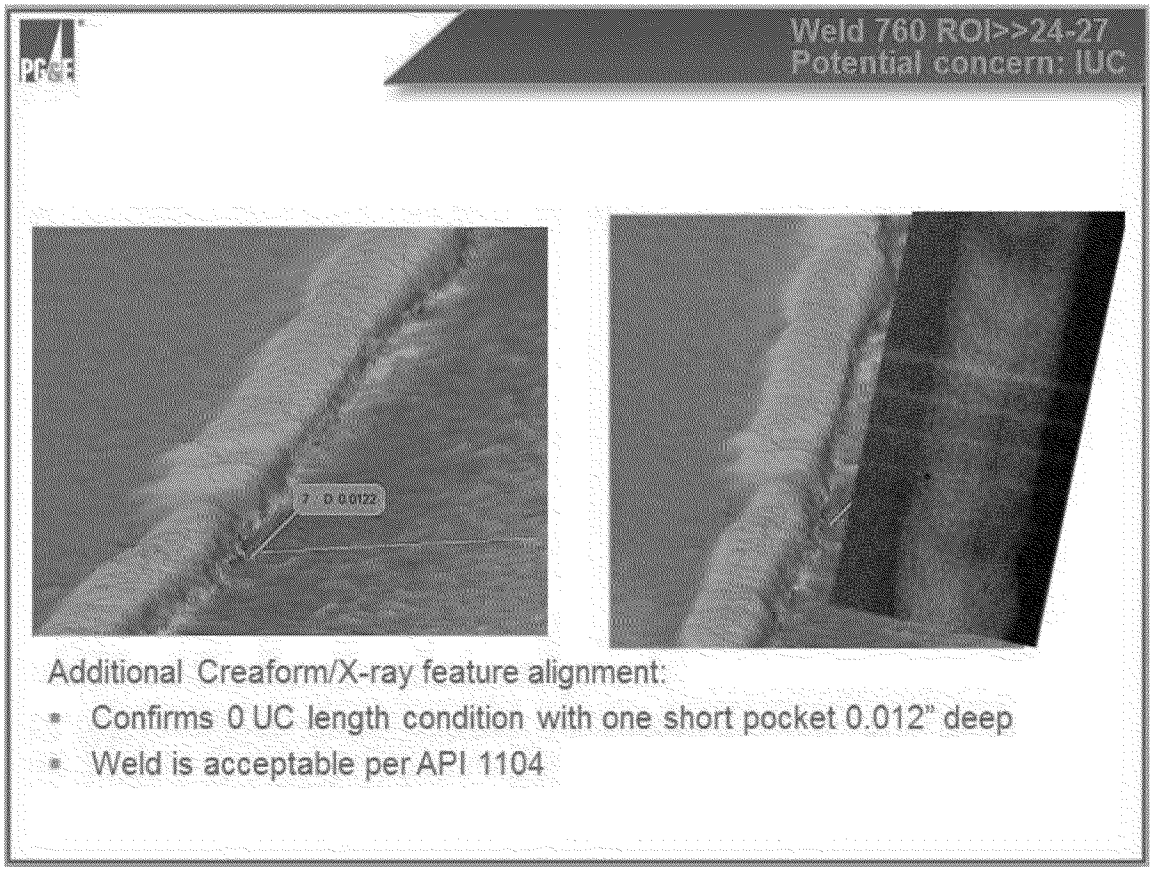


Figure 1 – Assessment of Weld 760 IUC region of interest

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, 20th edition
2	W-760	Internal Undercut (IUC)	24-27	Acceptable to API 1104, 20th edition
3	W-770	Internal Undercut (IUC)	36-42	Acceptable to API 1104, 20th edition
4	W-771	Internal Undercut (IUC)	12-24	Acceptable to API 1104, 20th edition
5	W-781	Internal Undercut (IUC)	44-49	Acceptable to API 1104, 20th 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,

AppendixII External
Consult PGE Line 114

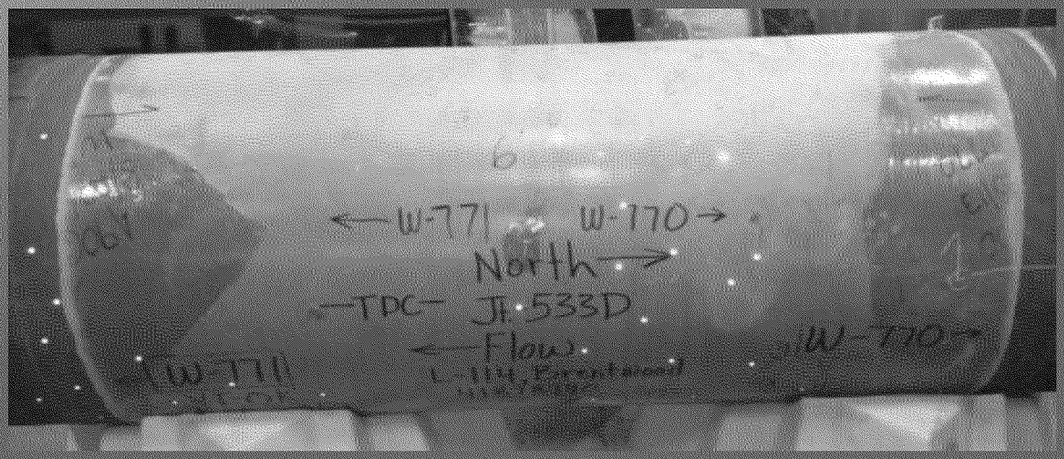
Appendix III

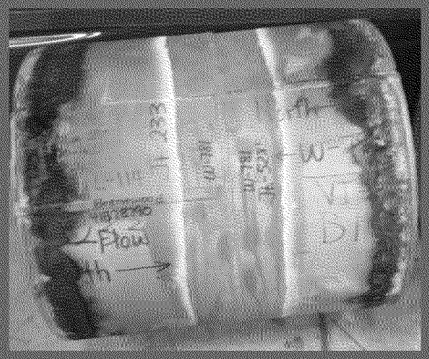
WIX report of radiography

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

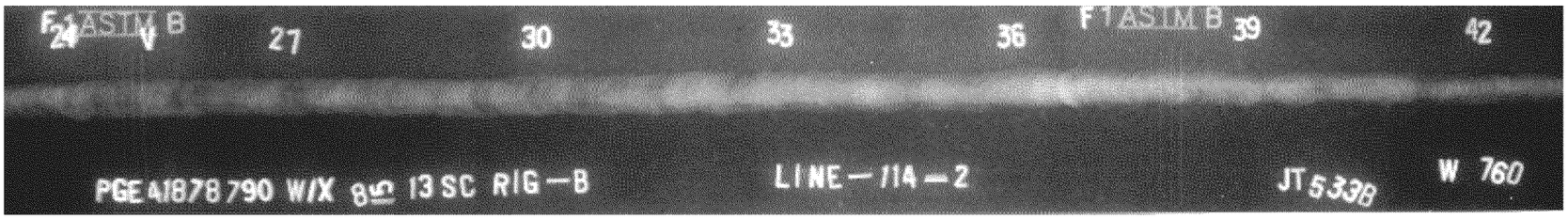
No.	Weld No.	Regulatory Level III Interpretation	Location in View
1	W-738	External Undercut (EUC)	36-42
2	W-760	Internal Undercut (IUC)	24-27
3	W-770	Internal Undercut (IUC)	36-42
4	W-771	Internal Undercut (IUC)	12-24
5	W-781	Internal Undercut (IUC)	44-49

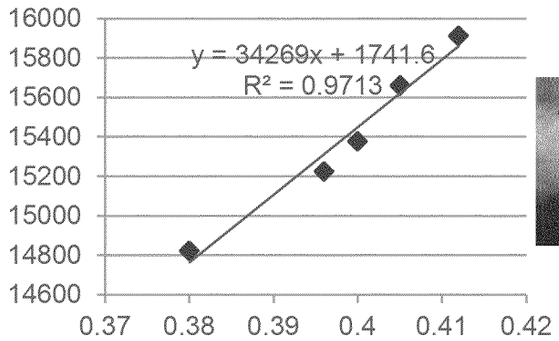
Weld 760 ROI>>24-27
Potential concern: IUC

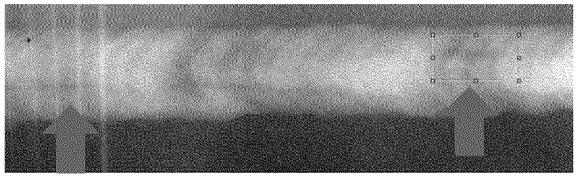
Weld 760 cited for indications of internal undercut from 24-27

