Designation: C 600 – 85 (Reapproved 2000)

Standard Method of Thermal Shock Test on Glass Pipe[1]

This standard is issued under the fixed designation C 600; 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 Since thermal shock resistance is so closely related to the linear coefficient of expansion, this method for the determination of the thermal shock resistance of glass process pipe is primarily intended to supplement test results on the linear coefficient of expansion, Test Method E 228. This thermal shock test will not ordinarily be performed except in those cases where the thermal shock resistance may be questioned.

1.2 This method covers only two of four thermal shock possible approaches, namely independent downshock of outside and inside pipe surfaces. Downshock is more severe since a higher tensile stress is produced and, hence, more likely to produce failure.

1.3 *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:*

E 228 Test Method for Linear Thermal Expansion of Solid Materials with a Vitreous Silica Dilatometer[2]

3. Significance and Use

3.1 This method provides a practical means of assessing glass pipe strength under short-duration, thermally-imposed tensile stresses. In addition to a principal role played by the linear coefficient of thermal expansion, glass surface defects can also be major factors in reducing downshock performance.

4. Apparatus

4.1 *Oven*, equipped with a device to maintain the temperature with ±5°F (±3°C) of the specified temperature. An indicating controller is recommended. Otherwise, a dial thermometer should be attached and the temperature controlled manually.

4.2 *Water Tank*, at least 18 in. (457 mm) deep with a width and length sufficient to accommodate the samples to be tested.

TABLE 1 Oven Temperature Setting

Nominal Pipe Size, in.	T_{oven}	
	°F	°C
¼	282	140
⅜	282	140
½	282	140
¾	282	140
1	282	140
1½	282	140
2	282	140
3	282	140
4	251	122
6	232	111

The tank shall be filled with ice water to a depth of at least 12 in. (305 mm). The water temperature shall be maintained at 34 ± 2°F (1 ± 1°C).

4.3 *Timer*, capable of measuring seconds.

5. Sampling

5.1 A random sampling of 1 % (but not less than two pieces) of pipe and fittings shall be made.

6. Procedure

6.1 Set the oven at the proper temperature, in degrees Fahrenheit, determined as follows:

$$T_{oven} = 32 + 1.25\ (' \Delta T_{recommended}) \quad (1)$$

6.2 *Thermal Shock Test—Outside Surface*—Close off all open ends of sample; use glass pipe caps or flat metal plates, plus the necessary flanges, gaskets, inserts, nuts, and bolts. Keep the closed sample in the oven, at temperature, for at least 30 min. Completely submerge the sample in the tank of ice water for 30 s. Keep the time elapsed between removing the sample from the oven and submerging it in ice water not less than 15 s, nor more than 45 s. Inspect each sample for indications of failure.

6.3 *Thermal Shock Test—Inside Surface*—Close off all open ends of sample except one; use glass pipe caps or flat metal plates, plus the necessary flanges, gaskets, inserts, nuts, and bolts. Keep the partially closed sample in the oven, at temperature, for at least 30 min. Remove the sample from the oven, placing the one open end up. Pour ice water into the open end of the sample to overflowing. Keep the time elapsed between the removal of the sample from the oven and the beginning of the time to pour the water to no less than 15 s and no more than 45 s. Pour water into the sample at a rate such that the sample shall be filled within 1 min from the start of the pouring.

[1] This method is under the jurisdiction of ASTM Committee C-14 on Glass and Glass Products and is the direct responsibility of Subcommittee C14.05 on Glass Pipe.

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[2] *Annual Book of ASTM Standards*, Vol 14.02.

NOTE 1—For tests in 6.1 through 6.3 the same sample(s) may be used for inside and outside surfaces (unless the sample fails one of the two tests).

7. Report

7.1 Report the following:
7.1.1 Sampling percentage,
7.1.2 Number, size, and description of each sample tested,
7.1.3 Time of transfer used,
7.1.4 Temperature differential used, and
7.1.5 Results of test:
7.1.5.1 For the outside surface thermal shock test, number of samples that failed, and
7.1.5.2 For the inside surface thermal shock test, number of samples that failed.

8. Precision and Bias

8.1 Due to the fail-pass nature of the test, statements on precision and bias are not applicable.

9. Keywords

9.1 glass; pipe; thermal shock