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Standard Specification for Tools to Squeeze-off Polyethylene (PE) Gas Pipe or Tubing[1]

This standard is issued under the fixed designation F1563; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers the physical requirements for tools used to squeeze-off polyethylene (PE) pipe and tubing. It is limited to squeeze-off procedures set forth by the pipe manufacturer as referred to in Specification D2513 for gas pressure pipe systems.

1.2 Nothing in this specification shall be construed as recommending practices or systems at variances with governing codes and project specifications.

1.3 Where applicable in this specification, "pipe" shall mean "pipe and tubing," and "tool" shall mean "squeeze-off tool."

1.4 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.5 The following safety hazards caveat pertains only to the test methods portions, Section 5 and Appendix X1 of this specification: *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D638 Test Method for Tensile Properties of Plastics

D1598 Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure

D1600 Terminology for Abbreviated Terms Relating to Plastics

D2513 Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings

F412 Terminology Relating to Plastic Piping Systems

F1041 Guide for Squeeze-Off of Polyolefin Gas Pressure Pipe and Tubing

3. Terminology

3.1 *General*—Definitions are in accordance with Terminology F412, unless otherwise specified. Abbreviations are in accordance with Terminology D1600, unless otherwise specified.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *squeeze-off*—a technique used to control the flow of gas through a pipe by the compressing action of a mechanical, hydraulic or pneumatic device. Squeeze-off may be used, as recommended by the tool or pipe manufacturer, to reduce the flow of gas to an acceptable rate. Under certain conditions complete stoppage of flow may be obtained.

4. Materials and Manufacture

4.1 Tools shall be manufactured from materials that have the structural properties to meet the requirements of this specification.

5. Other Requirements

5.1 *Force Mechanism*—The force mechanism (mechanical, hydraulic or pneumatic) shall provide a force of at least 1.25 times the force required to squeeze-off the most rigid pipe size within the squeeze parameters recommended by the manufacturer of the tool. The most rigid pipe is a function of pipe diameter, wall thickness, pipe material and temperature. The tool manufacturer determines which pipe products his tool is suitable for. Power tools such as impact wrenches or pneumatic motored torque multipliers shall not be used.

5.2 *Tool Strength*—A tool shall not be structurally damaged or functionally affected when tested as follows:

5.2.1 Measure the load (*P*) required to squeeze-off the most rigid pipe (largest size, thickest wall, highest density, lowest temperature) within the range of the tool.

5.2.2 Prepare a pipe specimen from this pipe. The specimen length shall be no less than five times the nominal outside diameter of the pipe, but in no case less than 12 in. (305 mm).

5.2.3 Insert the pipe specimen into the tool. Center the specimen in the tool.

5.2.4 Apply the largest load attainable by the force mechanism (without additional mechanical advantage) onto the

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

mechanical stops and then inspect. Any permanent damage or deformation to the mechanical or hydraulic components is cause for rejection of the tool.

5.2.5 Apply a load of 1.25 × *P* (see 5.2.1) on the pipe for twenty cycles. A cycle is: apply load, hold load for one minute, remove load. For each cycle, use a new unsqueezed area of pipe, at least three pipe diameters from a previous squeeze.

5.3 *Release Protection*—Each tool shall be built to prevent unintentional release in the squeeze mode. A screw-feed mechanism used to apply force in some tools qualifies as premature release protection if the force can only be removed by unscrewing the mechanism at the 1.25 × *P* test load.

5.4 *Release Rate*—For pipe sizes greater than 1 in. (25 mm) IPS, it is recommended[3] the tool design provide a release rate of 0.5 in./min (12.7 mm/min) or less, as suggested in Guide F1041.

5.5 *Flow Control*—Squeeze-off results in the reduction of gas flow and in some cases the complete stoppage of gas flow. This specification does not specify to what degree of gas flow control is required for any set of squeeze-off conditions. Appendix X1 provides a procedure for evaluating flow control. Other procedures for flow control evaluation may also be used.

5.6 *Grounding*—Squeezing and releasing the squeeze of plastic pipe containing flowing gas can increase the presence of static electricity on the pipe surfaces. The tool shall include a suitable electrical grounding feature or recommendations for controlling electrostatic discharges.

NOTE 1—Static discharge through pipe wall may occur in some cases if electrostatic charges exceed the dielectric strength. Some tool manufacturers recommend checking the squeeze area for pinhole leaks by soaping.

6. Dimensions Mass, and Permissible Variations

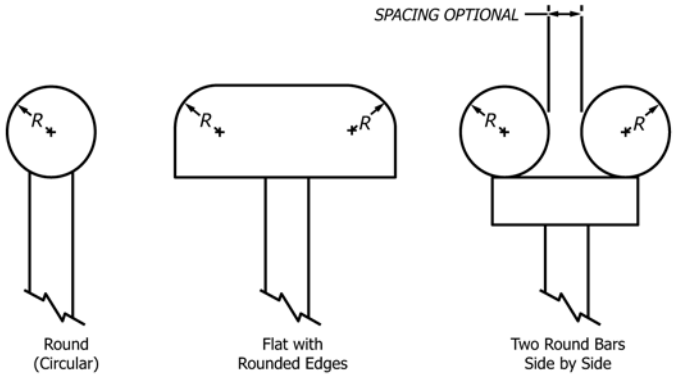
6.1 *Squeeze Bar Configuration*—The squeeze bars shall be of a size and configuration that compresses the pipe walls to reduce the gas flow, but does not damage the pipe. Squeeze bars may be configured as round (circular), flat with rounded edges, two round bars side by side or any other configuration that can meet the requirements of this specification (see Fig. 1). For suggested[3] minimum squeeze bar radii areas, see Table 1.

