WELDING QUALIFICATIONS — GD55.505-1

Original Issue Date: 03/02/84 Revision Date: 04/23/15 Status: Revised

Subject Matter Expert: R. Pfister & D. Steinmetz Revised By: R. Pfister & B. Kaiser

Approved By: Gary Hebbeler & John Hill Department: Gas Operations

Reference: CFR Title 49 Parts 192.221, 225, 227, 229, 805; 195.214, 222; API 1104 (20th Edition)

Gas Standard: NA OQ Tasks: This procedure

Gas Operations Plan: Natural Gas Section E; Hazardous Liquid Plan Section 6; Natural Gas Operators Qualification Plan and Hazardous Liquid Operators Qualification Plan.

Purpose: This procedure is to provide uniform guidelines for welding operator qualifications for Company and Contractor welders, and welding operators on steel natural gas and hazardous liquid pipeline facilities.

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1. QUALIFICATION OF WELDING PROCEDURES

A. This procedure covers the operator qualification of welders (both Company and Contract welders) and welding procedures for manual shielded metal arc (stick), metal inert gas (MIG) for welding at the Brecon Repair Shop.

B. All welding procedures shall be qualified by the Engineering Department in accordance with the requirements of Section 5 of A.P.I. Standard 1104, "Qualification of Welding Procedures for Welds Containing Filler-Metal Additives".

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C. All welding of steel pipelines within the Company shall be performed in accordance with established written procedures that have been qualified to produce sound ductile welds.

2. WELDER QUALIFICATIONS

A. Company and Contract welders shall be qualified for this procedure to weld on Duke Energy's facilities.

1) Qualification tests for Field Welders (stick) shall be in accordance with Section 6 of the American Petroleum Institute's (API) Standard 1104.

2) Qualifications tests for Component Welders (MIG) shall be in accordance with Section 1 of Appendix C of CFR Title 49 Part 192 "Qualifications for Welders of Low Stress Pipe".

B. Qualification Tests for Field Welders (stick)

1) The multiple qualification test will be comprised of welding a horizontal fixed 12.75" diameter steel pipe butt weld and a fixed 12.75" diameter branch connection, where the branch piece is pointing in the vertical down position . The pipe used will be grade X-52. The wall thickness shall be 0.250".

2) The coupons extracted from the butt weld will be tested in the following fashion:

a) Face Bend
b) Root Bend
c) Tensile
d) Nick

3) The branch connection will have coupons extracted per API 1104 Figure 11. Each coupon will be "scarfed" using an acetylene torch on each weld in order to determine if there are any slag inclusions or air pockets in the welds.

4) There will also be a written exam given which tests basic welding knowledge.

5) In the event the Field Welder fails any part of the exam, the soonest the Field Welder will be eligible to re-test is three (3) months. The Field Welder who

does not pass the second time will not be eligible for re-test for twelve (12) months.

C. Qualifications Tests for Component Welders (MIG)

1) Qualification tests shall be in accordance with Section 1 of Appendix C of CFR Title 49 Part 192, "Qualification of Welders of Low Stress Pipe".

2) The qualification work for the MIG welds will be done using a 4.5" diameter steel butt weld. This allows the MIG welder to weld on any pipe diameter equal to or less than the 4.5" diameter pipe. The pipe will be 0.188" wall thickness and be Grade X-52. The pipe will be welded in a fixed horizontal position. The weld must conform to the specifications of the procedure under which the welder is being qualified.

3) The (4) coupons extracted from the butt weld will be subjected to only a root bend test.

3. WELDING PERMITS

A. Each welder shall have a valid welding permit as proof of his qualifications.

B. A welder who successfully passes the qualification test shall be issued a welding permit for a maximum period of one year, after which the welder must be re-qualified or have had a production weld tested and found acceptable within the preceding six (6) calendar months (§195.222).

C. The welding permit shall be completed, signed and issued by the welding supervisor or designate.

4. WELD IDENTIFICATION

A. All pipeline and connected welds shall be identified. Each welder shall be issued identification numbers by the Welding Supervisor or designate.

B. Welding of steel pipelines within the Company system shall be performed in accordance with the technical provisions of Company's welding procedures and shall be in compliance with the applicable sections of the "Welding of Pipelines

and the Code of Federal Regulations, A.P.I. Standard 1104 and Part 192 and 195, Title 49 of the Code of Federal Regulations. "Transportation of Natural and Other Gas by Pipelines, Minimum Federal Safety Standards" and "Transportation of Hazardous Liquids by Pipeline."

5. QUALIFICATION RECORDS

A record of all Welder Qualification Tests, including detailed results of each test, shall be recorded and shall be maintained as long as this procedure is in use plus five years.

6. RESPONSIBLITY

A. The Welding Supervisor is responsible for:

1) Qualifying Company and Contract welders and welding operators,

2) Issuing welding permits,

3) Maintaining records of qualification tests,

4) Maintaining a list of qualified welders and welding operators,

5) Maintaining the procedures for which welders and welding operators are qualified.

