

SAMPLE SPECIFICATION FOR BUTT FUSION OPERATOR AND EQUIPMENT

1 GENERAL REQUIREMENTS

1-1 SCOPE:

1-1.1 This specification is intended to insure quality HDPE fusion welds are achieved. By meeting each item of the specification, a properly trained fusion operator will use properly maintained equipment. Verification of sample joints can be destructively tested and records of all fusion joints can be reviewed against accepted fusion variables.

1-2 RESPONSIBILITY

1-2.1 The employer of the fusion machine operator is responsible for the fusion joint quality of the fusion welds made by that individual. The employer is responsible for documenting all qualification and training records of that individual.

1-2.2 The owner of fusion equipment is responsible for all maintenance records of fusion equipment.

1-2.3 Employer of the fusion machine operator to have in-house safety program, established for at least 2 years with verifiable information in regard to schedules and history of safety meetings.

2 FUSION PROCEDURE

2-1 A fusion procedure that follows the guidelines of ASTM F 2620 Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings must be documented on company letterhead.

2-2 Considerations should be given to and provisions made for adverse weather conditions, such as temperatures below freezing, precipitation, or wind, which is accepted by the owner/engineer.

2-3 A record or certificate of training for the fusion operator must be provided that documents training to the fundamentals of ASTM F 2620.

3 FUSION OPERATOR

3-1 All HDPE fusion equipment operators shall be qualified to perform pipe joining. Fusion equipment operators shall have current, formal training on all fusion equipment employed on the project. Training received more than two years prior to operation with no evidence of activity within the past 6 months shall not be considered current.

3-2 For projects with at least 5000' or with pipe 26" or larger, operators or their supervisor must have a current McElroy Fusion Training Certificate for the equipment to be used on the project.

3-3 When the fusion machine operator is employed by the HDPE pipe and fusion machine supplier, the supplier shall maintain an ISO 9001 Certified Quality Management System.

4 FUSION PERFORMANCE QUALIFICATION

4-1 TESTING REQUIREMENTS

4-1.1 Written Examination: All operators should be able to pass a minimum 20 question written examination with a passing grade of 80% to verify understanding of the procedures, essential variables, and requirements outlined

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in ASTM F 2620.

- 4-1.2 Physical Examination: All operators must perform a minimum of two welds, each weld must pass a visual examination per section 4-2 and mechanical tests per section 4-3.

4-2 VISUAL EXAMINATION

- 4-2.1 For pipe sections, examine the full exterior circumference for bead uniformity before cutting. After cutting the pipe section, review the interior bead. All beads should have visually acceptable bead formation as shown in Fig 4 and Appendix X2 of ASTM F2620. In addition, the following characteristics are expected:

- 1) There shall be no evidence of cracks or incomplete fusing
- 2) There shall be no evidence of captured objects (e.g., pipe shavings, facer ribbons) between bonded surfaces.
- 3) Variations in upset bead heights on opposite sides of the cleavage and around the circumference of fused pipe joints are acceptable.
- 4) The apex of the cleavage between the upset beads of the fused joint shall remain above the base material surface
- 5) Fused joints shall not display visible angular misalignment, and outside diameter mismatch shall be less than 10% of the nominal wall thickness
- 6) Fusion data record review that meet criteria of section 6-2.1 can be used as additional verification of visual indicators.

4-3 MECHANICAL TESTS

- 4-3.1 Each pipe sample weld shall be subjected to testing at two locations 180 degrees apart from each other in the joint weld. All specimens shall be tested by one of the following methods:

- 1) Reverse Bend Test are allowed for pipe sizes 6" IPS or smaller. The specimens shall be removed and tested in accordance with ASTM F 2620, Appendix X4.
- 2) Guided Side Bend Test are allowed for all pipe sizes 4" IPS and larger. The specimens shall be removed and tested in accordance to recommendations and procedures provided by McElroy Manufacturing.
- 3) In Field Tensile Testing is allowed for all pipe size 4" IPS and larger. The specimens shall be removed and tested in accordance to recommendations and procedures provided by McElroy Manufacturing.
- 4) High Speed Tensile Impact Test is allowed for pipe sizes 3"-63" for all wall thicknesses less than 2.5". The specimens shall be removed and tested in accordance to ASTM F 2634.
- 5) Hydrostatic Burst Test is allowed for pipe sizes 2"-24". The specimen length should measure 6 times pipe diameter with the butt fusion joint in the center of the specimen. The specimen should be tested in a tank filled with water, and testing conditions monitored and recorded with computerized equipment. The specimen will be tested at 4 times pipe rated pressure for 5 minutes with no failure of joint allowed.

- 4-3.2 All samples shall be labeled with operator information. Testing must be done at 73 degrees F plus or minus 5 degrees. The test temperature and sample size are critical to testing. Testing performed at cold or elevated temperatures may not give similar results to tests performed at ambient temperatures.

