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# Federal & State Code Requirements Pipe Joining-Welding

*2014 Fall Conference*



# Agenda



- Review
  - Department of Transportation
    - Part 192 Transportation of Natural and Other Gas by Pipeline
      - Subpart E – Welding of Steel in Pipelines
        - 192.225 Welding Procedures
        - 192.227 Qualification of Welders
        - 192.229 Limitations of Welders
        - 192.233 Miter Joints
        - 192.235 Preparation for Welding
        - 192.241 Inspection and test of Welds
        - 192.243 Nondestructive Testing
        - 192.245 Repair or Removal of Defects

# Agenda



- Review
  - State Requirements
    - New Hampshire
      - 500 Rules
    - Massachusetts
      - 220 CMR
    - Maine
      - 65-407 PUC Chapter 420
  - Welding Procedures
    - Review Welding Procedures
      - API 1104 20<sup>th</sup> Edition Essential Variables
  - Welding Documents
    - NDT Reports
    - Welder Qualifications
      - Multiple Qualification (Destructive Tests)
      - Re-Qualification (X-Rays)

- DOT Part 192 Subpart E Welding of Steel in Pipelines
  - 192.225 Welding Procedures
    - (a) Welding Must be performed by a qualified welder in accordance with welding Procedures qualified under section 5 of API 1104 (incorporated by reference, see 192.7) 192.7 / B. American Petroleum Institute (API)
    - (b) Each welding procedure must be recorded in detail, including the results of the qualifying tests. This record must be retained and followed whenever the procedure is used.

Test Welds to Qualify Welding Procedures shall be determined by destructive testing in accordance with the applicable welding standard (s).

# DOT Part 192



- 192.227 Welding Qualification of welders

- (a) Except as provided in paragraph (b) of this section, each welder must be qualified in accordance with section 6 of API 1104 (incorporated by reference, see 192.7)

However, a welder qualified under an earlier edition than listed in 192.7 of this part may weld but may not requalify under that earlier edition.

- Single Qualification

- (b) A welder **may** qualify to perform welding on pipe to be operated at a pressure that produces a **hoop stress of less than 20% of Specified Minimum Yield Strength (SMYS)** by performing an acceptable test weld, for the process to be used, under the test set forth in section I of **Appendix C** of this part. Each welder who is to make a welded service line connection to a main must also first perform an acceptable test weld under section II of Appendix C of this part as a requirement of the qualifying test.

- Appendix C – Qualification of Welders for Low Stress Level Pipe

## I. Basic Test

The test is made on pipe 12 inches 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 1/8-inch 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 but-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 a the same diameter as a typical main. The weld is made in the dame 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.

# DOT Part 192



- **192.229 Limitations on welders**

- (a) No welder whose qualification is based on nondestructive testing may weld compressor station pipe and components.
- (b) No welder may weld with a particular welding process unless, within the preceding 6 calendar months, he has engaged in welding with that process.
- (c) A welder qualified under 192.227 (a)
  - (1) May not weld on pipe to be operated at a pressure that produces a hoop stress of 20 % of more of SMYS unless within the preceding 6 calendar months the welder has had one weld tested and found acceptable under the sections 6 or 9 of API Standard 1104 (incorporated by reference, see 192.7). Alternatively, welders may maintain an ongoing qualification status by performing welds tested and found acceptable under the above acceptance criteria **at least twice each calendar year**, but at intervals not exceeding 7 ½ months. A welder qualified under an earlier edition of a standard listed in 192.7 of this part may weld but may not requalify under that earlier edition; and
  - (2) May not weld on pipe to be operated at a pressure that produces a hoop stress of less than 20% of SMYS unless the welder is tested in accordance with paragraph © (1) of this section or requalifies under paragraph (d) (1) or (d) (2) of this section.
- (d) A welder qualified under 192.227 (b) may not weld unless –
  - (1) Within the preceding 15 calendar months, but at least once each calendar year, the welder has re-qualified under 192.227 (b) or
  - (2) Within the preceding 7 ½ calendar months, but at least twice each calendar year, the welder has had –
    - (i) A production weld cut out, tested, and found acceptable in accordance with the qualifying test; or
    - (ii) For welders who work only on service lines 2 inches or smaller in diameter, two sample welds tested and found acceptable in accordance with the test in section III of Appendix C of this part.