B. Welders are responsible for:

1) Carrying a valid welding permit,

2) Identifying welds performed

7. Exhibit A - Appendix C to Part 192—Qualification of Welders for Low Stress Level Pipe

I. *Basic test.* The test is made on pipe 12 inches (305 millimeters) or less in diameter. The test weld must be made with the pipe in a horizontal fixed position so that the test weld includes at least one section of overhead position welding. The beveling, root opening, and other details must conform to the specifications of the procedure under which the welder is being qualified. Upon completion, the test weld is cut into four coupons and subjected to a root bend test. If, as a result of this test, two or more of the four coupons develop a crack in the weld material, or between the weld material and base metal, that is more than $\frac{1}{8}$-inch (3.2 millimeters) long in any direction, the weld is unacceptable. Cracks that occur on the corner of the specimen during testing are not considered. A welder who successfully passes a butt-weld qualification test under this section shall be qualified to weld on all pipe diameters less than or equal to 12 inches.

II. *Additional tests for welders of service line connections to mains.* A service line connection fitting is welded to a pipe section with the same diameter as a typical main. The weld is made in the same position as it is made in the field. The weld is unacceptable if it shows a serious undercutting or if it has rolled edges. The weld is tested by attempting to break the fitting off the run pipe. The weld is unacceptable if it breaks and shows incomplete fusion, overlap, or poor penetration at the junction of the fitting and run pipe.

III. *Periodic tests for welders of small service lines.* Two samples of the welder's work, each about 8 inches (203 millimeters) long with the weld located approximately in the center, are cut from steel service line and tested as follows:

(1) One sample is centered in a guided bend testing machine and bent to the contour of the die for a distance of 2 inches (51 millimeters) on each side of the weld. If the sample shows any breaks or cracks after removal from the bending machine, it is unacceptable.

(2) The ends of the second sample are flattened and the entire joint subjected to a tensile strength test. If failure occurs adjacent to or in the weld metal, the weld is unacceptable. If a tensile strength testing machine is not available, this sample must also pass the bending test prescribed in subparagraph (1) of this paragraph.

LIMITATIONS OF WELDERS AND WELDING PROCESSES GD55.512-1

Original Issued Date: 03/02/1984 Revision Date: 06/04/13 Status: Revised

Approved By: John Hill Department: Gas Operations

Reference: CFR Title 49 Part 192.153, .227, .229, .233, .313; 195.222

Gas Standard: N/A Gas Operations Plan: Natural Gas section 5; Hazardous Liquid section 6

Purpose: This procedure is to provide uniform guidelines regarding limitations on welders and the welding processes.

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1. RESPONSIBILITY

A. Gas Field Operations is responsible for:

1) Qualifying welders

2) Maintaining welders qualification records

3) Ensuring appropriate classification and qualified welders are assigned welding.

B. Gas Engineering is responsible for maintaining this procedure.

2. LIMITATION ON WELDERS

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A. After initial qualification, a welder may not perform welding unless requalification has occurred within the preceding 12 months or has had a production weld cut out, tested and found acceptable in accordance with the qualifying test.

B. No welder may weld a specific welding process unless he has welded with that specific process within the preceding six (6) months (§192.229), and for hazardous liquid pipelines had one weld tested and found acceptable under section 9 of API 1104 (§195.222).

C. A welder may be required to re-qualify if there is a question about his ability. (See procedure GD55.505-1 *Welding Qualifications*)

D. Class II welders shall not weld on pipelines operating at pressures of 60 PSIG or more.

E. Only Class I welders using the manual shielded arc (stick) or metal inert gas (MIG) processes may weld on piping operating at all pressures.

3. LIMITATION ON WELDING PROCESS

A. Oxy-acetylene welding is prohibited on piping which contains gas or has a nominal diameter greater than 2".

B. Tap connections shall be located so that they do not intersect a longitudinal or girth weld.

4. MITER JOINTS

Miter joints are permitted only where factory made steel welding elbows cannot be utilized and "all" of the following conditions are satisfied:

A. The nominal pipe size is 12" or smaller

B. Each pipe end shall have an equal angle cut for proper miter joint design. The beveled ends shall be reasonably smooth and uniform. The dimensions shall be in accordance with the qualified welding procedure

C. The distance between miter joints shall be at least one pipe diameter as measured from the crotch of each joint.

D. A miter joint on steel pipe to be operated at a pressure that produces a hoop stress of 30% or more of the SMYS may not deflect the pipe more than 3°.

E. A miter joint on steel pipe to be operated at a pressure that produces a hoop stress of less than 30% but more than 10% of the SMYS may not deflect the pipe more than 12 ½°.

F. A miter joint on steel pipe to be operated at a pressure that produces a hoop stress of 10% or less of the SMYS may not deflect the pipe more than the following:

NOMINAL PIPE SIZE	MAXIMUM DEFLECTION
2"	32 °
3"	21 °
4"	16 °
6"	11°
8"	8 °
12"	5 °

G. Deflections caused by misalignment up to 3° are not considered miter joints.

5. WROUGHT STEEL WELDING ELBOWS

Wrought steel welding elbows and transverse segments of these elbows may not be used for changes in direction of steel pipe that is 2 inches or more in diameter unless the arc length, as measured along the crotch is at least 1 inch. The following guideline shall be used for determining the minimum deflection that can be obtained from segments of these elbows.

