TEST REPORT

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Report Number: 918-10033 **Project No.:** 17645

Report Issued: June 15, 2010

Client: Speakman Company
P.O. Box 191
Wilmington, DE 19899 **Contact:** Chris Miedzius

Source of Samples: The samples were sent by Speakman Company and received by IAPMO R&T Lab in good condition on May 4, 2010.

Date of Testing: May 20, 2010 through June 14, 2010.

Sample Description: Concealed, wall-mounted thermostatic/ pressure balancing valve.

Models No.: G20-2031

Scope of Testing: The purpose of the testing was to determine if the sample tested of thermostatic/pressure balancing valve met the applicable requirements of ASME A112.18.1-2005/CSA B125.1-05, entitled "Plumbing Fixture Fittings" and ASSE 1016-2005, entitled "Automatic Compensating Valves for Individual Showers and Tub / Shower Combinations".

Conclusion: The sample tested of the thermostatic/ pressure balancing valve, model G20-2031 from Speakman Company COMPLIED with applicable requirements of ASME A112.18.1-2005/CSA B125.1-05, and COMPLIED with the applicable requirements of ASSE 1016-2005.

Pending: sections 4.9.2, 6,

By our signatures below, we certify that all the testing and sample preparation for this report was performed under continuous, direct supervision of IAPMO R&T Lab, unless otherwise noted.

Tested by,

Hanks Ninh

Hanks Ninh, Project Engineer

Reviewed by,

Sean Vuu

Sean Vuu, P.E., Manager, Specialty Projects

Primary Standard: ASME A112.18.1-2005/CSA B125.1-05 Clauses tested / evaluated:

4.1	Supply Fittings	4.2	Servicing
4.3	Installation	4.5	Connections other than threaded
4.8	Cover Plates	4.9	Toxicity
4.12	Cross-flow		
4.15	Automatic Compensating Valve	5.2	Coatings
5.3	Pressure and Temperature	5.4	Flow Rate
5.5	Operating Requirements	5.6	Life Cycle
5.8	Resistance to Use Loading		
6.0	Markings		

ASSE 1016-2005 Sections tested / evaluated:

1.1	Application	1.2	Scope
2.1	Samples Submitted	2.2	Samples Tested
2.3	Drawings	3.1	High Temperature Test
3.2	Working Pressure Test	3.3	Maximum Torque and/or Force Adjustment Test
3.4	Life Cycle Test		
3.5	Pressure and Temperature Variation Test	3.6	Cold Water Supply Failure
		3.7	Outlet Temperature and Flow
3.8	Hydrostatic Pressure Test	4.1	Markings
4.2	Installation and Maintenance Instructions	4.3	Accessibility

Clauses/Sections of ASME A112.18.1-2005 / CSA B125.1-05 and ASSE 1016-2005 not listed above were considered not applicable to subject product.

Test Results: All tests and evaluations were conducted per the written procedures in the specified standards.

ASME A112.18.1-2005/CSA B125.1-05

4.1 Supply Fittings

4.1.1 Rated Pressure – COMPLIED

4.1.1.1 The thermostatic/ pressure balancing valve was designed for a rated pressure of 100 psi.

4.1.1.2 The thermostatic/ pressure balancing valve was designed to function at any pressure between 20 psi and 125 psi.

4.1.2 Rated Temperatures – COMPLIED

The thermostatic/pressure balancing valve was designed for rated supply temperatures from 40°F to 160°F.

4.1.3 Seating Members – COMPLIED

The thermostatic/pressure balancing valve had replaceable seat. The seat disc arrangement was replaceable. The seat disc arrangement did not vibrate in service. The threaded device used to secure the disc remained secure after the disc had been removed and replaced five times.

4.2 Servicing – COMPLIED.

The thermostatic/ pressure balancing valve was designed to such that the replacement of wearing parts can be accomplished without removing the fittings from the supply system, without removing the piping from the body, without disturbing the finished wall, and by using standard tools or manufacturer provided tools.