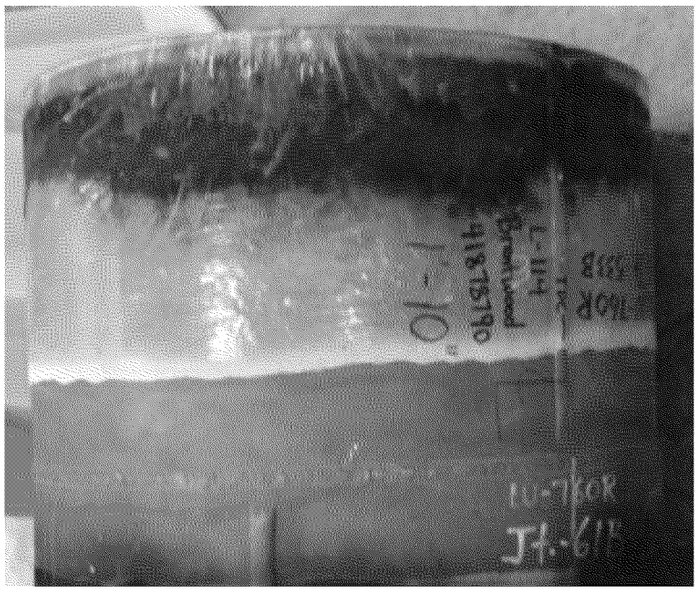
Excised weld photo-documented and ROI aligned with weld features

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







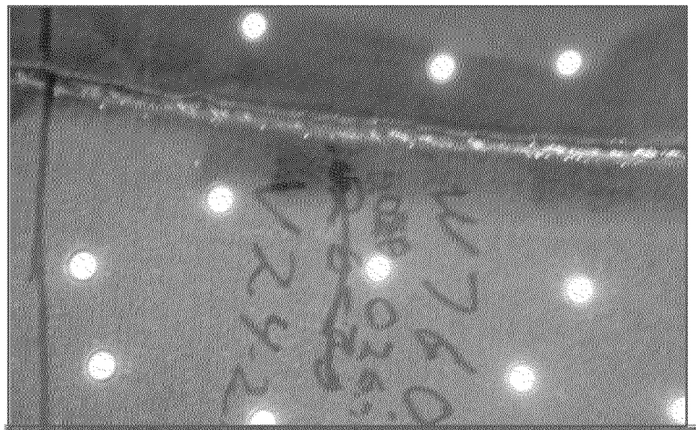


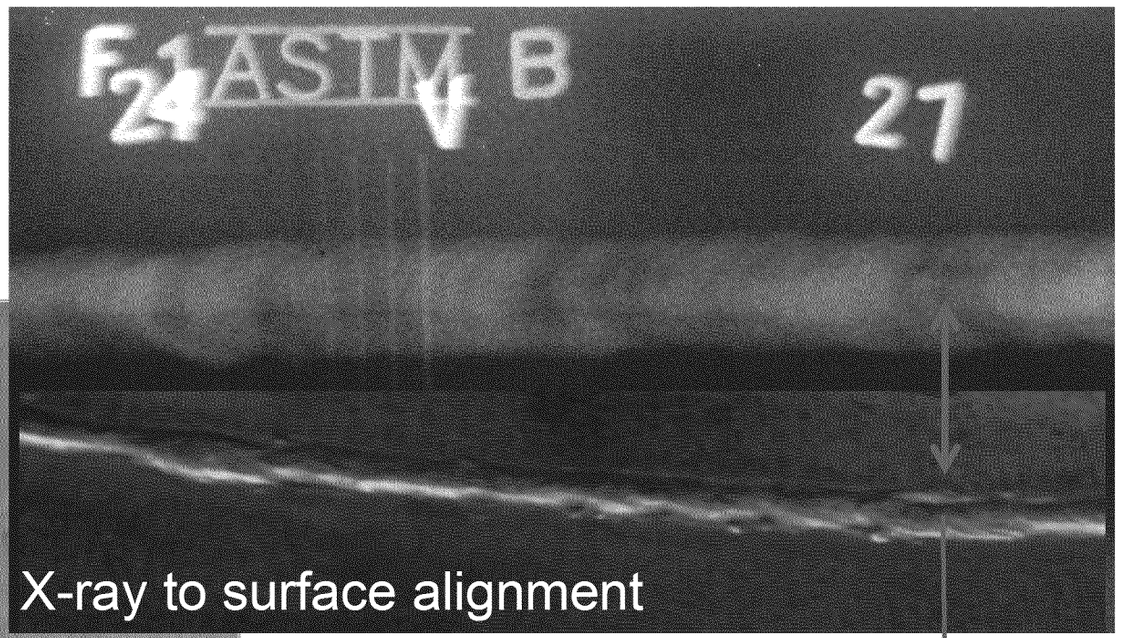
RT *estimated* depths of 0.012 – 0.028 inches

Further correlation pursued with 3D surface map

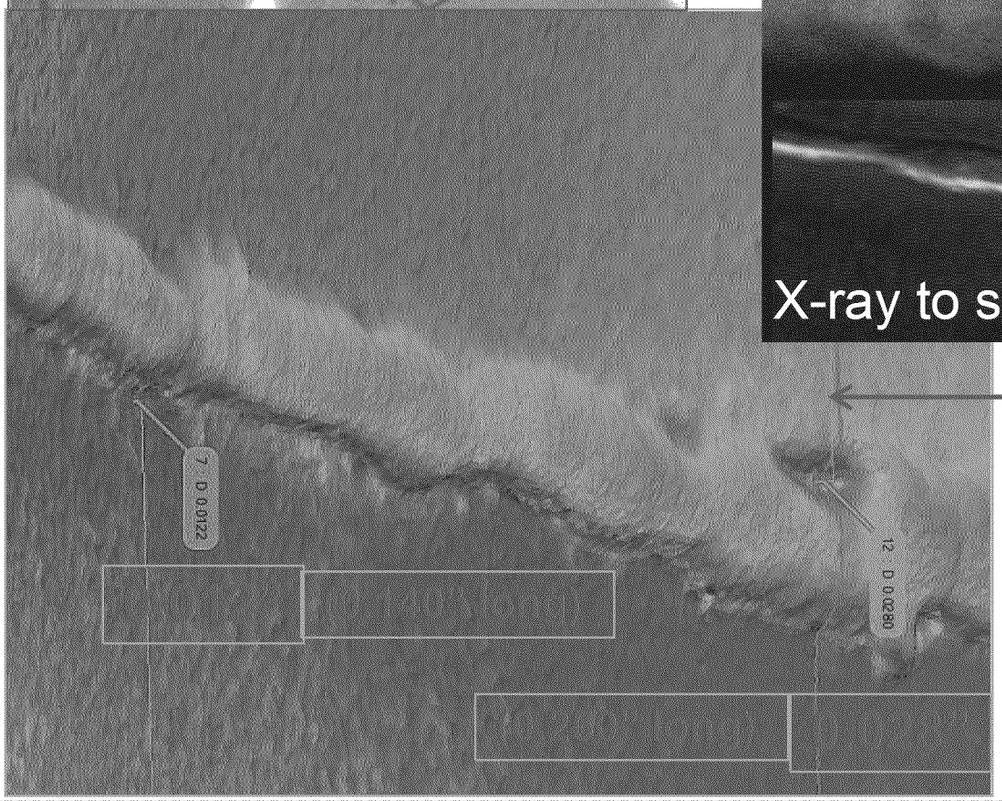
Weld 760 ROI>>24-27
Potential concern: IUC