NOMINAL PIPE SIZE	MINIMUM DEFLECTION
2"	32 °
3"	21 °
4"	16 °
6"	11°
8"	8 °
12"	5 °
16"	4°
20" and 24"	3°

6. WELDED CLOSURES

Using flat welded closures instead of pipe caps are permitted only for 3 inch or small diameter pipe, operating at less than 100 PSIG.

LIMITATIONS OF WELDERS AND WELDING PROCESSES	GD55.512-1

7. DOCUMENTATION

A. Welders will record welding information on the Daily X-Ray Report. Refer to procedure *GD60.739 X-Ray Report – Daily Completion* for details on how the report is to be prepared and distributed.

B. Daily X-Ray Reports will be maintained by Gas Engineering for the life of the pipe.

WELD INSPECTION – VISUAL GD60.738

Original Issue Date: 10/01/1987 Revision Date: 3/30/2012 Status: Revised

Approved By: John Hill Department: Gas Operations

Reference: CFR Title 49 Parts192.241 & 195.222, 228 Gas Standard: 6.2

Gas Operations Plan: Natural Gas Section 5.4; Hazardous Liquid Section 5

Purpose: To instruct Gas Field Operations and Contractor Construction Management personnel in the performance of visual weld inspections.

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1. General

A. To comply with state and federal regulations Gas Operations has established procedures for the visual inspection of welds.

B. Visual inspection of welding must be conducted to insure that:

1. The welding is performed in accordance with the welding procedure.

2. The weld is acceptable. The acceptability of a weld that is visually inspected is determined according to the standards in Section 6.4 of the A.P.I. Standard 1104.

3. All welds must present a neat work-man-like appearance.

C. Visual inspections are intended only to determine that welds are performed according to approved procedures by welders certified by the Company. The visual inspections do not replace leakage or strength tests.

2. Responsibility

A. The Gas Engineering is responsible for developing, maintaining and issuing this procedure.

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B. The Manager of Contractor Construction Management, or designate is responsible for :

1. Ensuring that the Inspectors in charge of welding projects are qualified by training and experience. Each must understand and apply the requirements of API Standard 1104 and Subpart E of Part 192 – Minimum Federal Safety Standards, by:

   a. Determining the acceptability of a weld under API Standard 1104.

   b. Determining whether an unacceptable weld should be removed or repaired.

2. Providing a copy of the welding procedures being used at the work site and such additional instructions as may apply to that project. This will not be necessary if the project is routinely and repetitively performed.

3. Ensuring to following steps are taken:

   a. Each Welder is currently qualified under the welding procedure being used, by actually viewing the up-to-date qualification card issued to the welder

   b. Each weld is made according to the written procedure and other instructions issued by Gas Engineering

   c. The welding is performed in accordance with the welding procedure and as defined by Gas Standards

   d. The correct pipe is being welded

   e. The welding operation is protected from weather conditions that would impair the quality of the completed weld

   f. The welding surfaces are clean and free of any materials that might be detrimental to the weld;

   g. The materials being welded (pipe or components) are properly aligned while the root bead is being deposited

   h. Each defective weld is either repaired or removed

3. <u>Inspection Prior to Welding</u>

WELD INSPECTION – VISUAL	GD60.738

A. Inspection of pipe - the pipe ends shall be free of dents, gouges and have uniform roundness.

B. Pipe preparation- the welding surfaces must be cleaned and be free of any material that may be detrimental to the weld.

C. Alignment:

1. The fit-up of the joint shall be visually inspected before the weld is made.

2. The alignment of the abutting ends shall be such as to minimize the offset between surfaces. For pipe of the same normal wall thickness the offset shall not exceed 1/16-inches.

3. The longitudinal joints are offset and located in the top section of each pipe.

4. Unequal wall thickness. The offset shall be equally distributed around the circumference of the pipe. If within the limits of (Exhibit B).

5. Line-up clamps shall be used where applicable.

6. Fillet welds must be made with clean surfaces mated to the proper size.

   a. The throat dimension (the concave portion) of a weld-o-let type fitting is not to be radically adjusted so as to reduce the wall thickness of the fitting.

   b. Socket fittings are lined-up with a minimum of 1/16" gap between the pipe end and the internal stop of the fitting (Exhibit A).

   c. Slip-on flanges are to have the pipe is stabbed (inserted) so as to provide a distance between the inside weld and the flange face of no more than ½" (Exhibit A).

4. Inspection During Welding

A. Welding electrodes and rods.

1. Welding electrodes must be kept dry with flux intact.

2. Type and size shall be in accordance with the applicable welding procedure.

B. Technique:

1. All electric arc welding shall be done by the down/hand method.

2. Each weld bead shall be completed before the next bead is started.

3. After completion of the stringer and each filler bead, the inspector shall check for proper slag removal and that all visible defects are removed or repaired before the next bead is started.