4.3 Installation – COMPLIED

A method of sealing between the fitting and the fixture to which it is fastened was provided.

4.5 Connections other than Threaded Connection – COMPLIED

The ½" solder-joint sockets complied with ASME B16.18.

4.8 Cover plates and Escutcheons – NOT APPLICABLE

4.8.2 The escutcheon was not provided for evaluation.

4.9 Toxicity

4.9.1 NSF 61-9 – NOT APPLICABLE

NSF 61-9 test was not applicable to tub/shower fittings.

4.9.2 Metal Alloys – PENDING

All metal alloys in contact with potable water contained less than 8% lead as required. The brass valve body contained 1.62% lead and the cap, service stop contained 1.62% lead, heat element contained 0.01% lead, check valve nut contained 1.44% lead, check valve seat contained 1.55% lead, and check valve screw contained 1.53% lead. No solder and flux were used in the fitting.

* Note: pending on Stainless Steel nuts and bolts, and other small parts (springs, valve disc) inside mixing valve.

4.12 Cross-flow – COMPLIED

4.12.2 The check valves installed at the cartridge inlets of the thermostatic/pressure balancing valve used to prevent cross-flow met the requirements specified in Clause 5.3.3.

4.15 Automatic Compensating Valve Temperature Control – COMPLIED

(a) The thermostatic/pressure balancing valve complied with ASSE 1016-2005. Refer to the ASSE 1016 Section of this report for details.
(b) The device was equiped with an adjustable means to limit the setting of the device toward the hot position.
(c) The device was adjustable by the user; and
(d) The device did not have a downstream water-temperature–adjustment device.

5.1 General – FOLLOWED

All applicable tests were conducted in accordance with Table B1.1 of this standard.

5.2 Coatings (for handle only, no cover plate)

5.2.1 General – COMPLIED

The significant surfaces of the plated surfaces were free of blisters, pits, roughness, cracks, and uncoated areas.

5.2.2 Corrosion – COMPLIED

All coatings were subjected to the corrosion test of ASTM B117 for Service Condition 2 for 24 h as specified in Section 5.2.2.2.1. After exposure there was no basis metal corrosion, blistering, cracking, peeling, or discoloration of the coating.

5.2.3 Adhesion – COMPLIED

5.2.3.2 The coatings on metals met the grind-saw test requirements as defined in ASTM B571.

5.3 Pressure and Temperature

5.3.1 Static and Dynamic Seals – COMPLIED

The seals of the thermostatic/pressure balancing valve did not leak or otherwise fail when tested in accordance with Clause 5.10.3.1 of the standard. The test pressure was at 125 psi for 5 minutes each with the seating members opened and outlets closed and with the seating members closed and outlets opened.

5.3.2 Burst Pressure – COMPLIED

The valve withstood a hydrostatic burst pressure of 500 psi for 1 minute without failure when tested in accordance with Clause 5.3.2.2 of the standard.

5.3.3 Cross-flow Check Valves – COMPLIED

The cross-flow check valves did not leak more than 0.01 gpm out of one supply inlet when the opposite supply inlet was pressurized to 5 psi with water at 50 °F for 1 minute with the primary shut-off opened and all outlet blocked. The actual leakage was 0.00 gpm.

5.4 Flow Rate – COMPLIED.

5.4.1 The thermostatic/pressure balancing valve met the flow rate requirements as specified in Table 1 of the standard when tested in accordance with Clause 5.4.2.

Findings: the flow rate at 20 psi was 2.4 gpm from the outlets. The minimum required was 2.4 gpm. The flow rate did not change after the life cycle.

5.5 Operating Requirements – COMPLIED.

5.5.1 The thermostatic/pressure balancing valve was operable with a force and torque not exceeding that in Table 2 of the standard when tested per Clause 5.3.1.4.

Findings: The actual operating torque was 10 lbf-in for the temperature control dial and shut-off valve.