Digital surface profile tool alignment





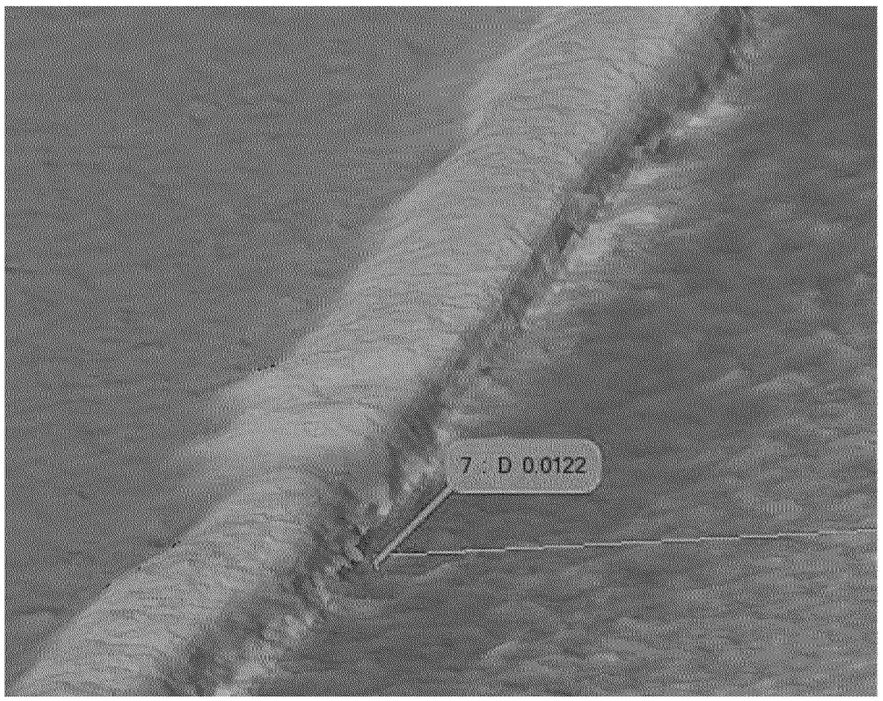
X-ray to surface alignment

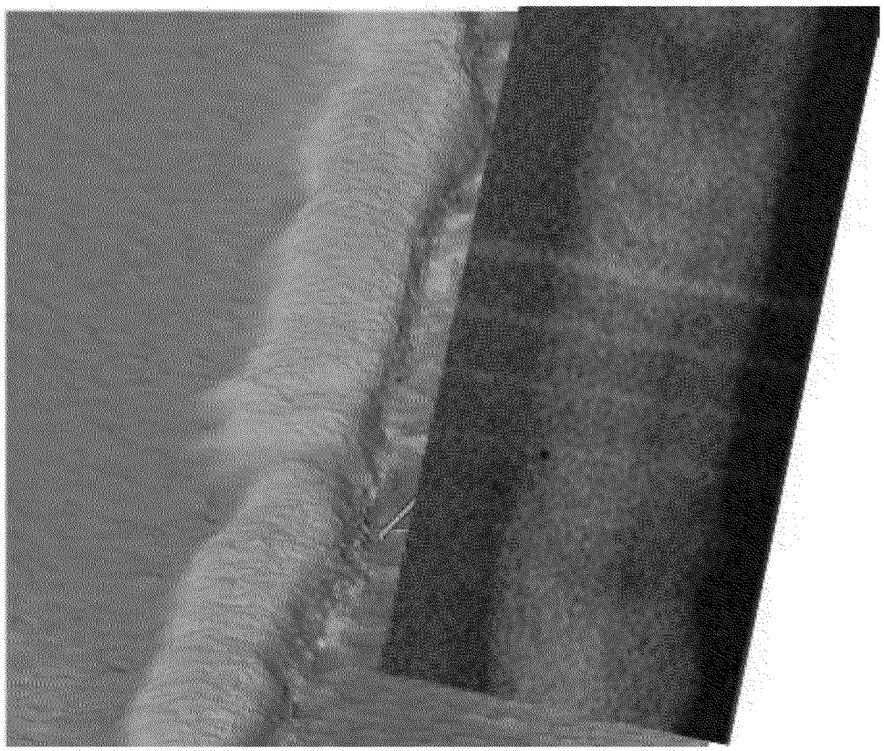


Creaform 3D (+/- 0.002”) surface profile:

- **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**

Weld 760 ROI>>24-27
Potential concern: IUC





Additional Creaform/X-ray feature alignment:

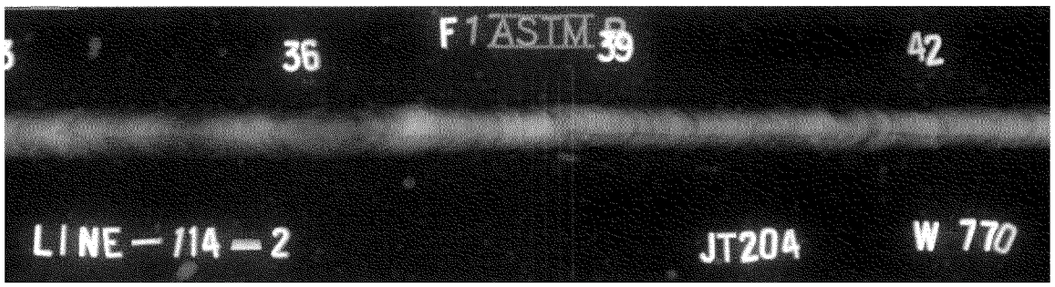
* Confirms 0 UC length condition with one short pocket 0.012” deep
* Weld is acceptable per API 1104

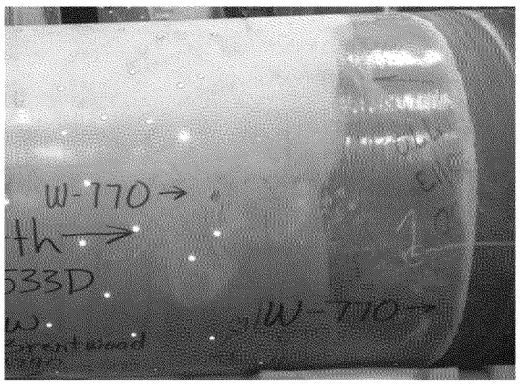
Weld 770 ROI>>36-42
Potential concern: IUC

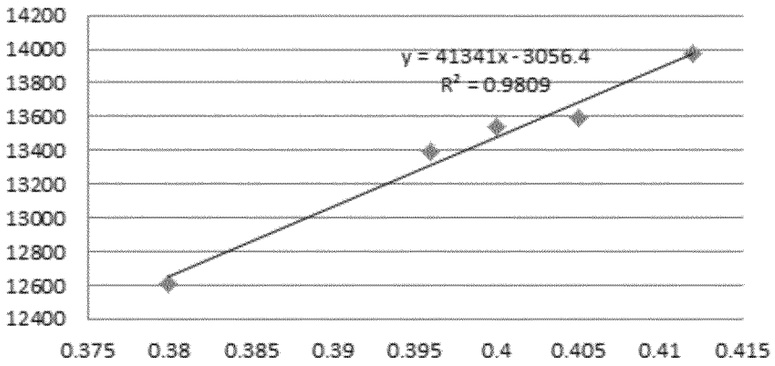
Weld 770 cited for indications of internal undercut from 36-42

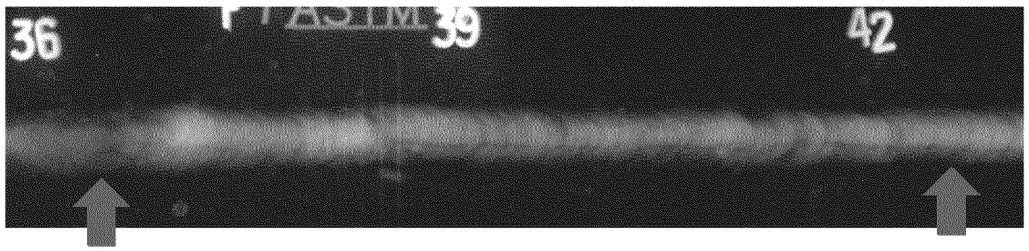
Excised weld photo-documented and ROI aligned with weld features

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







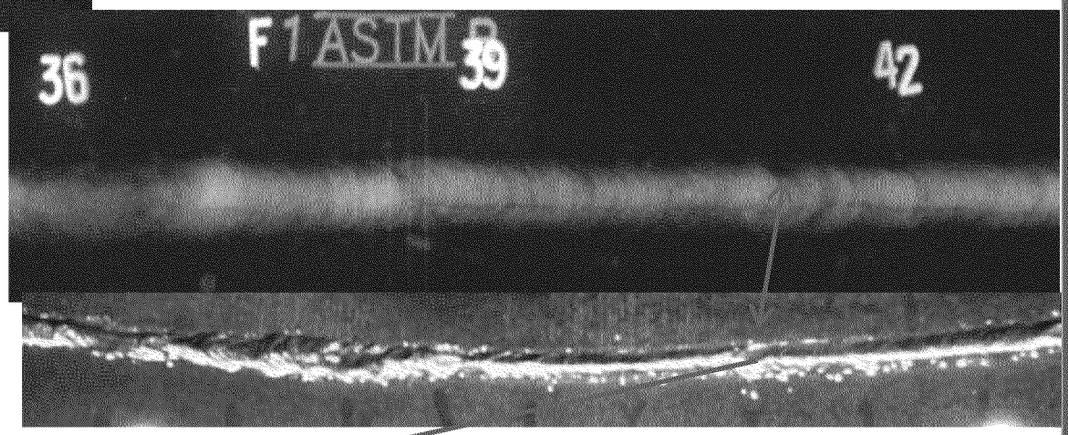


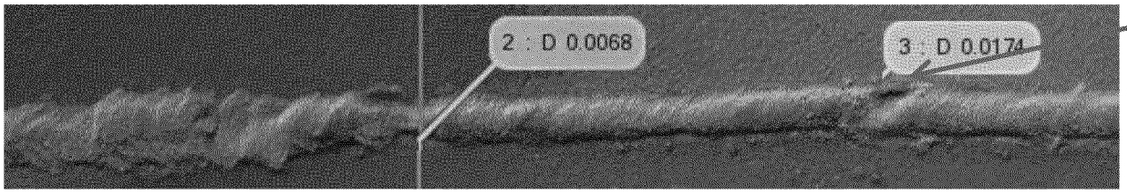
RT *estimated* depths of up to 0.008 inches

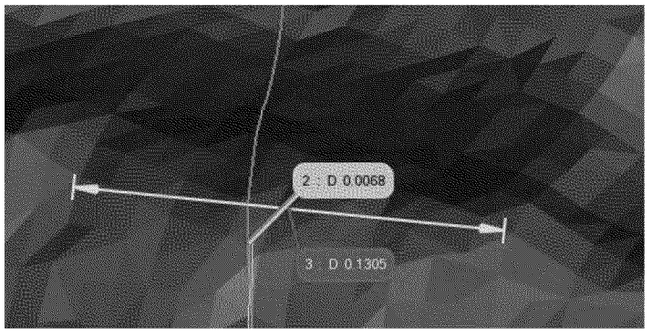
Further correlation pursued with 3D surface map