C. Weather:

1. The welding operation will be protected from weather conditions that would impair the quality of the weld.

5. Inspection of Completed Weld

A. Cap bead:

1. Shall have a uniform cross section around the entire circumference of the pipe.

2. Shall be approximately 1/8-inch greater than the original groove.

3. At no point shall the crown be below the surface level of the pipe.

4. It shall be free of visible defects such as cracks, porosity, lack of fusion, and undercut.

B. Undercutting:

1. The depth of undercutting must not be more than 1/32" or 12.5% of the pipe wall thickness, whichever is smaller.

2. Also, there must not be more than 2.0" of undercutting in any continuous 12" length of weld.

C. The inspector should check each weld to assure that it is identified.

6. Exhibits

Exhibit	Name
A	Fillet Welds and Recommended Attachment Details for Flanges
B	Permissible Mismatch of Wall Thickness for Butt Welding

WELD INSPECTION – VISUAL	GD60.738

EXHIBIT A

FILLET WELDS AND RECOMMENDED ATTACHMENT DETAILS FOR FLANGES

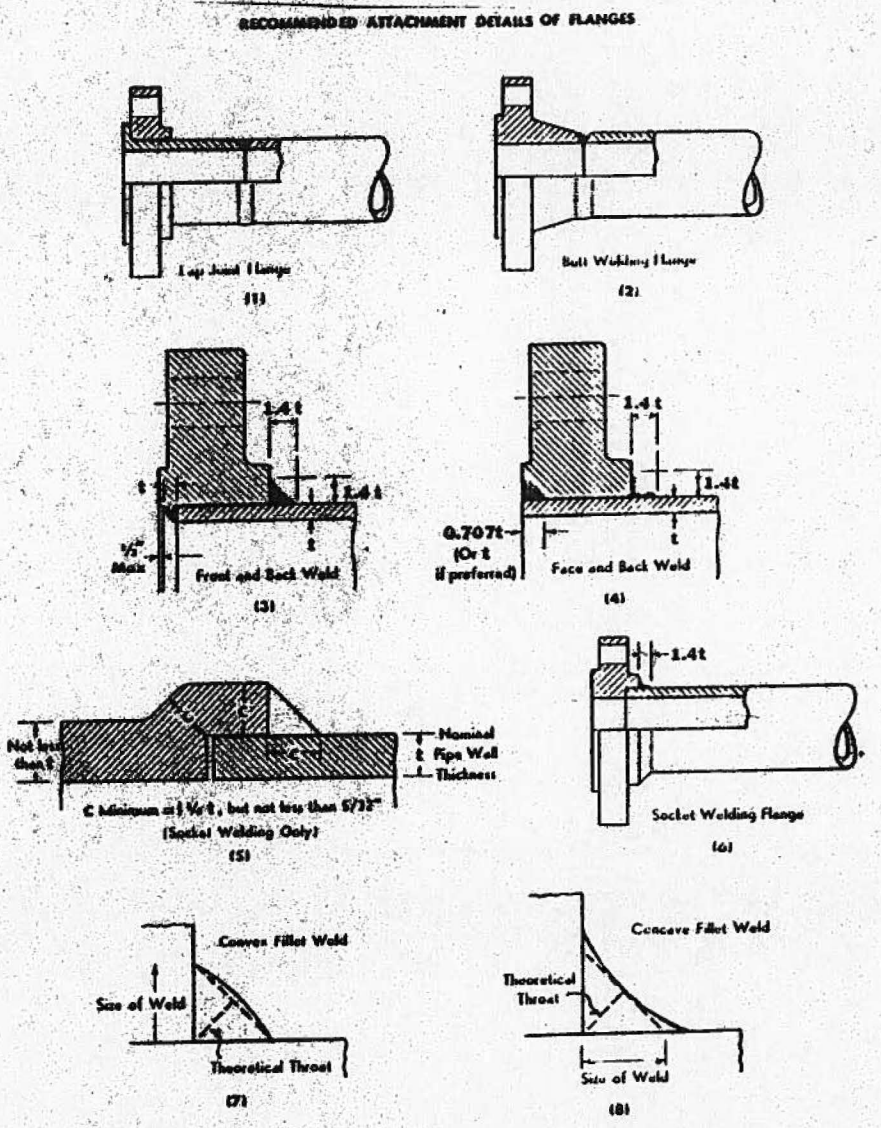

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EXHIBIT B

PERMISSIBLE MISMATCH OF WALL THICKNESS FOR BUTT WELDING

PERMISSABLE MISMATCH OF WALL THICKNESS FOR BUTT WELDING

X = <20% SMYS (<1/8")

= ≥ 20% SMYS (<3/32")