5.6 Life Cycle

5.10.5 Life Cycle Test – COMPLIED

Automatic compensating valve did not leak after the life cycle test specified in Clause 5.10.5.2.

5.8 Resistance to Use Loading

5.8.1 Operating Controls – COMPLIED.

5.8.1.1 The operating control withstood a force of 30 lbf , applied in the manner required to operate the control, three times greater than that specified in Table 2 without failure.

5.8.1.2 The operating control that could be grasped withstood an axial force of 100 lbf without pulling off.

6.0 Markings

6.1 **General – PENDING (The cover plate was not provided)**

The unit should be permanently marked with the manufacturer's name which was visible after installation.

6.2 **Temperature Identification – PENDING**

The unit should have identifiable temperature control settings.

6.3 **Packaging – PENDING**

The packaging should be marked with the manufacturer's name and model number.

6.4 **Instruction for Automatic Compensating Valves – PENDING**

The thermostatic/pressure balance valve should be accompanied with installation instructions, which specified how to adjusted the temperature limit setting.

ASSE 1016-2005

1.1 Application – COMPLIED.

The device was automatic compensating valve intended for use on individual shower or tub/shower combination fixtures in order to reduce the risk of scalding and thermal shock. It was intended to be installed at the point-of-use, where the bather or bather's attendant had access to flow and final temperature control mechanisms, and where no further mixing occurred downstream of the device.

1.2 Scope – COMPLIED

1.2.1 The device was classified as "Type T/P" valve, and met all the applicable requirements of ASME A112.18.1-2005/CSA B125.1-05. It was equipped with an adjustable means to limit the setting of the device toward the hot position and it was intended to be the final temperature control.

1.2.2 The device was designed to function at a maximum pressure of 125.0 psi.

1.2.3 The device was adjustable from full cold up to a minimum of 100.0 °F outlet temperature with hot water inlet temperatures ranging from 120.0 °F to 180.0 °F and cold water inlet temperatures ranging from 39.0 °F to 80.0 °F. The device was capable of limiting the maximum outlet temperature to 120.0 °F when tested in accordance with this standard.

1.2.4 The device was designed to function at a flow of 2.5 gpm.

2.1 Samples Submitted – FOLLOWED.

Three samples of each model and size were submitted by the manufacturer.

2.2 Sample Tested – FOLLOWED.

One sample of each model and size was selected and complete testing was performed in the order listed.

2.3 Drawings – COMPLIED.

Installation instructions and assembly drawings were submitted and reviewed.

3.1 High Temperature Extreme Test – COMPLIED.

The device was installed in accordance with Figure 1, with all shut off valves and the throttle valve in the full open position. The hot water supply was set at 45.0 psi and 175.8 °F and the cold water was set at 45.0 psi and 76.8 °F. The outlet temperature was adjusted to the maximum allowable outlet temperature but not exceed 120 °F. The flow rate was set to 2.5 gpm for 5 min.

Findings: The device did not develop and defects that would prevent full compliance with any remaining requirements in this standard.

3.2 Working Pressure Test – COMPLIED

A hydrostatic pressure of 125.0 psi was applied to the inlets of the device for 5 minutes each with the seating members closed and outlets open to atmosphere, and with the seating members open and outlets blocked.

Findings: There was no indication of leakage of the device.

3.3 Maximum Torque and/or Force Adjustment Test – COMPLIED.

With the device installed in accordance with Figure 1 and tested with the conditions as specified in Section 3.3.2, the maximum torque required to adjust the device did not exceed the limits set forth in ASME A112.18.1-2005 / CSA B125.1-05.

Findings: The maximum adjustment torque measured was 10 lbf-in.

3.4 Life Cycle Test – COMPLIED

With the device installed in accordance with Figure 2 and tested with the conditions as specified in Section 3.4.2, the temperature control mechanism was tested to 20,000 cycles at a constant rate of 5-20 cycles per minute and the automatic temperature compensating element was tested to 80,000 cycles per Table 1.

