



Designation: F3535 – 21

Standard Practice for Field Leak Testing of Polyamide-12 (PA12) Pressure Piping Systems Using Gaseous Testing Media Under Pressure (Pneumatic Leak Testing)¹

This standard is issued under the fixed designation F3535; 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 practice provides information on apparatus, safety, pre-test preparation, and procedures for conducting field tests of polyamide-12 (PA12) pressure piping systems after installation using gaseous testing media such as un-odorized inert non-toxic gas or air, and applying pressure to determine if leaks exist in the system (pneumatic leak testing). This practice applies only to testing to discover leakage. Testing for other purposes such as testing to establish operating pressure is beyond the scope of this practice.

1.2 Leak testing with pressurized gaseous testing media shall be used only if one or both of the following conditions exists:

1.2.1 The piping system is so designed that it cannot be filled with a liquid, or

1.2.2 The piping system service cannot tolerate traces of liquid testing media.

1.3 Where hydrostatic testing is specified in contract documents or by the authority having jurisdiction, testing using pressurized gaseous testing media (pneumatic) testing shall not be substituted without the express consent and authorization of the authority having jurisdiction.

1.4 Some manufacturers prohibit or restrict testing of their products with pressurized gaseous testing media. Contact component manufacturers for information. Where the manufacturer of a test section component prohibits or restricts testing with pressurized gaseous testing media testing in accordance with this practice shall not be used without the express consent and authorization of the authority having jurisdiction and the component manufacturer.

NOTE 1—Components that are not suitable for testing with gaseous testing media may not be suitable for service with pressurized gas.

¹ This practice is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.40 on Test Methods.

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1.5 This practice does not address leak testing using pressurized liquids (hydrostatic testing). For field leak testing using pressurized liquids, consult the manufacturer for guidance.

1.6 This practice does not apply to leak testing of non-pressure, negative pressure (vacuum), or non-PA12 (polyamide-12) piping systems.

1.7 This practice does not apply to fuel gas piping systems that extend from the point of delivery to the appliance connections. For other than undiluted liquefied petroleum gas (LP-Gas) systems, the point of delivery shall be considered to be the outlet of the service meter assembly or the outlet of the service regulator or service shutoff valve where no meter is provided. For undiluted LP-Gas, the point of delivery shall be considered to be the outlet of the final pressure regulator, exclusive of line gas regulators, in the system. This practice does not apply to LP-Gas systems covered under NFPA 58.

1.8 This practice is intended for use with PA12 pressure piping that conveys gaseous media under pressure (compressed gas) if the owner or operator or installer of the line does not have an established leak testing procedure that is acceptable to the authority having jurisdiction.

1.9 **Warning**—Failure during a pressurized gaseous testing media leak test can be extremely violent and dangerous because energy that is applied to compress the gaseous testing media and to pressurize the system will both be suddenly released.

NOTE 2—To illustrate the violent hazard of failure, assume a 5 HP compressor is used to raise the test section to test pressure and that it takes 1 h to achieve test pressure. If sudden rupture occurs, energy release may occur in 2 s. Therefore, the horsepower of the energy release would be $5 \text{ HP} \times 1 \text{ h} \times 3600 \text{ s/h} / 2 \text{ s} = 9000 \text{ HP}$. Further, if diameter is doubled, energy release is four times greater. For an example test section that is twice the diameter, energy release would be 36 000 HP.

1.10 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. Numbered

notes and information in parentheses in the text of the practice are non-mandatory information. Table notes are mandatory information.

1.11 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.12 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

D1600 Terminology for Abbreviated Terms Relating to Plastics

F412 Terminology Relating to Plastic Piping Systems

2.2 PPI Standard:³

PPI TR-4 PPI HSB Listing of Hydrostatic Design Basis (HDB), Hydrostatic Design Stress (HDS), Strength Design Basis (SDB), Pressure Design Basis (PDB), Minimum Required Strength (MRS) Ratings and Categorized Required Strength (CRS) For Thermoplastic Piping Materials or Pipe

2.3 NFPA Standard:⁴

NFPA 58 Liquefied Petroleum Gas Code

3. Terminology

3.1 Abbreviations and terms are in accordance with Terminology **D1600** and Terminology **F412** unless otherwise indicated.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *authority having jurisdiction, n*—the organization, office or individual responsible for “approving” equipment and installation, or a procedure.

3.2.1.1 *Discussion*—The term “authority having jurisdiction” is used in this practice in a broad manner since jurisdictions and “approval” agencies vary, as do their responsibilities. Where public safety is concerned, the “authority having jurisdiction” may be a federal, state, local or other regional department or individual such as a fire chief, fire marshal, chief of a fire prevention bureau, labor department, building official, or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau or other insurance company representative may be the “authority having jurisdiction”. In many circumstances, the property owner or his authorized engineer or agent assumes the role of

the “authority having jurisdiction”; at government installations, the commanding officer or departmental official may be the “authority having jurisdiction.”

3.2.2 *approve, v*—(approved, approving, approval) acceptable to or authorized by the authority having jurisdiction.

3.2.3 *authorized persons, n*—persons that are fully informed of the testing procedure and hazards of field pressure testing, and that are qualified to operate the onsite testing equipment, and that are qualified to perform onsite leak detection.

3.2.3.1 *Discussion*—Authorized persons may be agents or representatives or inspectors for the authority having jurisdiction, or may be employees of the party conducting the test. Contract documents may identify responsibilities, but regardless of assigned responsibilities, only authorized persons shall be allowed in proximity of test sections when testing (in accordance with Section 9) is underway.

3.2.4 *gaseous testing media, n*—a non-toxic, non-flammable fluid that is chemically compatible with piping system components, and at testing temperature and pressure exists in a non-solid, non-liquid state.

3.2.5 *pressure piping system, n*—a piping system where all components in the system are pressure rated and intended for conveying a fluid under continuous internal pressure. (See also Terminology **F412**, pressure pipe, and non-pressure pipe.) To verify suitability for pressure service, consult the component manufacturer.

3.2.5.1 *Discussion*—PPI TR-4 provides information about stress ratings for some plastic piping compounds, materials, and products.

3.2.6 *restraint, n*—temporary or permanent structural measures or devices that restrict, guide, prevent, or safely limit disjoining and movement of the piping system and piping components while the system is under pressure during testing or service conditions. Restraint may include backfill, anchors, thrust blocks, external clamps and tie rods (joint restraints), pipe guides, etc.

3.2.6.1 *Discussion*—Restraint means that if violent separation or failure occurs during pressurization or testing, any movement of components or parts is sufficiently constrained or prevented such that damage or injury is prevented.

3.2.7 *system design pressure, n*—the limiting continuous internal pressure specified by the piping system designer. System design pressure may be less than the pressure ratings of components in the system. System design pressure may be limited by component pressure ratings, by code or application requirements, or by other restrictions.

3.2.8 *visible leakage, n*—the visible escape (bubbles, drip, spray, stream, flow, etc.) of test media from the test section through components, joints, connections, appurtenances and the like in the test section. Visibility of gaseous media leakage is enhanced by the application of leak detection fluid at joints, seals or seams where leakage is likely.

4. Summary of Practice

4.1 The section of the piping system to be tested shall be isolated from other parts of the system, and shall be restrained as described in 3.2.6. Components that are not to be subjected

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.

³ Available from Plastics Pipe Institute (PPI), 105 Decker Court, Suite 825, Irving, TX 75062, <http://www.plasticpipe.org>.

⁴ Available from National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02169-7471, <http://www.nfpa.org>.