B31.8 APPENDIX 1

	0.120"	0.125"	0.154"	0.156"	0.172"	0.188"	0.203"	0.216"	0.219"	0.237"	0.250"	0.277"	0.281"	0.312"	0.322"	0.344"	0.365"	0.375"	0.438"	0.469"	0.500"	
0.120"	#	X	#	X	#	X	#	X	#	X	#	X	#	X		X		X		X		0.120"
0.125"	#	X	#	X	#	X	#	X	#	X	#	X	#	X	#	X		X		X		0.125"
0.154"	#	X	#	X	#	X	#	X	#	X	#	X	#	X	#	X	#	X		X		0.154"
0.156"	#	X	#	X	#	X	#	X	#	X	#	X	#	X	#	X	#	X		X		0.156"
0.172"	#	X	#	X	#	X	#	X	#	X	#	X	#	X	#	X	#	X		X		0.172"
0.188"	#	X	#	X	#	X	#	X	#	X	#	X	#	X	#	X	#	X	#	X	#	0.188"
0.203"	#	X	#	X	#	X	#	X	#	X	#	X	#	X	#	X	#	X	#	X	#	0.203"
0.216"		X	#	X	#	X	#	X	#	X	#	X	#	X	#	X	#	X	#	X	#	0.216"
0.219"		X		X	#	X	#	X	#	X	#	X	#	X	#	X	#	X	#	X	#	0.219"
0.237"		X		X	#	X	#	X	#	X	#	X	#	X	#	X	#	X	#	X	#	0.237"
0.250"				X		X		X	#	X	#	X	#	X	#	X	#	X	#	X	#	0.250"
0.277"						X		X		X	#	X	#	X	#	X	#	X	#	X	#	0.277"
0.281"							X		X	#	X	#	X	#	X	#	X	#	X	#	X	0.281"
0.312"								X		X	#	X	#	X	#	X	#	X	#	X	#	0.312"
0.322"									X		X	#	X	#	X	#	X	#	X	#	X	0.322"
0.344"										X		X	#	X	#	X	#	X	#	X	#	0.344"
0.365"											X	#	X	#	X	#	X	#	X	#	X	0.365"
0.375"											X		X	#	X	#	X	#	X	#	X	0.375"
0.438"															X		X	#	X	#	X	0.438"
0.469"																	X		X	#	X	0.469"
0.500"																			X	#	X	0.500"

To determine whether two wall thicknesses can be joined without special end preparation, the following steps shall be followed:

1. First you must determine the MAOP of the line - X is used for under 20% SMYS and # is used for over /equal to 20% SMYS.
2. Find the horizontal column for one of the wall thicknesses to be used.
3. Follow the horizontal column until it intersects the vertical column for the other wall thickness.
4. If an "X or #" appears at the intersection of the two columns, the wall thicknesses may be joined without special end preparation.
5. If no "X or # " appears at the intersection of the two columns, the thicker section shall be tapered (1 on 4) to meet the thinner section or the joint shall be backed up by welding.

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VISUAL AND RADIOGRAPHIC WELD INSPECTION ON STEEL PIPELINES GD55.500

Original Issue Date: 8/15/88 Revision Date: 03/25/14 Status: Revised

Approved By: John Hill Department: Gas Operations

Reference: CFR Title 49 Parts 192.241 & 243; 195. 222, 228, 234; API 1104

Gas Standard: 6.2 Gas Operations Plan: Natural Gas Section 5 & Hazardous Liquid Section 5

Purpose: To provide a statement of general policy to satisfy code requirements for visual and radiographic weld inspections on steel pipe.

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1. GENERAL

A. To comply with State and Federal Regulations, Gas Operations has established procedures for visual and radiographic (X-ray) inspection of welds.

B. The two (2) common methods of inspection to be used for non-destructive testing of welds are:

1. Visual Weld Inspection

a. This method is used when non-destructive inspection is impractical or not required.

b. Visual Welding Inspectors must be trained and qualified to perform visual inspections.

c. Visual welding inspections can be a supplement to non-destructive inspection.

VISUAL AND RADIOGRAPHIC WELD INSPECTION ON STEEL PIPELINES GD55.500

2. Non-Destructive Inspection (X-Ray)

a. The following list depicts when an X-ray is required:

System	Pipe Size	Frequency of Radiograph or Visual Inspection
All Systems	All Sizes	For mains installed in buildings, 100% radiograph is required
SP, MP, IP, 60#	All Sizes	Visual Inspection by qualified personnel. In addition, 100% radiograph inspection of: 1) Aerial crossings, such as free spans or pipe supported along bridges. 2) Welds that will have limited access, such as under waterways, and encased main piping under expressways.
F/L, T/L	All Sizes greater than 2" Diameter	100% Radiograph
F/L, T/L	All Sizes less than or equal to 2" Diameter	Visual Inspection by qualified personnel. In addition, 100% radiograph inspection of: 1) Aerial crossings, such as free spans or pipe supported along bridges. 2) Welds that will have limited access, such as under waterways, and encased main piping under expressways.
Liquid Propane	All Sizes	100% Radiograph
Regulator Station	All Sizes T/L, F/L	Each regulator station to be determined by Gas Engineering & Planning
F/L, T/L	All Sizes greater than 2" Diameter	100% radiograph to inlet of final stage of regulation.

b. The Radiographic Technician must be certified in accordance with recommendation of the American Society of Nondestructive Testing (ANST) and Recommended Practice SNT-TC-1A for the test method

VISUAL AND RADIOGRAPHIC WELD INSPECTION ON STEEL PIPELINES
GD55.500

used. Each technician must be qualified with API-1104. Only Level II and Level III technicians are permitted to nondestructively inspect Duke Energy Facilities.

c. The Radiographic inspection is an acceptable method for testing all welds except for fillet welds.