Findings: After the test, the device did not leak when retested in accordance with Section 3.2 and the adjustment torque did not exceed the requirements in Section 3.3.

3.5 Regulation and Temperature Variation Test – COMPLIED.

3.5.6 a) The valve was tested as described in Section 3.5.2 (Type P) in its entirety.

3.5.2 The Type P device was installed in accordance with Figure 1 of the standard and tested per the procedure outlined in this section.

3.5.2.2 Type P devices

3.5.2.2a) The hot water supply pressure was decreased by 50% and the maximum outlet temperature changes were observed and recorded for 25 seconds.

Findings: The outlet water temperature spike change was +0.6 °F within the first 5 seconds. After the first 5 seconds, the maximum outlet temperature variation was -2.6 °F from the initial set temperature.

3.5.2.2b) The conditions were restored as in Sections 3.5.2.1 (a) through (c) and the hot water supply pressure was increased by 50% and the maximum outlet temperature changes were observed and recorded for 25 seconds.

Findings: The outlet water temperature spike change was -1.1 °F within the first 5 seconds. After the first 5 seconds, the maximum outlet temperature variation was -0.7 °F from the initial set temperature.

3.5.2.2c) The conditions were restored as in Sections 3.5.2.1 (a) through (c) and the cold water supply pressure was decreased by 50% and the maximum outlet temperature changes were observed and recorded for 25 seconds.

Findings: The outlet water temperature spike change was – 1.3 °F within the first 5 seconds. After the first 5 seconds, the maximum outlet temperature variation was –0.9°F from the initial set temperature.

3.5.2.2d) The conditions were restored as in Sections 3.5.2.1 (a) through (c) and the cold water supply pressure increased by 50% and the maximum outlet temperature changes were observed and recorded for 25 seconds.

Findings: The outlet water temperature spike was +1.1 °F within the first 5 seconds. After the first 5 seconds, the maximum outlet temperature variation was +0.2 °F from the initial set temperature.

3.5.6 b) The valve was tested as describe in Section 3.5.4 (Type T) in its entirety.

3.5.4 The Type T device was installed in accordance with Figure 1 of the standard and tested per the procedure outlined in Section 3.5.4.2.

3.5.4.2 Type T Devices

3.5.4.2(a) The hot water supply pressure was decreased by 20 percent and the maximum outlet temperature changes were observed and recorded for 25 seconds.

Findings: The outlet water temperature spike change was –0.6 °F within the first 5 seconds. After the first 5 seconds, the maximum outlet temperature change was –1.5 °F from the initial set temperature.

3.5.4.2(b) The conditions were restored as in Sections 3.5.4.1 (a) through (c). The hot water supply pressure was increased by 20 percent and the maximum outlet temperature changes were observed and recorded for 25 seconds.

Findings: The outlet water temperature spike change was -0.6 °F within the first 5 seconds. After the first 5 seconds, the maximum outlet temperature change was -0.7 °F from the initial set temperature.

3.5.4.2(c) The conditions were restored as in Sections 3.5.4.1 (a) through (c). The cold water supply pressure was decreased by 20 percent and the maximum outlet temperature changes were observed and recorded for 25 seconds.

Findings: The outlet water temperature spike change was -0.9 °F within the first 5 seconds. After the first 5 seconds, the maximum outlet temperature change was -0.2 °F from the initial set temperature.

3.5.4.2(d) The conditions were restored as in Sections 3.5.4.1 (a) through (c). The cold water supply pressure was increased by 20 percent and the maximum outlet temperature changes were observed and recorded for 25 seconds.

Findings: The outlet water temperature spike change was +0.8 °F within the first 5 seconds. After the first 5 seconds, the maximum outlet temperature change was +0.2 °F from the initial set temperature.

3.5.4.2(e) The conditions were restored as in 3.5.4.1 (a) through (c). The hot water supply temperature was increased by 25 °F at a rate of 5 °F per minute and the maximum outlet temperature changes were observed and recorded for 25 seconds.