Weld 770 ROI>>36-42
Potential concern: IUC

Digital surface profile tool alignment



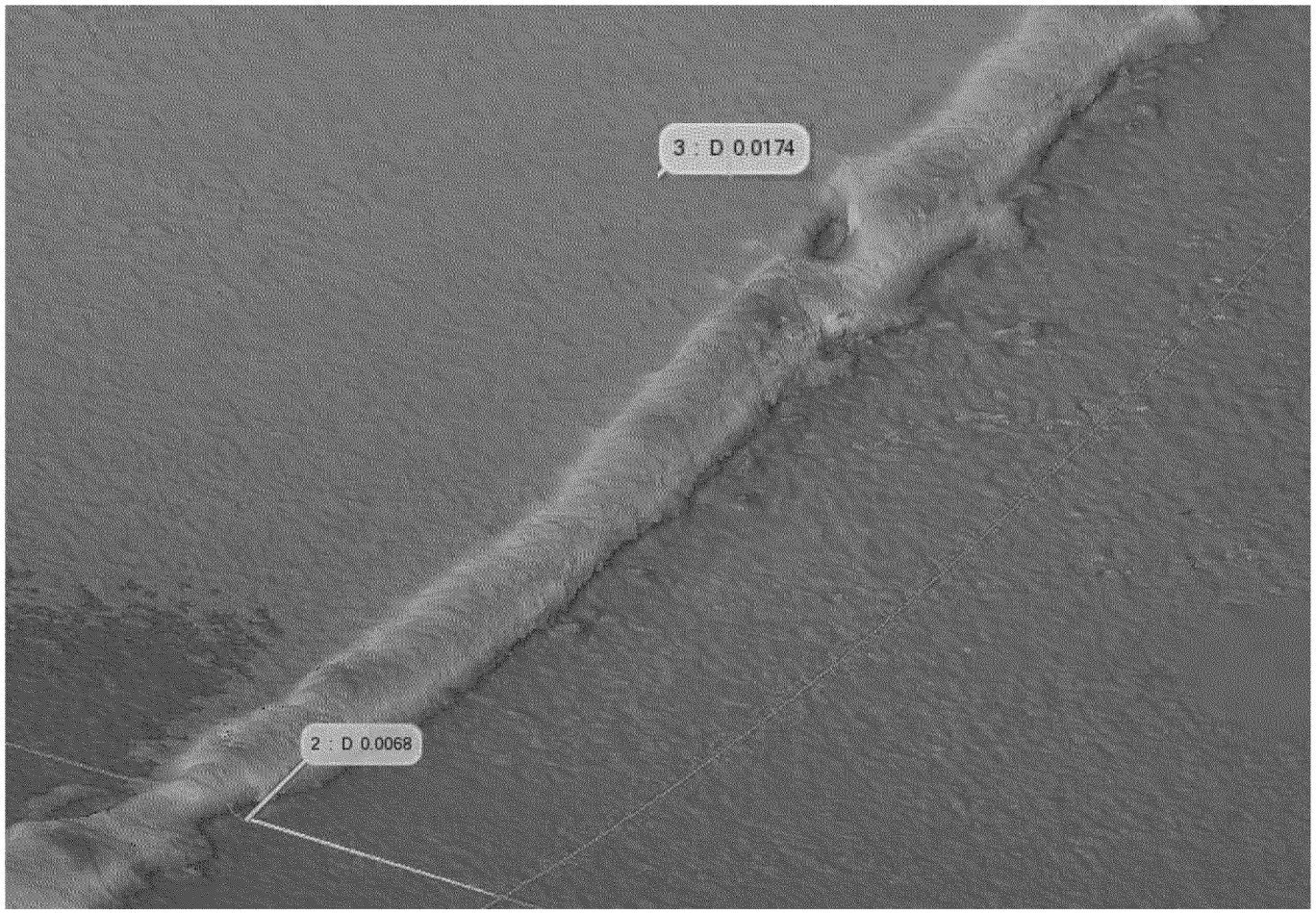




Creaform 3D (+/- 0.002”) surface profile:

- **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**

Weld 770 ROI>>36-42
Potential concern: IUC



Additional Creaform/Polyworks perspective of ROI 36-42:

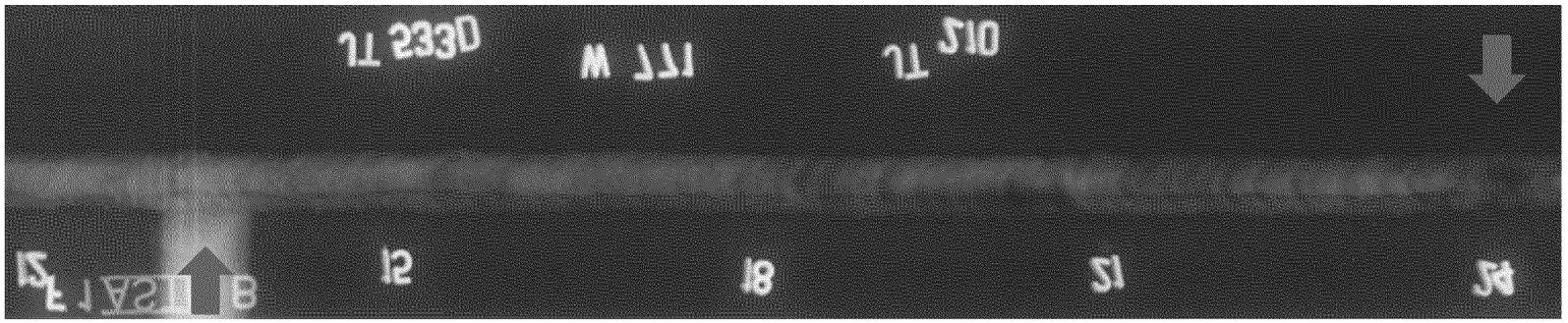
* Confirms UC indication is diffraction/"shadowing" from high/low condition
* Weld is acceptable per API 1104

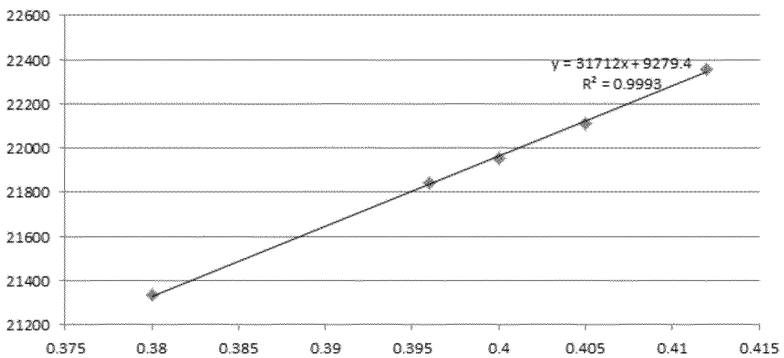
Weld 771 ROI>>12-24
Potential concern: IUC

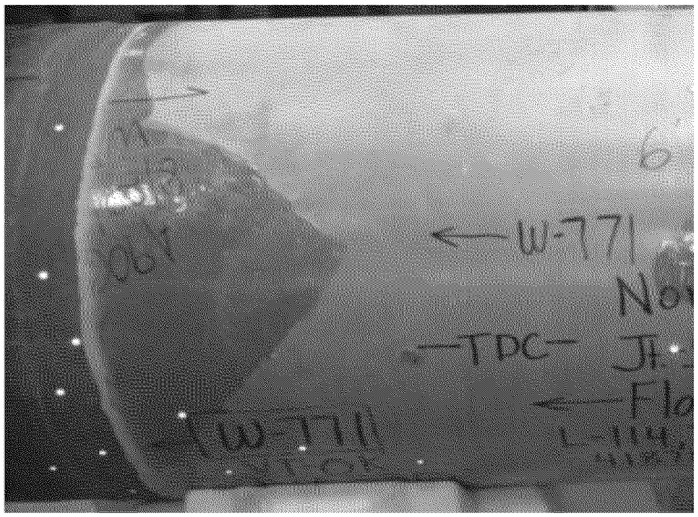
Weld 771 cited for indications of internal undercut from 12-24