# States Requirements



- New Hampshire

- 500 Rules

- Utility shall ensure & document welders are qualified
      - Welder qualified by destructive testing with-in preceding 63 months at least 5 years
      - Engaged in welding with that process with-in the preceding 6 months
    - All welds are visually inspected by qualified welding inspector in accordance with API 1104 section 8.3
    - Projects operating greater than 60 pounds require 10% NDT of projects that consist of at least 10 welds ; or
    - NDT field test on at least one weld for projects that include 5 to 9 welds
    - Any weld failure will require no less than 50% of all welds any additional failure will require 100% NDT

- Massachusetts

- 220 CMR

- Visually inspections of welds shall be performed by qualified welding inspector
    - Record or each NDT or visual inspection for life of pipeline
    - 6"greater shall be NDT
    - All pipeline tie-in welds shall be NDT

- Maine

- 65-407 PUC Chapter 420
    - 192 provisions



- API 1104, 20<sup>th</sup> Edition
  - Section 5 Qualification of Welding Procedures
    - 5.1 Procedure Qualification
      - Detailed Procedure Spec, Demonstrate Mechanical Properties
    - 5.2 Record
      - The record shall be maintained as long as the procedure is in use
    - 5.3 Procedure Specification
      - Process, Pipe & Fitting Mat, Dia. & Wall Thickness, Joint design etc.
    - 5.4 Essential Variables
      - Welding Procedure must be re-established as a new procedure specification & must be completely re-qualified when any of the essential variables are changed. Changes other than those given in 5.4.2 made be made in the procedure without the need for re-qualification, provided the procedure spec is revised to show the changes.

- Section 6 Welder Qualification
  - 6.1 General, determine ability of welders
  - 6.2 Single Qualification
  - 6.3 Multiple Qualification
    - Test has to witnessed
    - Butt Weld and Fillet Weld done at the same time
    - The weld shall be acceptable if it meets the requirements of 6.4 and **either** 6.5 or 6.6.
      - 6.4 Visual Examination, free of cracks, inadequate penetration, burn-through
      - 6.5 Destructive Testing
      - 6.6 Radiography-Butt Welds Only, Radiographs shall be made of each of the test welds

- Section 7 Design & Prep of a Joint for Production Welding
  - 7.1 General, Piping shall be welded by qualified welders using qualified procedures
  - 7.2 Alignment, Not to exceed 1/8 inch driven by qualified procedure
  - 7.3 Use of Lineup Clamp for Butt Welds
    - Internal root bead shall be completed
    - External at least 50% of root bead
  - 7.4 Bevel
  - 7.5 Weather Conditions
  - 7.6 Clearance
  - 7.7 Cleaning Between Beads
  - 7.8 Position Welding
  - 7.9 Roll Welding
  - 7.10 Identification of Welds
  - 7.11 Pre-Post Heat Treatment

# API 1104 20<sup>th</sup> Edition



- Section 8 Inspection & Testing of Production Welds
  - 8.1 Rights of Inspection
  - 8.2 Methods of Inspection
  - 8.3 Qualification of Inspection Personnel
  - 8.4 Certification of Nondestructive Testing Personnel
- Section 9 Acceptance Standards for Nondestructive Testing
  - Radiographic Testing
  - Magnetic Particle Testing
  - Liquid Penetrant Testing
  - Ultrasonic Testing
  - Visual Inspection
- Section 10 Repair & Removal of Defects
- Appendix B-in-Service Welding
  - B.1 General
    - Burning Through
    - Hydrogen Cracking

## Re-Qualification Reports

All re-qualification reports shall have the following information

### X-Ray Reports

Location, addresses on x-ray report, or state, test joint for re-qualification

Welder's name

Date of x-ray report

What Code, only one, API 1104, 20th edition, (must have both listed)

What process used,

Shielded Metal Arc Welding (SMAW) or Welding Procedure, or Electrode type, E6010, etc., welding procedure and electrode drive the process.

Welds shall pass for re-qualification submittal

Name of Company performing inspection

To work for multiple companies you need to know what procedure they have adopted, O&M

If their O&M states MUGP-1, my multiple qualifications were done with the NGA procedures can I weld for them.

Two things have to happen:

- 1) The company that adopted MGUP-1 needs a copy of the NGA to see if any of the procedure / welder essential variables were met if not you can weld for them.
- 2) You have to follow their welding procedures, in this case will be MGUP-1

# Questions

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