

**Test Report**  
**CAST-A-SEAL Pipe-To-Structure Connectors**  
**Specification ASTM C 1644-06**

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**Purpose of Test:** This test was performed to measure performance of the CAST-A-SEAL Pipe-To-Tank Connectors within the requirements of ASTM C 1644-06, Section 7; *Standard Specification for Resilient Connectors Between Reinforced Concrete On-Site Wastewater Tanks and Pipes.*

**Test Materials:** The test was conducted using two of each model of CAST-A-SEAL connector: CAS 402 (2", 3", 4", and 6") and CAS 402F (4") cast into monolithic concrete blocks. The blocks and connectors were fitted onto a test fixture which permitted simultaneous testing of two connectors. In each test, a sample of the connector was tested in the infiltration orientation and another sample in the exfiltration orientation. Each test was conducted with two pieces of pipe joined with a flexible connector in the middle so that the pieces could be moved relative to each other without losing the seal between them.

A certified gauge (0 – 15psi) in current calibration was used to verify pressure and a calibrated stopwatch was used to verify time. A constant weight load was applied to each pipe during the shear portion of the test at a rate of 50 lbs/inch pipe diameter. Weight was measured on a calibrated scale and was placed 12" from the connector using a chain as a conformal loading device.

**Test Method:** In each test below, after assembly of the test apparatus, the outlet vent was opened and the inlet tap was opened. When water filled the vessel completely as evidenced by its flowing from the outlet vent, the inlet valve was closed and then the outlet valve was closed. Pressure was raised inside the test fixture until test pressure was reached. Timing of the test was begun when the test pressure was reached and the connectors and pipes were observed for any indication of leakage. Pressure was adjusted as needed during the test to maintain test pressure. Upon completion of one set of test requirements, the

test conditions were changed without pressure reduction until all required tests of each connector/pipe combination were completed. At the conclusion of the tests for each connector/pipe combination, a new pipe/connector combination was installed and the tests were repeated until all connector/pipe combinations were tested.

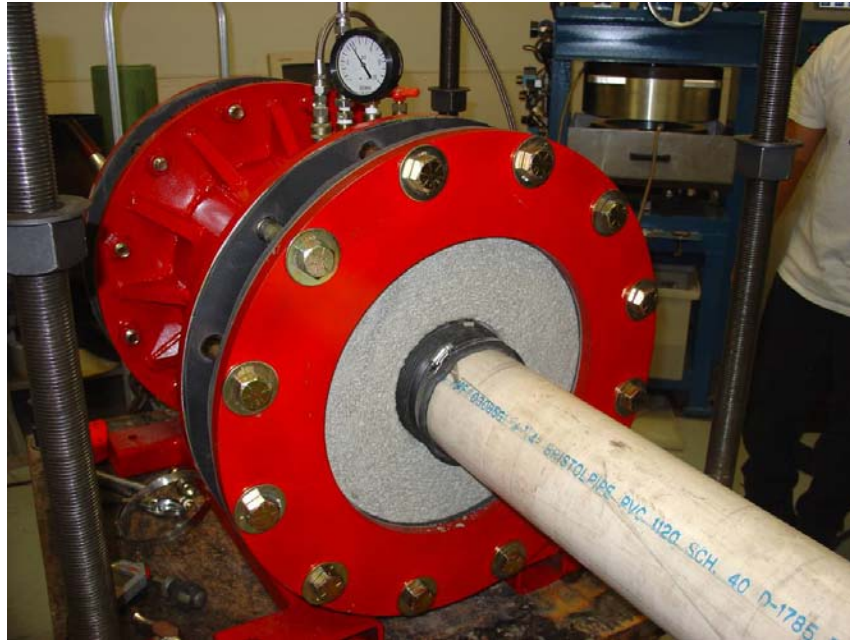
The tests were conducted in three phases, with two connectors in different test orientations in each phase. The photos following show typical test set-ups for the required test conditions.

### Test Protocol Matrix

Test Phase	Test Parameters	Connector 1 Orientation	Connector 1 Condition	Connector 2 Orientation	Connector 2 Condition
1	5 psi 5 minutes	Infiltration	Straight Alignment	Exfiltration	Constant Shear Load
2	5 psi 5 minutes	Infiltration	Constant Shear Load	Exfiltration	Straight Alignment
3	5 psi 5 minutes	Infiltration	7 degree Deflection	Exfiltration	7 degree Deflection



**Test Fixture allows simultaneous testing of Infiltration (left) and Exfiltration (right) connector orientations**  
(Angular Deflection Test shown)



Test Set-Up for Straight Alignment (Exfiltration orientation shown)



Test Set-Up for Angular Deflection (Exfiltration orientation shown)



Test Set-Up for Shear Load (Infiltration orientation shown)

**Test Results:** A total of 48 discrete tests were conducted, using 4 sets of CAST-A-SEAL Pipe-to-Tank Connectors and six different sizes and types of pipe. Tests were conducted for each connector in both infiltration and exfiltration orientations for each pipe size and type for which it is recommended. Each combination was subjected to the required hydrostatic test pressure (5 psi min.) for the required time (5 minutes). No leakage was observed from any of the tested combinations of connectors and pipe. The test results are tabulated below.

### Test Protocol Results

Connector	Pipe	Pipe OD	Shear Test Weight	Test Results
CAS 2"	1-1/2" Schd 40	1.75"	75 lbs	Pass All
CAS 2"	2" Schd 40	2.5"	100 lbs	Pass All
CAS 402 w/adaptor	3" Schd 40	3.5"	150 lbs	Pass All
CAS 402	4" SDR 35	4.21"	200 lbs	Pass All
CAS 402	4" Schd 40	4.5"	200 lbs	Pass All
CAS 402F	4" SDR 35	4.21"	200 lbs	Pass All
CAS 402F	4" Schd 40	4.5"	200 lbs	Pass All
CAS 6"	6" Schd 40	6.625"	300 lbs	Pass All

**Conclusion:** The CAST-A-SEAL Pipe-to-Structure Connectors as shown in the table above conform fully to the test requirements of ASTM C 1644-06, Section 7.

Respectfully submitted,

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