Excised weld photo-documented and ROI aligned with weld features

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





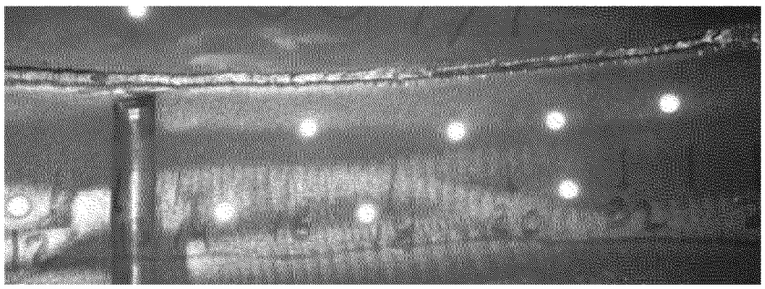


RT *estimated* depths of up to 0.008 inches

Further correlation pursued with 3D surface map

Weld 771 ROI>>12-24
Potential concern: IUC

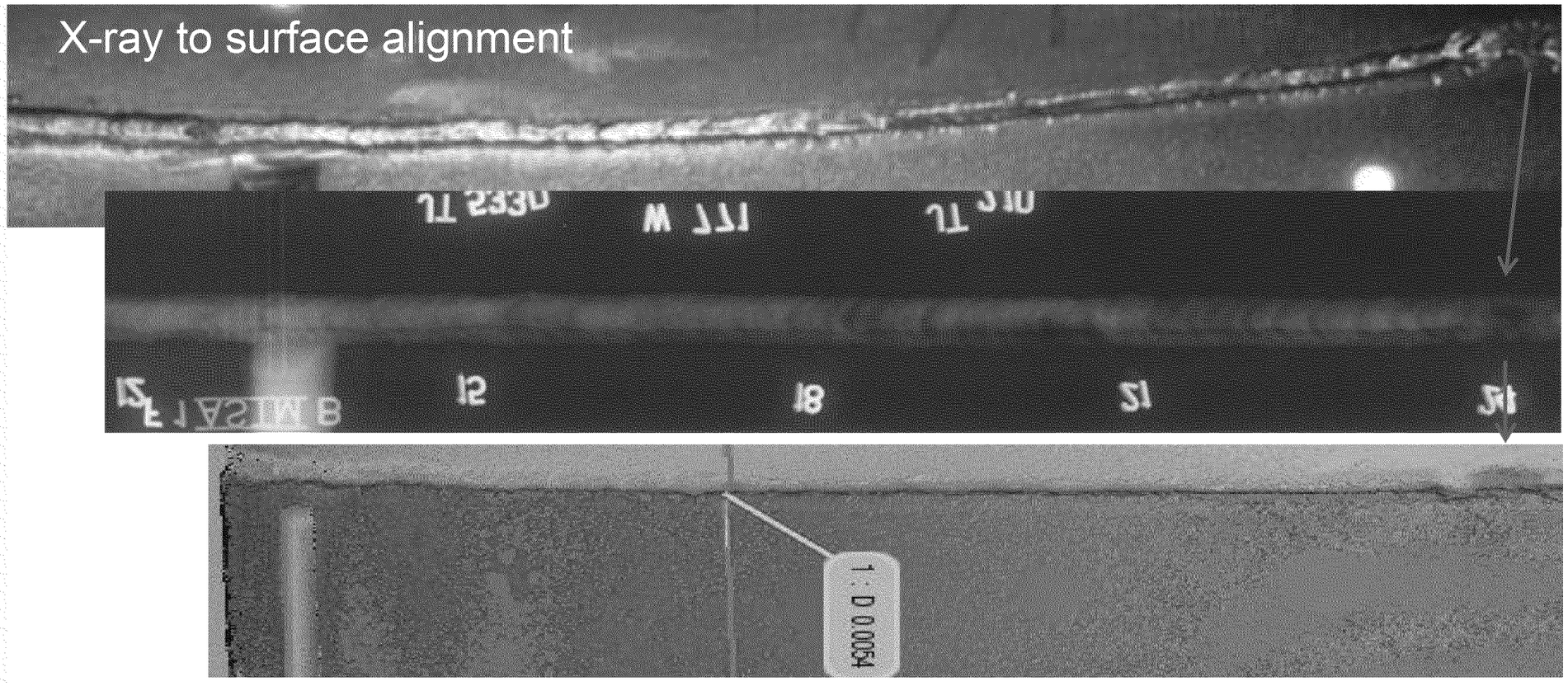
Digital surface profile tool alignment



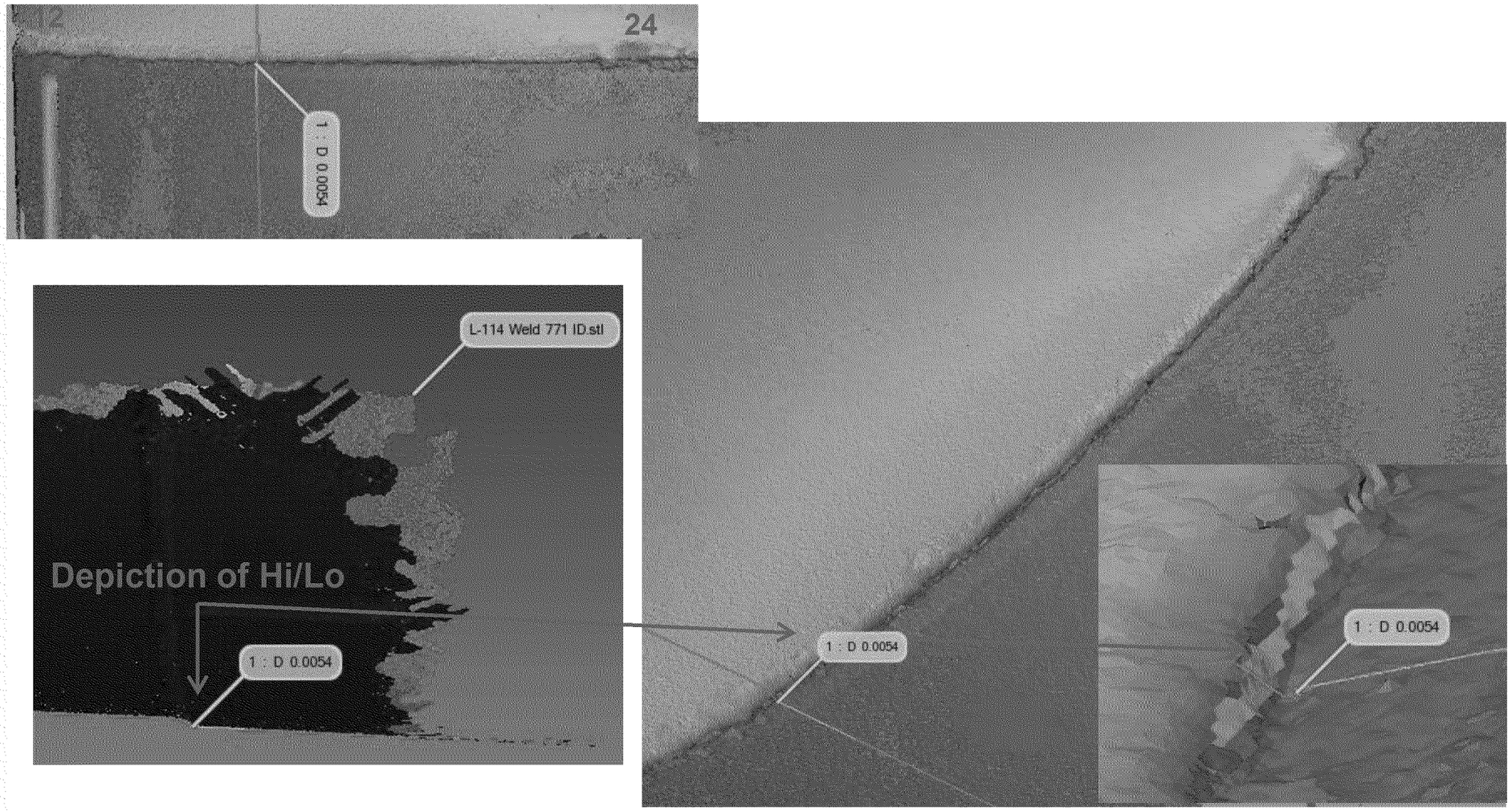
Creaform 3D (+/- 0.002") surface profile:

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

X-ray to surface alignment



Weld 771 ROI>>12-24
Potential concern: IUC



Additional Creaform/Polyworks perspective of ROI 12-24:

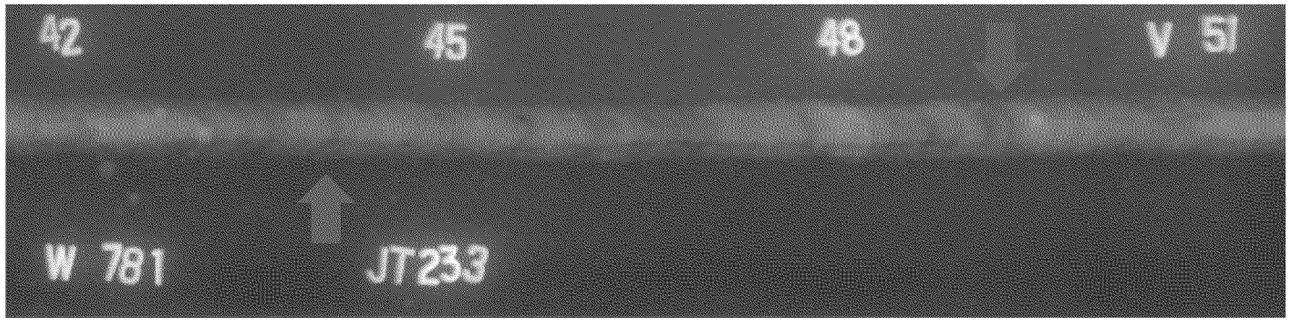
* Confirms UC indication is diffraction/"shadowing" from high/low condition
* Weld is acceptable per API 1104