Findings: The outlet water temperature spike change was +2.4 °F within the first 5 seconds. After the first 5 seconds, the maximum outlet temperature change was +2.4 °F of the initial set temperature.

Requirements: Within the first 5 seconds, the temperature spike from the initial outlet set temperature greater than ±3.6 °F should not last more than 1 second when measured at the ±3.6 °F variation line. After the initial 5 seconds, the maximum temperature variation from the initial outlet set temperature should not be greater than ±3.6 °F.

3.6 Cold Water Supply Failure Test – COMPLIED.

The device was installed in accordance with Figure 1, and conditions set in accordance with Sections 3.5.2.1 (a) through (c). The device automatically reduced the discharge flow to 0.5 gpm or less within 5 seconds, such that the outlet temperature did not exceed 120.0 °F prior to the flow being reduced to 0.5 gpm when the cold water supply failed.

Findings: The discharge flow was reduced to 0.1 gpm within 1.0 seconds and the outlet temperature did not exceed 120.0 °F during that time period.

3.7 Outlet Temperature and Flow Capacity Test – COMPLIED.

With the device installed in accordance with Figure 1, the hot and cold water inlets were set at 45.0 psi and the discharge flow was set at 2.5 gpm. The test procedure outlined in Section 3.7.2 (a) through (d) was performed.

Findings: The device could flow a minimum of 2.25 gpm, was adjustable from the cold position up to a minimum of 100.0 °F, and was capable of limiting the maximum outlet temperature to 120.0 °F or less under all test conditions.

3.8 Burst Pressure Test – COMPLIED.

With the outlets blocked and seating members fully open, the device's body was pressurized with ambient to 500.0 psi for 1 minute.

Findings: There was no leakage through the device body.

4.1 Markings

4.1.1 Marking of Devices – **PENDING**

Each device SHOULD BE permanently marked with the manufacturer's name, model no. and "Type T/P" and the markings were visible during field servicing.

4.1.2 Temperature and Control Setting Identification – **PENDING.**

The device should have identifiable control setting to indicate the direction or means of adjestment to change the temperature. The marking should be clear, permanent, and visible after installation.

4.2 Installation and Maintenance Instructions

4.2.1 Instructions – **PENDING**

The device should be accompanied with the installation instructions. The device had a spring check valve at the inlets of the cartridge.

