



**Description**            These plastic pipe qualifications and joining procedures have been adopted to guide our employees and contractors on the necessary steps to select and produce plastic pipe and joints that meets standards of Facilities, as well as state and Federal Agencies having jurisdiction over these facilities.

All individuals joining plastic pipe must be qualified to perform that procedure.

**Regulatory Applicability**     Regulated Transmission Pipelines  
 Regulated Gathering Pipelines  
 Regulated Distribution Pipelines

**Frequency**                Any time plastic pipe is to be joined

**Reference**                49 CFR 192.281            *Plastic Pipe*  
49 CFR 192.283            *Plastic Pipe: Qualifying Joining Procedures*  
49 CFR 192.285            *Plastic Pipe: Qualifying Persons to Make Joints*  
49 CFR 192.287            *Plastic Pipe: Inspection of Joints*

**Forms / Record Retention**    None

**Related Specifications**        None

<b>OQ Task</b>	<b>Covered</b>	0671	Joining of Plastic Pipe – Solvent Cement
		0681	Joining of Plastic Pipe – Stab Fittings
		0751	Joining of Plastic Pipe - Butt Heat Fusion: Manual
		0761	Joining of Plastic Pipe - Butt Heat Fusion: Hydraulic Machine
		0781	Joining of Plastic Pipe – Electrofusion

(In order to perform the tasks listed above, personnel must be qualified in accordance with West Texas Gas's Operator Qualification program)



**Procedure Steps**

Design Specifications:

1. Only new polyethylene plastic pipe will be used in West Texas Gas’s facilities for New Construction. It must be qualified for natural gas use by the manufacturer accordance with listed specifications, free from visible defects and is, resistant to gas, chemicals, and its environment.
2. The pipe must be manufactured and marked to the standard in accordance to ASTM D 2513 and marked every two feet and legible at time of installation to indicate the following:
  - a. Size
  - b. Material
  - c. Manufacturer
  - d. Pressure Rating
  - e. Temperature Rating
  - f. Type, grade, or model.
3. The design pressure may not exceed 100 psig for plastic pipe used in distribution systems and at class 3 and 4 locations.
4. Plastic pipe may not be used where operating temperatures are below -20 degrees F or above 100 degrees F.
5. The wall thickness for thermoplastic pipe may not be less than 0.062 inches. For reinforced thermosetting plastic pipe, the minimum wall thickness must meet the following table.

Nominal Size	Wall Thickness
2”	0.060”
3”	0.060”
4”	0.070”
6”	0.100”

6. Design pressure for thermoplastic, fittings must conform to ASTM D 2513.

When joining plastic pipe with a solvent cement, adhesive, or heat fusion, do not disturb the joint until it has properly set. Threaded or miter joints are not to be used on plastic pipe. Used plastic pipe should not be utilized for gas handling processes.

Types of Joints:

1. Solvent Cement Joints



2. Heat-fusion Joints
3. Mechanical Joints:

Qualifying Joining Procedures

1. Plastic pipe will not be joined by a threaded joint or by a miter joint.
2. A plastic pipe joint that is joined by solvent cement, adhesive or heat fusion may not be disturbed until it has properly set.
3. Prior to using tools/equipment used in joining plastic pipe, the operator must ensure the tool is within calibration dates and being used within the manufacturer's recommended practice.
4. All joints must be made following written procedures that have been proven by testing per the following testing requirements to produce strong gastight joints. These procedures must be qualified according to the following:

a) Heat fusion and solvent cement:

Before a procedure that has been written can be used to make these joints, it must be qualified by subjecting a specimen joint made using the procedure to the following tests:

- i. Burst test requirements of –
    - Paragraph 6.6, or 6.7 of ASTM D2513 (thermoplastic pipe). WTG will not install thermosetting plastic pipe.
    - Paragraph 9.1, 9.2, 9.3, or 9.4 of ASTM Designation F1055 (electrofusion fittings for polyethylene pipe and tubing)
  - ii. If the procedure is intended for lateral pipe connections, a specimen joint made from pipe sections joined at right angles according to the procedure will be subjected to a force on the lateral pipe until failure occurs in the specimen. Failure must initiate outside the joint area for the procedure to qualify.
  - iii. If the procedure is intended for non-lateral pipe connections, follow the tensile test requirements of ASTM D638, except that the test may be conducted at ambient temperature and humidity. If the specimen elongates no less than 25% or failure initiates outside of the joint area, the procedure may be used.
- b) Mechanical joints - Before a procedure that has been written can be used to make mechanical plastic pipe joints that are designed to withstand tensile forces, the procedure must be qualified by subjecting 5 specimen joints made according to the procedure to the following tensile test:
- i) The apparatus for the test must be specified in ASTM D638 (except for conditioning).
  - ii) Ensure that the specimen is long enough that the distance between the grips or the apparatus and the end of the stiffener does not affect the joint strength.
  - iii) Test at a speed of 0.20 inches per minute, plus or minus 25%.
  - iv) Specimens less than 4 inches in diameter are qualified if the pipe yields to an elongation of no less than 25% or failure initiates outside of the joint area.