2. RESPONSIBILITY

A. Gas Field Operations and Contractor Construction Management are responsible for the visual and radiographic inspection of welds on steel pipe.

B. The Welding Supervisor of the Gas Operating Department is responsible for training and qualifying company personnel for visual weld inspection.

3. VISUAL WELD INSPECTION

A. Visual inspection of welding must be conducted to insure that:

1) The welding is performed in accordance with the welding procedure.

2) The weld is acceptable. The acceptability of a weld that is visually inspected is determined according to the standards in Section 6.4 of A.P.I. Standard 1104. In general, welds must be free from cracks, inadequate penetration, and burn through. All welds must present a neat work-man-like appearance. The depth of undercutting must not be more than 1/32" or 12.5% of the pipe wall thickness, whichever is smaller. Also, there must not be more than 2.0" of undercutting in any continuous 12" length of weld.

4. RADIOGRAPHIC (X-RAY) WELD INSPECTION

A. X-ray (as a form of non-destructive testing) is done to locate defects that may affect the integrity of the weld.

B. The acceptability of a weld that is X-ray tested is determined according to the standards in Section 11.1 of A.P.I. Standard 1104.

C. X-ray testing will be done on the following percentages of each day's field butt welds, selected at random by the operator and tested over the entire circumference:

VISUAL AND RADIOGRAPHIC WELD INSPECTION ON STEEL PIPELINES
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1) In Class 1 locations, except off shore, at least 10%.

2) In Class 2 locations, at least 15%.

3) In Class 3 and Class 4 locations, at crossings of major or navigable rivers, off shore, and within railroad or public highway right-of-ways, including tunnels, bridges, and overhead road crossings, 100% unless impracticable, in which case at least 90%. X-ray testing must be impracticable for each girth weld not tested.

D. When x-ray testing is required, a sample of each welder's work for each day must be tested, unless a welder's work is isolated from the principle welding activity.

E. X-ray test records must be identified by milepost, engineering station, or by geographic feature, the number of girth welds made, the number non-destructively tested, the number rejected, and the status of the rejects.

5. DOCUMENTATION

A. The performance of X-ray testing is recorded on the information sheet of the construction drawing by the on-site supervisor/inspector.

B. Daily X-ray reports are completed by the testing company indicating the test results.

6. RECORD RETENTION

A. All X-ray films and copies of reports are forwarded to the Welding Supervisor of Gas Operating for the purpose of review of the testing technician as well as the welder.

B. All X-ray reports are to be sent to Gas Records to be scanned and indexed into Fusion for record retention for the life of the pipeline.

C. The X-ray films are to be retained by the Welding Supervisor until the pipeline has been "placed in service" **AND** the job work order has been "closed out." All X-ray films associated with the "closed out" job must be disposed of. Disposal involves shredding of the films by the Welding Supervisor.

X-RAY REPORT – DAILY COMPLETION GD60.739

Original Issued Date: 04/15/1987 Revision Date: 10/16/2012 Status: Revised

Approved By: John Hill / Gary Hebbeler Department: Gas Operations

Reference: CFR Title 49 parts 192.243; 195.234, 266
Gas Standard: 6.2

Gas Operations Plans: Natural, Section 5.9; Hazardous Liquid, Section 6

Purpose: To instruct personnel in the completion and distribution of the Daily X-Ray Report, Form M-8196, by Gas Operating and x-ray testing contractor personnel.

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1. General

A. To comply with State and Federal regulations Gas Operations has adopted "X-Ray" as a nondestructive method of testing welds. The Daily X-Ray Report has been developed to document testing and interpretation and becomes the permanent record of these activities. Because of this, it is very important that this document is filled out correctly.

B. The Daily X-Ray Report form is also used to report the time and mileage of the x-ray crew for the purposes of accounting.

2. Responsibility

A. The Supervisor in charge of welding is responsible for instructing personnel in the proper procedure for completing the Daily X-Ray Report.

B. The Gas Field & System Operations Division of Gas Operating is responsible for implementing this procedure when an X-Ray is required.

C. The senior radiographer of the x-ray crew is responsible for evaluating the x-rays, documentation of testing, and the completion of this document except for approval signatures.

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D. The Company representative is responsible for verifying that testing activities have occurred and seeing that copies of the report are distributed within the company.

E. The Company has the responsibility to review the quality of performance and documentation by the testing contractor.

3. Daily X-Ray Report Documentation

This procedure refers to various sections of the Daily X-Ray Report as indicated by the headings below. It is important to fill out this report entirely.