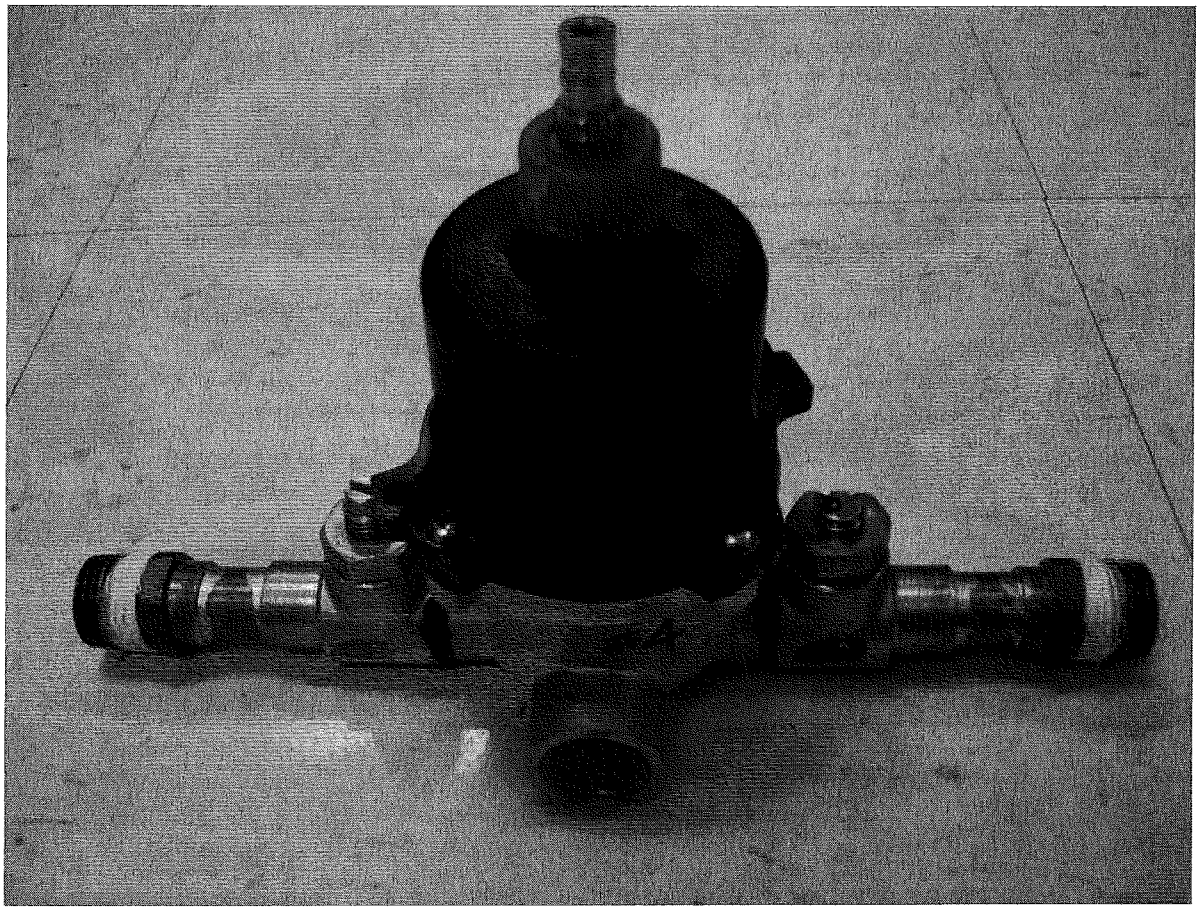
4.2.2 Temperature Limit Setting – **PENDING**

The manufacturer's instructions should specify how to adjust the temperature limit setting.

4.3 Accessibility – COMPLIED

The internal parts of the device were accessible from the finished wall for inspection, repairs, or replacement.

Photograph of Sample Tested



TEST REPORT

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Report Number: 918-10034 **Project No.:** 17645

Report Issued: June 15, 2010

Client: Speakman Company
P.O. Box 191
Wilmington, DE 19899 **Contact:** Chris Miedzius

Source of Samples: The samples were sent by Speakman Company and received by IAPMO R&T Lab in good condition on May 4, 2010.

Date of Testing: May 20, 2010 through June 14, 2010.

Sample Description: Concealed, wall-mounted thermostatic/pressure balancing valve.

Models No.: G20-2031

Scope of Testing: The purpose of the testing was to determine if the sample tested of pressure balancing valve met the applicable requirements of section 3.5 (@ 1.5 gpm) of ASSE 1016-2005, entitled "Automatic Compensating Valves for Individual Showers and Tub / Shower Combinations".

Conclusion: The samples tested of the thermostatic/pressure balancing valve, model G20-2031 from Speakman Company COMPLIED with Section 3.5 (@ 1.5 gpm) of ASSE 1016-2005.

By our signatures below, we certify that all the testing and sample preparation for this report was performed under continuous, direct supervision of IAPMO R&T Lab, unless otherwise noted.

Tested by,

Hanks Ninh

Hanks Ninh, Project Engineer

Reviewed by,

Sean Vuu

Sean Vuu, P.E., Manager, Specialty Projects

ASSE 1016-2005

3.5 Regulation and Temperature Variation Test – COMPLIED.

Note: The flow was changed to 1.5 gpm

3.5.6 a) The valve was tested as described in Section 3.5.2 (Type P) in its entirety.

3.5.2 The Type P device was installed in accordance with Figure 1 of the standard and tested per the procedure outlined in this section.