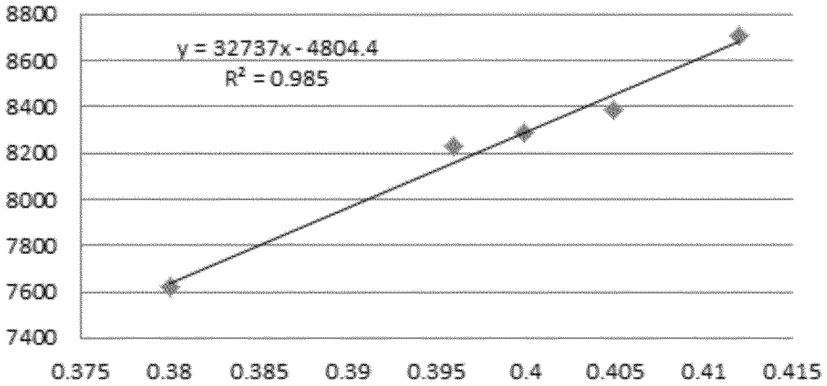
Weld 781 ROI>>44-49
Potential concern: IUC

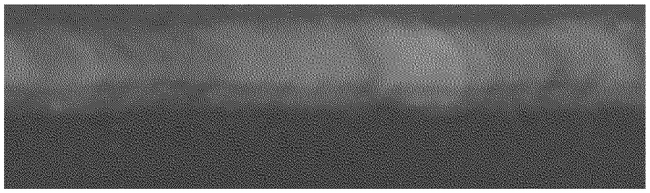
Weld 781 cited for indications of internal undercut from 44-49

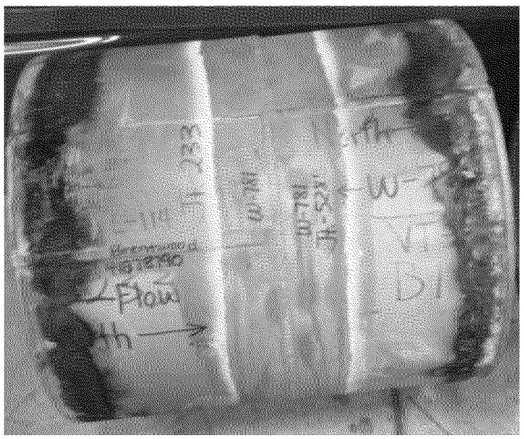
Excised weld photo-documented and ROI aligned with weld features

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









RT *estimated* depths of up to 0.015 inches

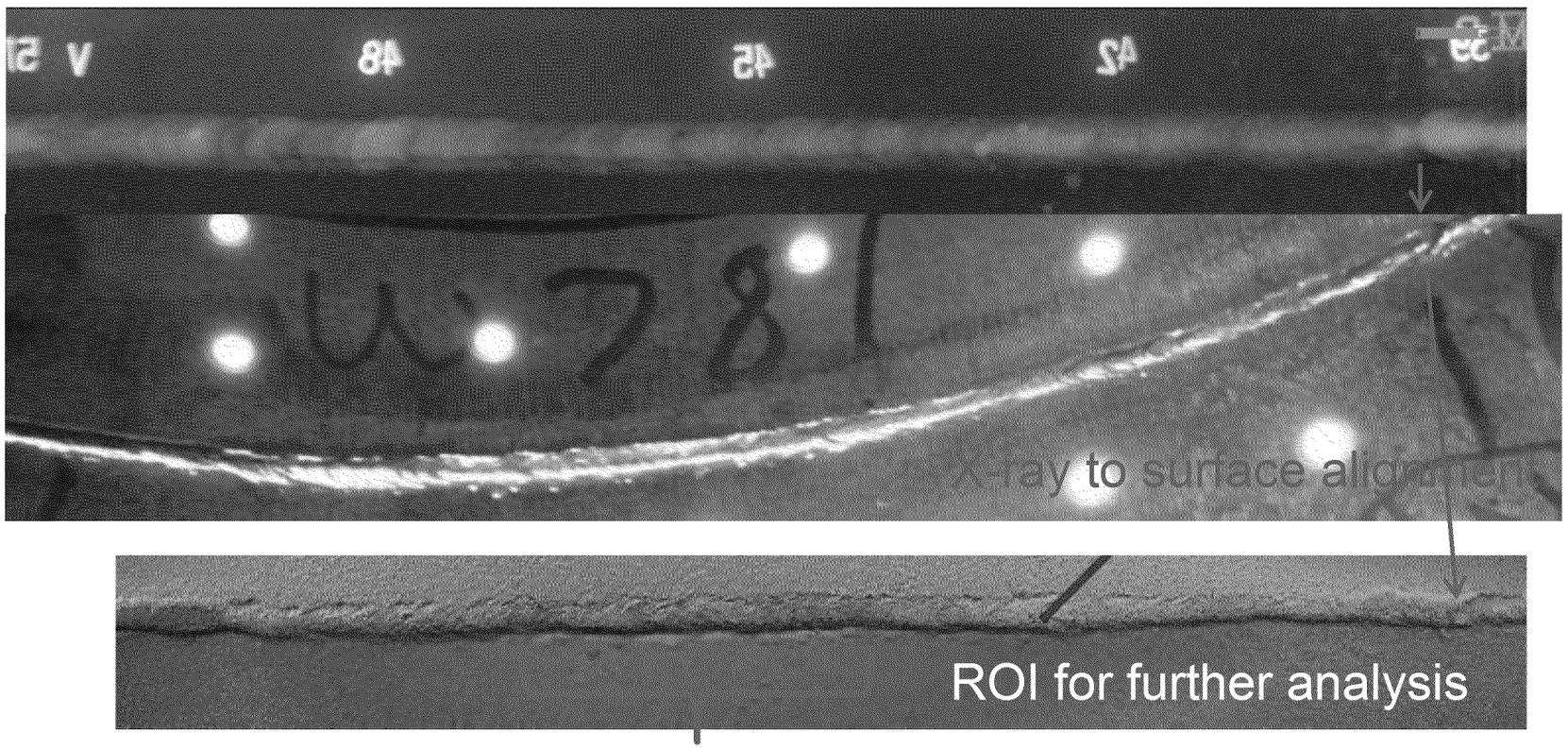
Further correlation pursued with 3D surface map

Weld 781 ROI>>44-49
Potential concern: IUC

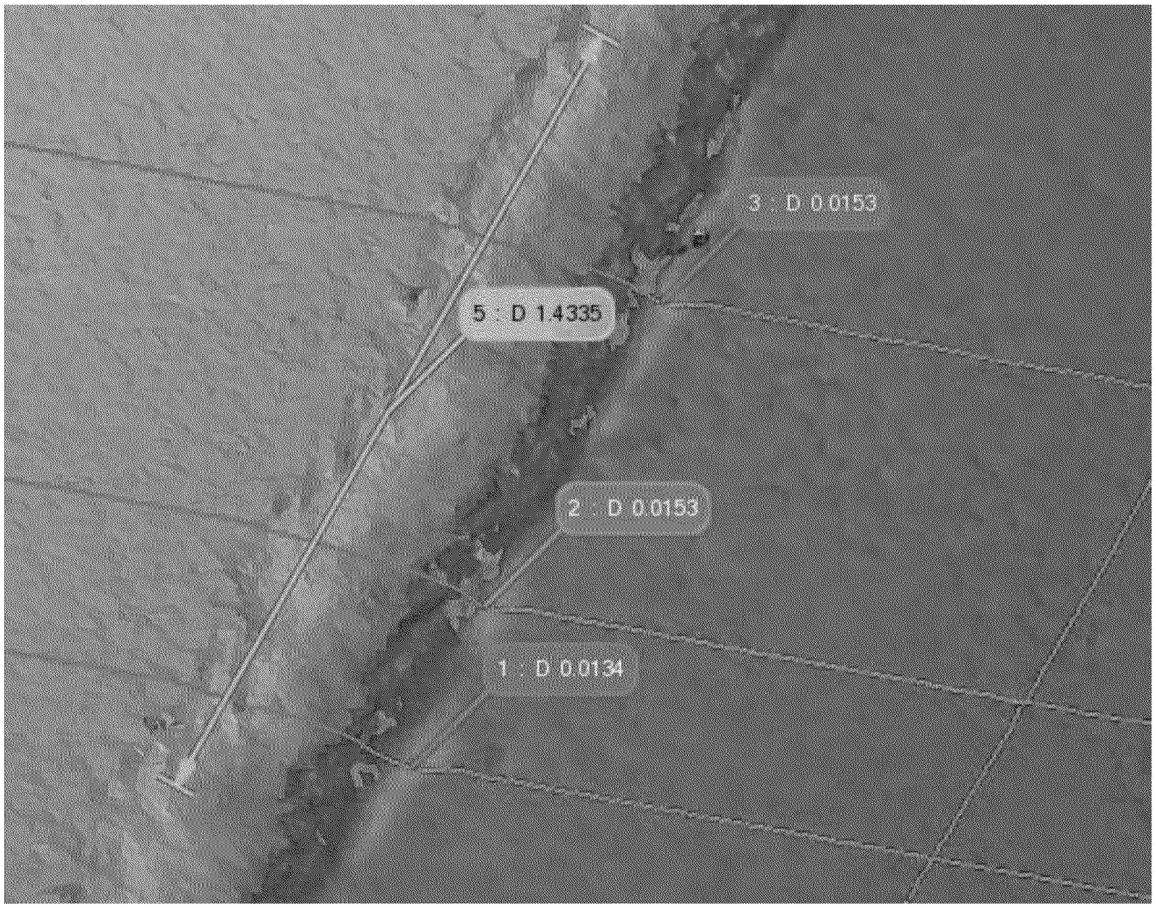
Digital surface profile tool alignment

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 <u>acceptable</u> per API 1104**