- v) Pipe specimens 4 inches in diameter and larger shall be pulled until the pipe is subjected to a tensile stress equal to or greater than the maximum thermal stress that would be produced by a temperature change of 100 degrees F or until the pipe is pulled from the fitting. If the pipe pulls from the fitting, the lowest value of the five test results or the manufacturer's rating, whichever is lower must be used in the design calculations for stress.
- vi) Each specimen that fails at the grips must be retested using new pipe.
- vii) Results obtained pertain only to the specific outside diameter, and material of the pipe tested, except that testing of a heavier wall pipe may be used to qualify pipe of the same material with a lesser wall thickness.
- c) A copy of each written procedure used for joining pipes must be available to the individuals making and inspecting the joints.
- d) WTG will not install pipe or fittings manufactured prior to July 1, 1980.

*Qualifying Individuals to Make Joints*

All individuals making plastic pipe joints must be qualified under the applicable procedures by appropriate training or experience in the use of the procedure and by making a specimen joint from pipe sections joined according to the procedures that passed inspection as described below:

1. The joint must be visually examined during and after assembly and found to have the same appearance as a joint or photographs of a joint that is acceptable under the procedure; and
2. In the case of heat fusion, solvent, cement or adhesive joints:
  - a) Tested under any of the test methods listed above applicable to the type of joint and material being tested; or
  - b) Cut into at least 3 longitudinal straps, each of which is:
    - i) Visually examined by the District Manager and found not to contain voids or discontinuities on the cut surfaces of the joint area; and
    - ii) Deformed by bending 180 degrees, and if failure occurs, it must not initiate in the joint area
3. All personnel qualification records must be maintained for a minimum of five years following construction.

NOTE: A person must be re-qualified under an applicable procedure once each calendar year at intervals not exceeding 15 months, or after any production joint is found unacceptable by testing under §192.513.

*Qualification of Plastic Pipe Joiners*

The District/Division Manager shall assure that all employees joining pipe have been qualified in accordance with procedures published by Energy Worldnet (EWN) The District Manager and local supervision will ensure all persons joining pipe will be qualified according to these procedures, and a record of qualified persons kept on file. Butt fusion joints will be visually inspected and tested in



accordance to ASTM F 2620 or an alternative written plan approved by WTG Vice-President of Operations.

Joining Plastic Pipe

Note: All materials and joints must comply with ASTM D 2513 requirements.

Each solvent cement joint on plastic pipe must comply with the following:

1. The mating surfaces of the joint must be clean, dry, and free of materials, which might be detrimental to the joint.
2. Use only primer with ASTM F 656 designation and solvent cement with ASTM D 2564 designation.
3. Use only PVC fittings marked ASTM D 2466 or ASTM D 2513.
4. Use only PVC pipe marked ASTM D 2513.
5. The joint may not be heated to accelerate the setting of the cement.

Each heat-fusion joint on plastic pipe must comply with the following:

1. Each heat fusion tool must be maintained and calibrated in accordance with the manufacturer's recommended practices.
2. A butt heat-fusion must be joined by a device that holds the heater element square to the ends of the piping, compresses the heated ends together, and holds the pipe in proper alignment while the plastic hardens.
3. Heat may not be applied with a torch or open flame.

Solvent Cement Joints

1. Solvent Cement for PVC pipe and fittings
  - a) Primer
    - i. Primer is a special cleaner that will cut through and clean the dense surface of PVC pipe. Primer must be applied liberally and with a scrubbing motion.
  - b) Solvent Cement
    - i. Solvent Cement must be free flowing, contain no lumps, dissolved particles or any foreign matter that would affect the joint strength.
    - ii. Solvent Cement must not show gelatin, stratification, or
    - iii. Separation that cannot be removed by stirring. Keep container closed when not in use.
2. Safe Handling of Primer and Solvent Cement
  - a) Liquid solvent and their vapors contained in plastic pipe cement and primers are highly flammable. The solvents if improperly handled can cause personal injury. Follow these precautions when using primer and solvent cement.
    - i. Avoid prolonged breathing of solvent vapors when in closed areas.
    - ii. Keep solvent primers and solvent cement away from all sources of heat, sparks and open flame.

- iii. Container should be tightly closed except when the contents are being used.
- iv. Use eye protection when using these liquids. In case of eye contact flush with plenty of water for 15 minutes and seek medical attention.
- v. Wear protective gloves to protect hands when applying cement or primer.
- vi. Use soap and water to wash skin in case of contamination.