- 4-3.3 Results of any mechanical test should be documented. Information on the weld and operator should be transferred from the sample to the testing record.

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4-3.4 FIELD HYDROSTATIC TESTING

4-3.4.1 When practical, intermittent and/or post construction testing of all HDPE lines will be performed in accordance with ASTM F 2164 Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure. Pass/Fail Criteria as per section 9.8 of that standard should be observed.

4-4 QUALIFICATION EXPIRATION

- 4-4.1 An operator's qualification will be considered expired when one of the following conditions has been met:
- A) When the fusion machine operator has not completed a fusion joint using a qualified procedure for a time period of 6 months or more, their qualification has expired
 - B) When there is specific reason to question the ability of the fusion machine operator to make fused joint meeting the requirements of the specification, the qualification of the fusion machine operator shall be revoked.
 - C) When the fusion machine operator has passed 2 years since last qualification date, their qualification has expired.

5 FUSION UNIT REQUIREMENTS

5-1 All Fusion Equipment, whether new or used, rented or owned, shall comply with the requirements of ISO 12176-1 "Equipment for Fusion Jointing Polyethylene Systems".

5-1.1 OWNER OPERATED FUSION EQUIPMENT

5-1.1.1 If the contractor owns butt fusion equipment, the equipment must be serviced within 3 months prior to use for this project. The machine must be environmentally friendly and in satisfactory working order. The hydraulic system must be leak free. The pressure gage must be checked for accuracy and the thermometer checked. For projects with pipe quantities of 5000' or longer, the fusion equipment should be serviced by a McElroy Authorized Service and Repair Center with at least one McElroy Certified Master Mechanic on staff within 3 months of the first fusion on the project.

5-1.2 RENTAL FUSION EQUIPMENT

5-1.2.1 Fusion Equipment must be maintained by a McElroy Certified Rental Operation. That company would have a McElroy Authorized Service and Repair Center with at least one McElroy Certified Master Mechanic on staff. When requested by owner or his authority, an inspection report detailing the components inspected within 3 months prior to arrival at jobsite will be provided.

5-1.2.2 No equipment older than 5 years should be on site without engineer approval and operating inspection.

5-1.2.3 DataLogger must be within current calibration and have accompanying records with it.

6 FUSION DATA RECORDS AND EVALUATION

6-1 FUSION DATA RECORDER

6-1.1 For 6" and larger pipe sizes, A McElroy DataLogger or equivalent fusion data recorder shall be used to record all fusion welds on hydraulically operated fusion equipment. The device shall be capable of meeting the requirements of ASTM F3124, "Standard Practice for Data Recording the Procedure used to Produce Heat Butt Fusion Joints in Plastic Piping Systems or Fittings". The device, or combination of devices, shall record the following variables of each fused joint:

- 1) Heater surface temperature immediately before inserting the heater plate. Alternatively, the heater plate may be measured with a pyrometer and entered into the weld record.
- 2) Gauge pressure during the initial heat cycle
- 3) Gauge pressure and elapsed time during the heat-soak cycle
- 4) Heater removal (dwell) time
- 5) Gauge pressure and elapsed time during the fusing/cool cycle
- 6) Drag pressure
- 7) Pipe diameter and wall thickness
- 8) Type of HDPE material(Specification and Classification) and manufacturer
- 9) Fusion Machine Identification

6-1.2 The device shall record the operator, a unique operator ID number, the date and time of each weld.

6-1.3 Records showing the device is up to date on all required calibration should be available for presentation when requested.

6-1.4 All fusion welds should be traceable to the report (via operator and weld ID) with an indentation weld stamp or by permanent paint marker/pen next to fusion weld.

6-1.5 When requested prior to commencement of work, a weld location map may be requested by the owner or owner's representative.

6-2 Fusion Data Record Review

6-2.1 The fusion data record for each fused joint shall be compared to the approved fusion procedure. The reviewer shall verify the following:

- 1) That all data required by section 6-1.1 was recorded
- 2) Interfacial pressure was within the acceptable range
- 3) Heater surface temperature was within the acceptable range
- 4) Butt fusion pressure applied during the fusing/cool cycle was correctly calculated to include drag pressure, fell within the acceptable range for the applicable size and agrees with the recorded hydraulic fusing pressure.
- 5) Butt fusing pressure was reduced to a value less than or equal to drag pressure at the beginning of the heat soak cycle.
- 6) Fusing machine was opened at the end of the heat soak cycle, the heater was removed, and the end were brought together at the fusion pressure with the acceptable time range
- 7) Cooling time at butt fusing pressure met the minimum time specified

6-2.2 If the recorded data in section 6.2-1 is outside the limits of the acceptable range,

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- the joint is unacceptable.
- 6-2.3 Frequency. Records for test fusion joints should be reviewed immediately after the joint is completed. Fusion joints for jobsite fusions should be reviewed daily or before being covered with backfill.