Weld 781 ROI>>44-49
Potential concern: IUC



Additional Creaform/Polyworks perspective of ROI 44-49:

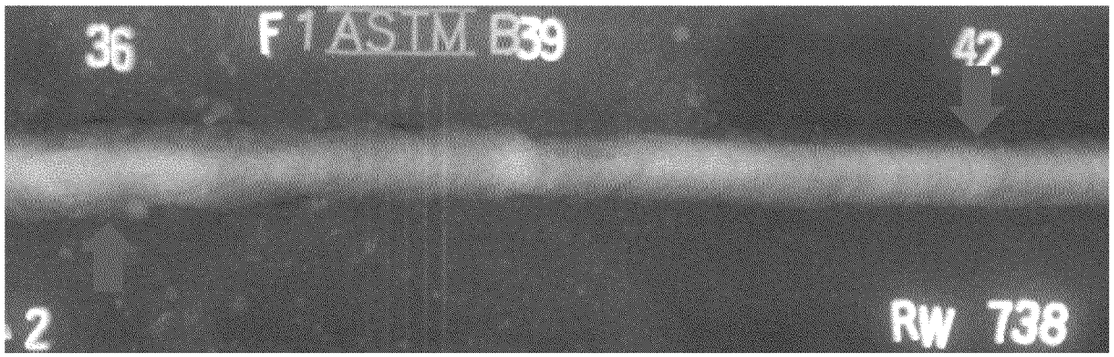
* Confirms UC indication is, in the majority, diffraction/"shadowing" from high/low condition with less than 2 inches of up to 0.015 inches deep IUC
* Weld is acceptable per API 1104

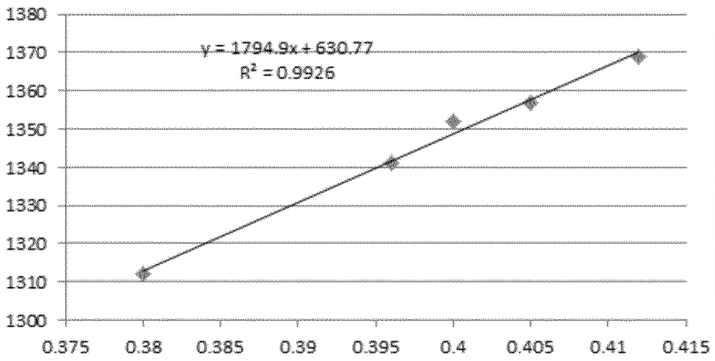
Weld 738 ROI>>36-42
Potential concern: EUC

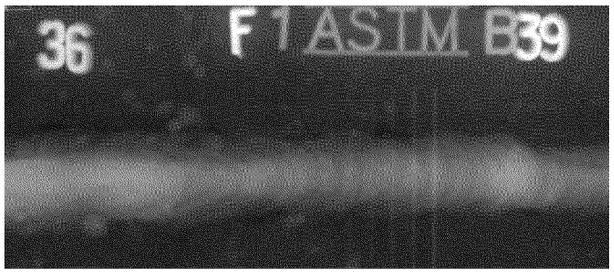
Weld 738 cited for indications of external undercut from 36-42

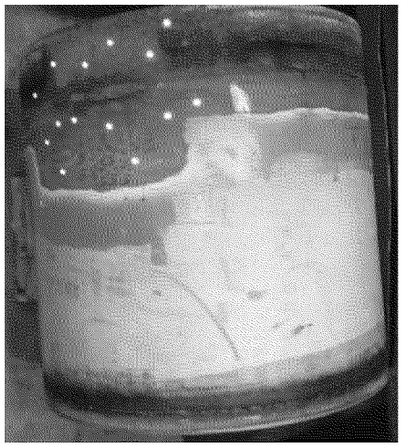
Excised weld photo-documented and ROI aligned with weld features

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







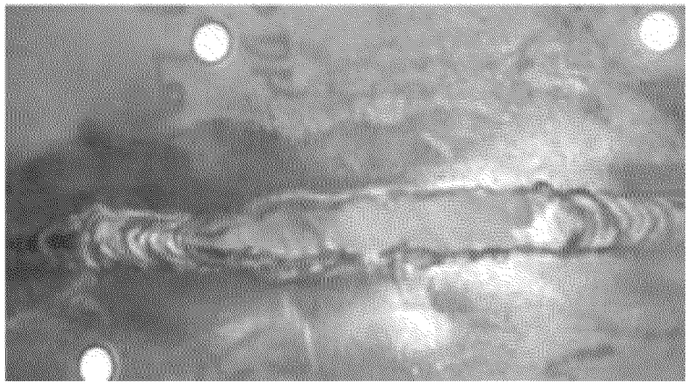


RT *estimated* depths of up to 0.030 inches

Further correlation pursued with 3D surface map

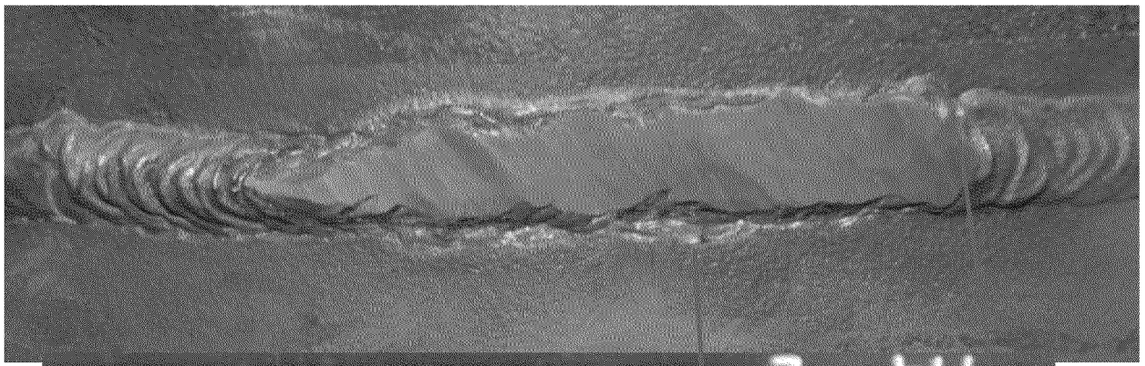
Weld 738 ROI>>36-42
Potential concern: EUC

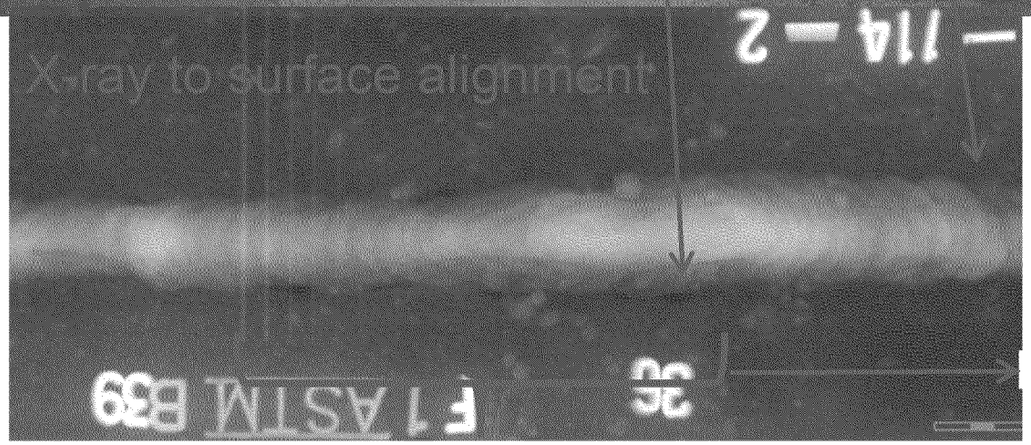
Digital surface profile tool alignment

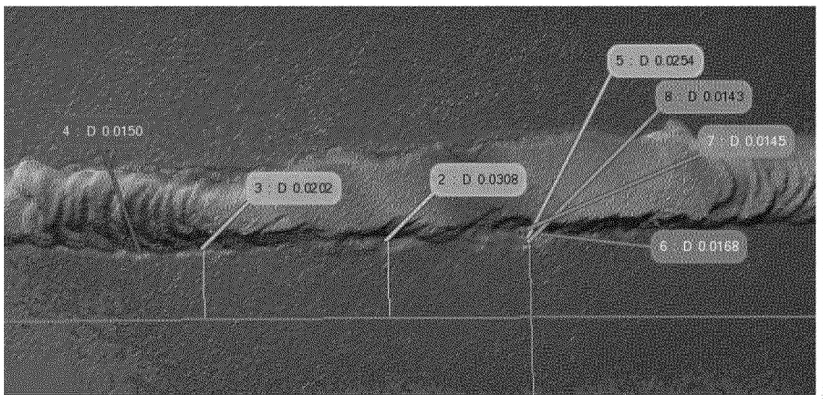


Creaform 3D (+/- 0.002") surface profile:

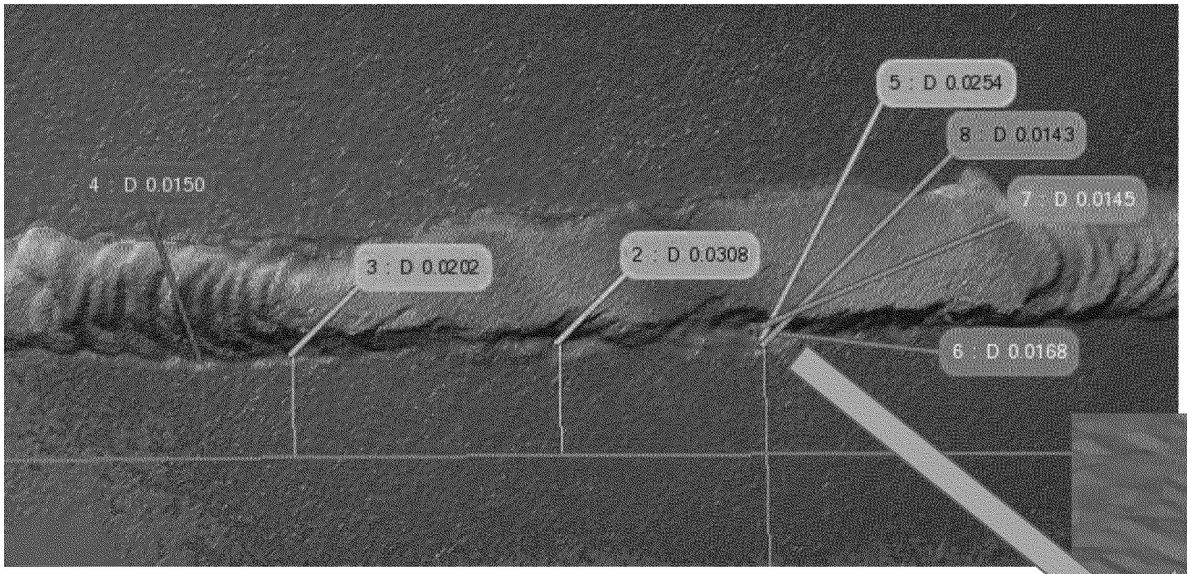
- External undercut identified up to 0.030" deep
- Sum of UC lengths < 1.5"
- Weld is <u>acceptable</u> per API 1104

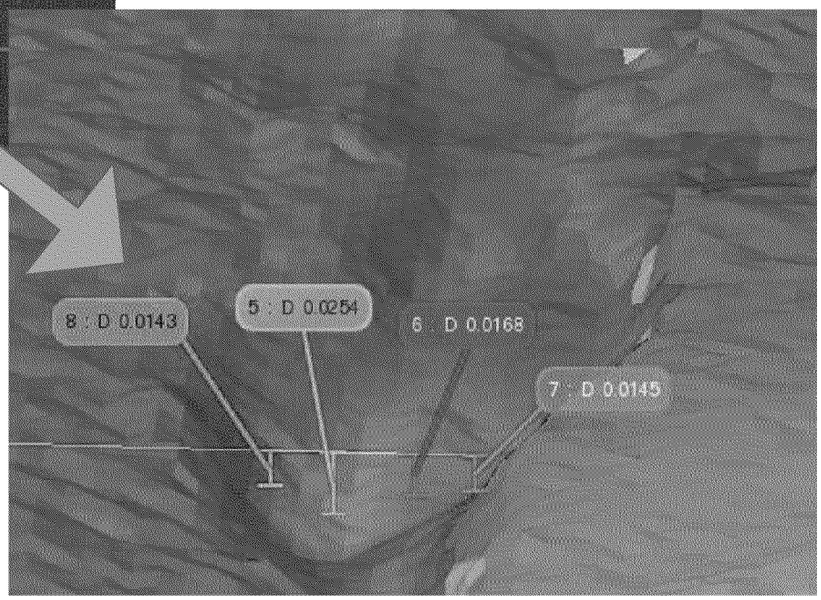






Weld 738 ROI>>36-42
Potential concern: EUC

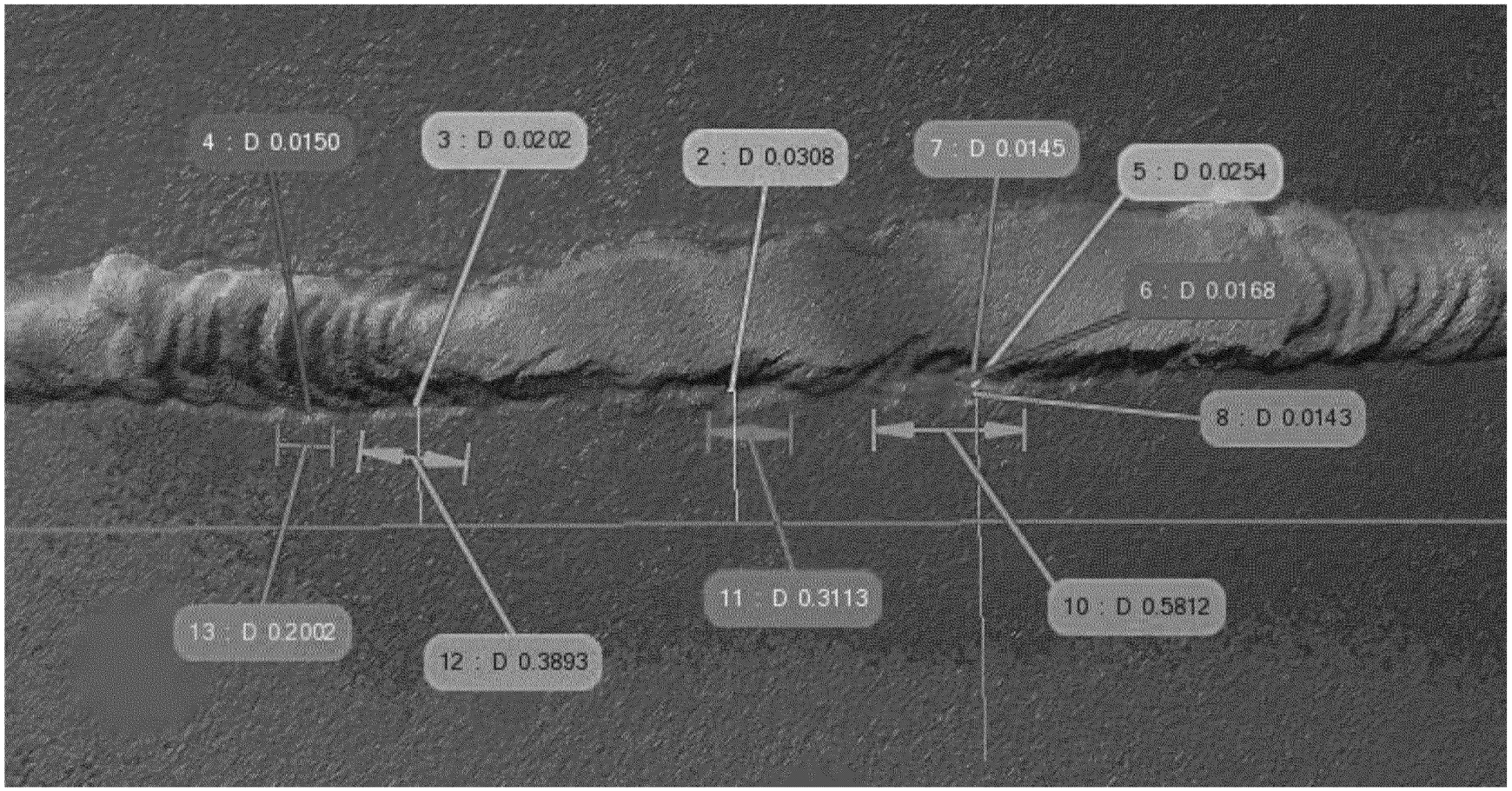




Additional Creaform/Polyworks perspective of ROI 36-42:

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

Weld 738 ROI>>36-42
Potential concern: EUC



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

NDT 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

Mr. Redacted
Pacific Gas and Electric Company
PG&E Applied Technology Services
3400 Crow Canyon Road
San Ramon, CA 94583

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

DLC/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