- District = Check the block following the district in which the x-ray work is being performed.
- State = Check the block preceding the state where the x-ray work is being performed.
- Sheet Number = Number the sheets used for each job each day. (e.g. 1 of 1, 1 of 2, 2 of 2, etc.)
- Date = Record the month, day and year when the x-ray work is being performed.
- Job Number = Record the job number of the construction drawing or I.D. number of the Field Generated Order form after the first "Duke Energy" listing.
- Work Order Number = Record the work order number for the work being performed after the second "Duke Energy" listing.
- Jobsite = Report the street and suburb or town and the location of the job for which the welds will be used, not necessarily the location at which the x-ray work was performed.
- Miles = Report the total round trip business mileage each day, i.e.
  a) From shop to job, from job to shop,
  b) When work is performed at two or more job locations on the same day, report the mileage from the shop to the 1st job only on the report for the 1st job. Report the mileage from the 1st job to the 2nd job on the report for the 2nd job, etc. Report the mileage from the last job to the shop on the report for the last job of the day.

X-RAY REPORT – DAILY COMPLETION **GD60.739**

- Work Day = Check the appropriate box for the work day using the following guidelines:
  a) 4 Hour Work Day = Check this block to report a regular 4 hour work day. If more than one sheet is used for a particular job, report the hours on the first sheet for that job.

  b) 8 Hour Work Day = Check this block to report a regular 8 hour work day. If more than one sheet is used for a particular job, report the hours on the first sheet only.

  c) Standby Day = Check this block to report a regular 8 hour work day in which no x-ray work was performed.

- Overtime Hours = Record the number of hours in excess of 8 on a regular work day and the total hours worked on dates which will be billed as overtime hours.

NOTE: Report the time and mileage for each job on Sheet No. 1 for that job. When time is spent on two or more jobs on the same day, line through the number 4 preceding "4 Hour Work Day" and report the hours to be charged to that job. Total time reported for an 8 hour day should be 8 hours. Total time reported for a 4 hour day should be 4 hours. Total mileage reported should equal total miles traveled to, between, and from jobs.

- Job Description = Record a brief description of the job, i.e. x-ray 20" pipe welds, etc.

- Source = Record the type of radiation source, i.e. IR192

- Curies = Record the strength of the source.

- Sensitivity = Record the sensitivity of the exposed film, i.e. 1T, 2T, 4T.

- Film = Record the film brand and/or type

- X-Ray Company = Record the name of the testing contractor who is performing the radiographic inspection

- Weld Number = Record the weld number. The radiographer shall confer with the company inspector for the weld number sequence.

NOTE: Welds on distribution piping which are x-rayed for quality control purposes only, do not have to be numbered. Use letters Q/C in place of a number.

- System = Record the coverage area of each film, i.e. 0-1, 1-2, 2-3, etc.

X-RAY REPORT – DAILY COMPLETION	GD60.739

- O.D. = Record the normal pipe diameter, i.e. 2", 4", 6", etc.
- Wall Thickness = Record the pipe wall thickness, i.e. .154, .188, .219, etc.
- Single Wall/Double Wall = Record the method of exposure with a check mark in the applicable block.
- Discontinuities – (LF, LP, P, etc.) = Record all unacceptable discontinuities in each view with a check mark in the applicable block (see the chart at the bottom of the page for abbreviations).
- Remarks = Record additional remarks or comments which pertain to the weld and/or material. Record pipe yield strength. If two pipes are different record each one separately. Keep the same sequence as the pipe welds. E.g X-52
- Acceptability Columns "A" & "R" = Record the quality of the weld for each view with a check mark in the applicable block. ("A" = Accepted, "R" = Rejected)
- Radiographer = Record the name of the radiographer.
- Assistant = Record the name of the radiographer's assistant.
- Welders (s) = The name, or company issued stamp number, of the person (s) who made the weld will be recorded by the radiographer. If multiple welders are represented on one sheet, identify the welder (s) responsible for rejects (by stamp number or name) in the left hand margin.
- Inspectors Approval = The approval signature of the company representative certifies that the time, date, job numbers, etc. are correct.
- District Supervisor = Signature of the District Supervisor

4. Distribution of X-Ray Report

The radiographer is responsible for distributing the filled in X-Ray Report. The report contains 3 separate sheets: a white copy, a yellow copy and a pink copy. The white copy, along with the film, goes to the welding supervisor. The yellow copy goes to the inspector, which is then placed in the folder with the final print. The pink copy stays with the X-ray technicians for their records.

