Hydrostatic Pressure Test Procedure for Riverflow System

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OBJECTIVE: To develop a test method suitable for measuring the leak rate of an open loop of 10-inch to 12-inch PVC pressure pipe, when used in a current-generating device installed in a swimming pool.

RESULTS: The attached test method is formatted as a Draft ASTM Standard, in anticipation that it will be submitted to ASTM Subcommittee F17.40 on Test Methods for Plastic Piping Systems. It is not at present an ASTM Standard and should not be represented to be an ASTM Standard.

Until such time as it is adopted as a consensus standard and given an ASTM designation, it is suggested that the test method be referred to as "Hauser Laboratories Method 62449-01."

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1. Scope

1.1 This standard describes a method for testing plastic piping installed as the main flow conduit in current-generating systems for swimming pools. Such conduits generally have two parallel horizontal sections joined by a vertical section, with the horizontal sections opening into the pool and functioning as inlet and outlet. The conduits are typically 10-inch to 12-inch nominal plastic pressure pipe.

1.2 This method uses test plugs and a standpipe to measure leak rate at a hydrostatic pressure of a approximately 4.5 psi at highest elevation in the system. It is suitable for use in testing open-ended plastic piping runs which normally operate with maximum static pressure of approximately 3 psi or less. It is not suitable for leak testing of closed plastic pressure piping systems.

1.3 This standard does not support 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 to determine the applicability of regulatory limitations prior to use.

2. Summary of Test method

2.1 Test plugs are installed at the inlet and outlet of the piping loop. A standpipe is installed in the upper test plug. Water is introduced through the lower plug while air is vented from the high point in the loop, to expel all air and completely fill the loop and begin to fill the standpipe. When the standpipe is filled above the highest elevation in the loop. The height of the water column in the standpipe is monitored. Leak rate is determined from the rate of change in the water in the standpipe versus elapsed time.

3. Significance and Use

3.1 This test can be used to measure the leak rate of the plastic piping loop. The test is capable of measuring leaks as small as 0.001 gallons per hour under conditions of thermal equilibrium.

3.2 This test cannot be used when the water level in the swimming pool is above the lowest point of the pipe loop inlet. The test should be performed before the pool is filled when testing new construction.

4. Interferences

4.1 This test cannot differentiate changes in water volume due to thermal contraction from leakage. Therefore, valid results can only be obtained under condition of approximate constant temperature.

4.2 The longer the test is run at approximate constant temperature, the greater the sensitivity of the test.

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4.3 In a typical installation with the volume of the tested piping approximately 200 gallons, a one-degree C change in the temperature of the pipe and water will change the apparent water volume by approximately 0.03 gallons. Decreasing temperature will cause the standpipe level to fall; increasing temperature will cause the standpipe level to rise.

5. Apparatus

5.1 Test plugs sized for the inlet and outlet piping diameters, typically 10-inch and 120-inch IPS nominal inside diameter. Cheme Industries T-handle pipe plugs in 10-inch and 12-inch sizes are suitable. Where venting air through the pump port is practical, the upper plug may be unvented.

5.2 Adapter for the inlet test plug: to convert to garden=hose female, or other appropriate water source.

5.3 Standpipe adapter for the outlet test plug: short length of PVC pipe with male NPT threaded end, 90-deg elbow, and 1-inch nominal NPT female threads.

5.4 8-foot length of 1-inch nominal IPS schedule 40 PVC pipe male NPT threads at one end.

5.5. 4-foot length of transparent plastic pipe with inside diameter equal to 1.00 inches, with fitting to connect to 1-inch nominal diameter PVC pipe.

5.6 Steel tape measure, 12-foot minimum length with graduations of 1/16-inch or less.

5.7 Stopwatch, clock or other timer capable of measuring intervals of up to 300 minutes with accuracy of 0.01 minute or better.

6. Hazards

6.1 Hydrostatic testing such as described in this method minimizes energy stored in the system during the test, and thus avoids the hazards associated with pneumatic testing. Nevertheless, the hydrostatic force on the test plugs and the mass of the test plugs are sufficient to cause injury of dislodged during the test. Use caution in installing test plugs and use appropriate secondary safety restraint, such as a cable or chain.

6.2 The PVC piping loop to be tested must have adequate mechanical support prior to filling with water. Specific job condition may require that the pipe loop be braced or otherwise supported with temporary structures so testing can be performed prior to backfilling.

6.3 Do not use the higher standpipe than specified in this method. Do not close off the standpipe to create a closed system.

6.4 Assure that the pump petcock or other high-point air vent is fully open prior to filling the pipe loop with water, and also that it is opened before draining water from the loop.

6.5 remove hydrostatic pressure by draining the system of water before removing either test plug.

7. Sampling, Test, Specimens, and Test Units

7.1 The sample is the actual circulation piping open loop as installed in as swimming pool. The test is typically performed prior to backfilling.

8. Procedure

8.1 Install the test plug in accordance with the manufacturer's recommendations. Install the plug with the hose fill port in the inlet (lower) end of the loop Install the plug with the standpipe adapter in the outlet (upper) end of the loop, with the 1-inch threaded opening at the top. Install the pipe plugs as recommended by the manufacturer.

8.2 Thread the 8-foot PVC pipe into the standpipe adapter. Align the pipe vertically. If the transparent pipe is not already connected to the PVC pipe, connect it.

8.3 Attach a water-supply garden hose or other suitable water sources to the port in the lower plug. Open the air vent at the high point of the loop, at the circulating pump,. Open the valve on the plug.

8.4 Continue adding water through the lower plug until the water level is approximately at the midpoint of the transparent pipe. Turn off the water supply and close the valve at the plug inlet.

8.6 mark the water level and note the time. This is 0 elapsed minutes.

8.7 After 10.0 minutes, record the change in water level to the nearest 0.1 inch, relative to the original marked level, record an increase in level as a positive and decrease as a negative.

8.8 repeat 87 at 10-minute intervals. Obtain at least 4 readings. Additional readings may be obtained as needed; record the elapsed time for these reading from the start of the test. It is convenient for these to be hourly intervals, but other intervals are acceptable of accurately recorded.

9. Calculation or Interpretation of Results

9.1 Plotting the relative height vs. elapsed time for the readings taken may be useful in determining periods of thermal equilibrium. Under thermal equilibrium, the water level will remain constant if the leak rate is zero; the rate of decrease in the height of the column is proportionate to the leak rate. However, if the water temperature in the system changes, thermal expansion or contraction will also affect the water column height.

9.2 Table 1 gives apparent leak rate as a function of change in the water level in the standpipe for a given interval. The following equation may be substituted for the table.

$LR = 0.204 * \Delta H / \Delta t$, where:
LR is leak rate in gallons per hour,
ΔH is change in water column height,, inches
Δt is the time during which the water column height change occurred, minutes

10. Report

10.1 Report column height change vs. time, and the associated apparent leak rate, for at least three consecutive intervals.

11. Precision and Bias

11.1 No data regarding the precision of the method is available at the time this new method is being written.

11.2 There is no alternate or reference test available to determine the bias, if any, of this method.

12. Keywords

12.1 Leak rate, water, plastic pipe, swimming pool

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