3.5.2.2 Type P devices

3.5.2.2a) The hot water supply pressure was decreased by 50% and the maximum outlet temperature changes were observed and recorded for 25 seconds.

Findings: The outlet water temperature spike change was +0.5°F within the first 5 seconds. After the first 5 seconds, the maximum outlet temperature variation was +0.9°F from the initial set temperature.

3.5.2.2b) The conditions were restored as in Sections 3.5.2.1 (a) through (c) and the hot water supply pressure was increased by 50% and the maximum outlet temperature changes were observed and recorded for 25 seconds.

Findings: The outlet water temperature spike change was -1.3°F within the first 5 seconds. After the first 5 seconds, the maximum outlet temperature variation was +0.7°F from the initial set temperature.

3.5.2.2c) The conditions were restored as in Sections 3.5.2.1 (a) through (c) and the cold water supply pressure was decreased by 50% and the maximum outlet temperature changes were observed and recorded for 25 seconds.

Findings: The outlet water temperature spike change was – 1.3°F within the first 5 seconds. After the first 5 seconds, the maximum outlet temperature variation was +0.7°F from the initial set temperature.

3.5.2.2d) The conditions were restored as in Sections 3.5.2.1 (a) through (c) and the cold water supply pressure increased by 50% and the maximum outlet temperature changes were observed and recorded for 25 seconds.

Findings: The outlet water temperature spike was +1.1°F within the first 5 seconds. After the first 5 seconds, the maximum outlet temperature variation was –0.6°F from the initial set temperature.

3.5.6 b) The valve was tested as describe in Section 3.5.4 (Type T) in its entirety.

3.5.4 The Type T device was installed in accordance with Figure 1 of the standard and tested per the procedure outlined in Section 3.5.4.2.

3.5.4.2 Type T Devices

3.5.4.2(a) The hot water supply pressure was decreased by 20 percent and the maximum outlet temperature changes were observed and recorded for 25 seconds.

Findings: The outlet water temperature spike change was +0.8°F within the first 5 seconds. After the first 5 seconds, the maximum outlet temperature change was -0.9°F from the initial set temperature.

3.5.4.2(b) The conditions were restored as in Sections 3.5.4.1 (a) through (c). The hot water supply pressure was increased by 20 percent and the maximum outlet temperature changes were observed and recorded for 25 seconds.

Findings: The outlet water temperature spike change was greater than -0.7°F within the first 5 seconds. After the first 5 seconds, the maximum outlet temperature change was -0.5°F from the initial set temperature.

3.5.4.2(c) The conditions were restored as in Sections 3.5.4.1 (a) through (c). The cold water supply pressure was decreased by 20 percent and the maximum outlet temperature changes were observed and recorded for 25 seconds.

Findings: The outlet water temperature spike change was -1.1°F within the first 5 seconds. After the first 5 seconds, the maximum outlet temperature change was -0.5°F from the initial set temperature.

3.5.4.2(d) The conditions were restored as in Sections 3.5.4.1 (a) through (c). The cold water supply pressure was increased by 20 percent and the maximum outlet temperature changes were observed and recorded for 25 seconds.

Findings: The outlet water temperature spike change was -0.5°F within the first 5 seconds. After the first 5 seconds, the maximum outlet temperature change was -0.7°F from the initial set temperature.

3.5.4.2(e) The conditions were restored as in 3.5.4.1 (a) through (c). The hot water supply temperature was increased by 25°F at a rate of 5°F per minute and the maximum outlet temperature changes were observed and recorded for 25 seconds.

Findings: The outlet water temperature spike change was +0.4°F within the first 5 seconds. After the first 5 seconds, the maximum outlet temperature change was +0.4°F of the initial set temperature.

Requirements: Within the first 5 seconds, the temperature spike from the initial outlet set temperature greater than ±3.6 °F should not last more than 1 second when measured at the ±3.6°F variation line. After the initial 5 seconds, the maximum temperature variation from the initial outlet set temperature should not be greater than ±3.6°F.

Photograph of Sample Tested