DUKE ENERGY

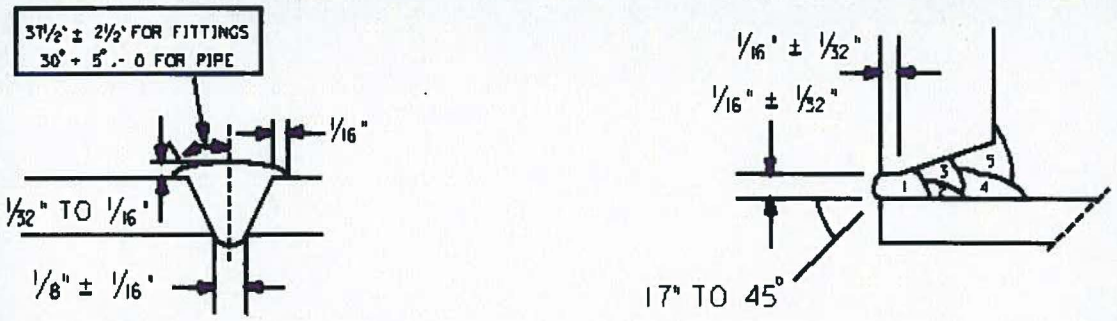
Welding Procedure Specification

(For Fabrication of High Pressure Line Pipe and Related Fittings)

TYPE OF RECORD	Weld Procedure Specification (WPS) No. ***BW-2-B- II***		Orig. Issue Date	Revision Date
	Procedure Qualification Record (PQR) No. 12-X60-375		Orig. Issue Date	Revision Date
PROCESS	Process Name: Shielded Metal Arc Welding (SMAW)		Type of Process: Manual	
	☑ Butt Welding (*BW*)	☐ Fillet Welding (*FW*)		
CODES & REGULATIONS	☑ DOT - 49 CFR, Part 192	☑ API 1104	☑ ASME B31.8	
DIAMETER	API 1104 6.2.2-d Guidelines	☐ Under 2-3/8" OD (*1*)	☑ 2-3/8" to 12-3/4" OD (*2*)	☑ > 12-3/4" OD (*3*)
MATERIAL	API 1104 5.4.2.2 Guidelines	☐ ≤ 42,000 PSI Yield (*A*)	☑ > 42,000 to 52,000 PSI Yld (*B*)	☐ ≥ 65,000 PSI Yield (*C*)
THICKNESS	API 1104 6.2.2-e Guidelines	☐ Under 3/16" thick (*I*)	☑ 3/16" thru 3/4" thick (*II*)	☐ Over 3/4" thick (*III*)

JOINT DESIGN

BUTT WELD ☑ FILLET WELD ☐



Groove Designs of Test Coupons

POSITION

WELD AXIS				TECHNIQUE		DIRECTION	
Flat (1G, 1F, 1FR)	☑	Plate	☐	Backhand	☐	Vertical - Up	☐
Horizontal (2G, 2F, 2FR)	☑	Pipe	☑	Forehand	☑	Vertical - Down	☑
Vertical (3G, 3F)	☑	Rotated [1]	☑				
Overhead (4G, 4F)	☑	Fixed	☑				
Multiple (5G, 5F)	☑	Inclined (6G, 6F)	☑				
Combination	☑						

FILLER METALS

AWS Electrode Nos: E6010	AWS Electrode Size: 1/8"	AWS Specification: A5.1	Filler Metal Group: 1
AWS Electrode Nos: E7010	AWS Electrode Size: 1/8"	AWS Specification: A5.5	Filler Metal Group: 1

GAS

SHIELDING GAS:	FLOW RATE:	FLUX:

ELECTRICAL CHARACTERISTICS & SEQUENCE OF BEADS

Current Type: AC ☐ DC ☑ Polarity: Straight/Negative ☐ Reverse/Positive ☑

BEAD NO.	ELECTRODE NO. & TYPE	Size [2]	RANGE VOLTS	RANGE AMPS	MAXIMUM TIME LAPSE ALLOWED [3] (Min.)	SPEED RANGE (IPM)	
Root (1)	E6010	1/8"	20-24	75-130	5	3-20	
Hot Pass (1)	E7010	1/8"	18-23	65-140	5	3-20	
Fill (2)	E7010	1/8"	18-24	65-140	5	3-20	
Cap (1)	E7010	1/8"	18-24	65-140	5	3-20	
Backweld ( )							

TOTAL NUMBER OF BEADS: 5 (or as determined by thickness)

LINE UP CLAMP ≥ 2" DIAMETER

Type ☑ External ☐ Internal Min. % Root Bead Before Removal = 50%

(Over)

TECHNIQUE	DISPOSITION STYLE		METHOD		ARC TYPE		
	Stringer Beads ☑		Multiple Pass ☑		Single Arc ☑	Other: ☐	
CLEANING	☑ Power	☐ Hand	☐ Both				
PRE-HEATING	Unless otherwise specified in the "Remarks" section below, pre-heating to 100° F is required if damp conditions exist and pre-heat to 200° F if ambient temperatur 50° F or lower. Temperature to be determined by pyrometer or temp stick.						
REMARKS*	[1] - Pipe maybe rotated if proper alignment is maintained with skids or structural framework with adequate number of roller dollies to prevent sag. [2] - Filler rod diameters may be changed depending on the situation. Amperage change as needed per rod specifications. N.E.V. [3] -Preheat to 250° F if the time lapse is greater than 5 minutes between passes at any time following the hot pass.						
APPROVAL	Engineer: Ralph Pfeifer				Date: 10/28/14		
	Weld Supervisor: [signature]				Date: 10/28/14		
	Director of Gas Engineering: [signature]				Date: 11/7/14		