### 3. Joining Procedures

- a) Pipe ends to be joined must be cut square. Use a fine tooth saw and a miter box if necessary.
- b) Chamfer and deburr the cut ends. Failure to chamfer (bevel edge) the ends of the pipe will result in the softened plastic being deformed as the pipe is inserted into the socket. This results in a leaking joint.
- c) All surfaces to be joined must be clean and free of moisture. Use clean dry cloth to clean and dry mating surfaces.
- d) Measure and mark the socket depth of the fitting on the outside of the pipe. Use a soft point marker so as not to scratch the pipe surface.
- e) Apply primer and cements with a natural bristle brush. Use a ½" brush for small pipe. For pipe sizes larger than 2" use a brush width that is equal to ½ the pipe diameter. Keep the brush immersed in the primer or cement between applications. Keep cement container tightly closed when not being used. Discard the cement at the first sign of gelling.
- f) PVC solvent cement is fast drying and must be applied as quickly as possible. It may be necessary for two employees to perform this operation on larger diameter pipe, or when the temperature of the fittings and pipe is at or above 100 degrees F.
- g) Use a scrubbing motion to apply primer to inside of the socket surface to ensure penetration. Repeat application may be necessary to soften the surfaces to be joined. Next, soften the surface of the pipe end up to the previously marked socket depth. Do not soften any pipe surface that will not be covered by the socket. Apply solvent cement to the pipe end and a light coat of cement to the inside surface of the socket. Avoid excess cement in the socket. Time is important at this stage of the joining process. Apply a second coat of cement to the pipe end.
- h) Assembly of joint – Immediately after applying the last coat of cement to pipe insert the pipe into the socket. Turn the pipe ¼ turn during assembly (but not after the pipe is fully bottomed) to distribute the cement evenly. Insert pipe with a steady even motion.
- i) Assembly must be completed within 20 seconds after the last application of cement. On larger size pipe two employees or mechanical forcing equipment may be needed to hold the pipe in place for one minute after assembly. Do not disturb or apply any force to joints. The joint can be destroyed by early rough handling.
- j) After assembly – Wipe excess cement from the pipe at the end of the socket fitting. A properly made joint will show a bead of cement around its entire perimeter. Any gaps indicate a defective joint that must be cut out and replaced.
- k) Cure Time - Handle assembled joints carefully until the cement has completed the cure period. See the following table for cure times.
  - 1. 30 minutes minimum at 60 to 100 degree F
  - 2. 1 hour min. at 40 to 60 degree F
  - 3. 2 hour min. at 20 to 40 degree F



4. 4 hour min. at 0 to 20 degree F
4. Testing PVC Joints
  - a) Pressure test on PVC piping and jointing will be conducted the same as testing procedures of plastic as outline in P-192.501.
5. Other Requirements
  - a) Tracer wires, tapes, or cable present on the system for locating purposes must be repaired if damaged after completion of all joining and before backfilling.

#### Heat Fusion – Butt Joints

##### *General*

This procedure has been qualified according to procedures published by the pipe manufacturer and as outlined in the Minimal Federal Safety standards for Pipelines Transporting Natural Gas.

##### *Application*

This procedure can be used for all systems and class locations that operate less than 100 psi.

##### *Procedures*

1. Process: Heat Fusion
2. Material: Polyethylene
3. Diameter: ¾" thru 6"
4. Joint Type: Butt Fusion
5. Joining:
  - i. Proper precautions need to be taken in a gaseous atmosphere to prevent an accidental ignition.
  - ii. Clean each pipe with clean cloth. Do not use synthetic or treated cloths.
  - iii. Square each end of pipe to be fused.
  - iv. Check line-up of pipe ends. Adjust for high or low.
  - v. Check heater temperature – should be 400-450 degrees F.
  - vi. Insert heater plate between pipe ends and bring ends firmly into contact with plate, but do not apply pressure, achieve a melt bead of 1/16" to 1/8" depending on pipe size.
  - vii. Remove heater plate and bring melted ends together. Apply only enough pressure to obtain a double roll back bead.
  - viii. Allow the joint to cool at least 30 seconds before removing pressure

#### Heat Fusion – Electrofusion

*All electrofusion joining processes will be made using the equipment and techniques that are recommended by the fittings manufacturer.*



*Repair of Plastic Pipe*

Each imperfection or damage, such as crushes, gouges or grooves that would impair the serviceability of plastic pipe must be repaired by patching saddle or removed.

*Inspection of Joints*

All individuals inspecting joints must be qualified by appropriate training or experience in evaluating the acceptability of plastic pipe joints made under the applicable joining procedure and approved by the District Manager after proper training on visual examination of joints.