6.2 *Over-Squeeze Protection*—The tool shall have mechanical stops to provide over-squeeze protection. These mechanical stops shall prevent the squeeze bars from reaching a separation (minimum gap) less than 70 % times twice the maximum pipe wall thickness as noted in Guide F1041:

$$minimum\ gap = (2)(0.7)(\ maximum\ wall\ thickness)$$

Squeeze tools designed for more than one size pipe (outside diameter and wall thickness) shall have adjustable stops provided to match the designated pipe sizes for that tool.

6.3 *Squeeze Bar Guide Spacing*—The tool shall have sufficient squeeze bar length and spacing between the bar guides to allow the maximum diameter pipe for that tool to be centered between the guides and squeezed to the correct bar stops without the squeezed pipe touching the guides.



NOTE 1— Other bar shapes may also be acceptable (see 6.1).

FIG. 1 Squeeze Bar Configurations

TABLE 1 Minimum Squeeze Bar Radii[A]

Nominal Pipe Size in.	Round Bar Minimum Radius (*R* in Fig. 1) in. (mm)	Flat Bar[B] Minimum Radius (*R* in Fig. 1) in. (mm)
¼ to ¾	0.50 (12)	0.25 (6.4)
1 to 1¾	0.62 (16)	0.31 (7.9)
3 to 4	0.75 (19)	0.38 (9.7)
6 to 8	1.00 (25)	0.50 (13)
10 to 12	1.00 (25)	0.50 (13)
14 to 16	1.25 (32)	0.62 (16)

[A] The suggested radii do not necessarily provide the strength required to comply with Section 5. Squeeze bar materials and tool applications may require radii greater than the minimums listed.
[B] Minimum length of flat area is two times *R*.

7. Workmanship, Finish, and Appearance

7.1 The manufacture of these tools shall be in accordance with good commercial practice to consistently produce tools that meet the requirements of this specification.

8. Sampling

8.1 Use a separate sampling procedure for each different style or size of tool. Select tools at random for testing. The pipe used to evaluate each tool shall be the same as pipe specified in 5.2.

9. Inspection

9.1 A quality control (QC) inspection method shall be established that will ensure conformance to this specification. Deviations shall be agreed upon between the purchaser and the supplier as part of the purchase contract.

10. Product Marking

10.1 Tools shall be permanently marked on a portion of the tool which will not interfere with its use or performance. Each tool shall be permanently marked with the following:

10.1.1 Nominal size of pipe or pipes for which the tool is designed, including IPS or CTS designation, and SDR or wall thickness, or both,

10.1.2 Manufacturer's name or trademark,

10.1.3 ASTM designation number, and

[3] GRI-92/0147.2 Volume 2, *Technical Reference on Squeeze-Off of Polyethylene Gas Pipes*. Available from the Gas Technology Institute (GTI), 1510 Hubbard Dr., Batavia, IL 60510.

10.1.4 Maximum hydraulic, pneumatic pressure allowed, if applicable.

11. Packaging and Package Marking

11.1 The tool shall be packaged in accordance with the supplier's standard practice in a manner ensuring arrival at destination in satisfactory operating condition.

11.2 Tool packages shall be labeled with the same information as in Section 10.

12. Keywords

12.1 flow control; squeeze-off; squeeze tools

APPENDIX

(Nonmandatory Information)

X1. PROCEDURE FOR EVALUATION OF TOOL FLOW CONTROL PERFORMANCE

X1.1 Gas Flow Rate:

X1.1.1 The gas flow rate through the squeeze-off area of the pipe specimen can be determined when tested as follows:

X1.1.1.1 Prepare three randomly selected pipe specimens in accordance with Test Method D1598 except they will be unfilled.

X1.1.1.2 Test the specimens in sequence using the tool being tested.

X1.1.1.3 Set the test specimen in the test apparatus as shown in Fig. X1.1. Locate the tool at the mid-point of the specimen. Close the squeeze bars to the recommended mechanical stops. Wait at least 1 min per inch diameter of the specimen. Adjust the pressure regulator to give an upstream pressure equal to the maximum line pressure that the tool is designed to squeeze-off, or to be the maximum pressure that the test pipe is rated for, whichever is less. Test pressures less than the maximum designed for may be used to establish specific gas flow control rate information as required by the gas pressure pipe system owner, the pipe manufacturer, and the tool manufacturer. Place the rubber hose inside the inverted

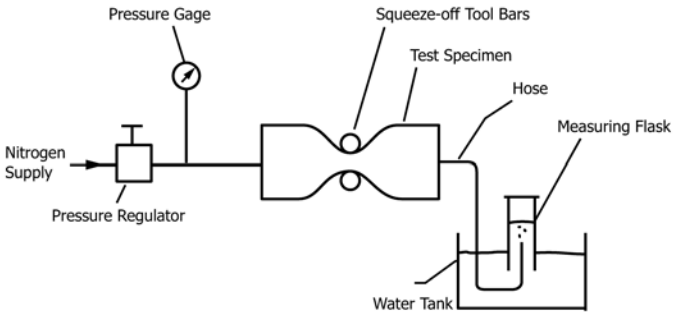


FIG. X1.1 Gas Flow Rate Apparatus

measuring flask and note the time in seconds to displace 60 $in.^3$ (0.001 m^3) of water. Calculate the gas flow rate. The gas flow rate can be calculated as follows:

$$Q = 125/t$$

where:

Q = gas flow rate in cubic feet (meters) per hour, and
t = time in seconds to displace 60 $in.^3$ (0.001 m^3) of water.