

Water Testing of Portland Cement Plaster/Stucco

No designer or contractor wants a leaky wall assembly. Unfortunately, due to some experimental design and poor construction practices, the industry experienced a rash of leaky buildings in the 1990's. The International Building Code¹ in an attempt to address the concerns and allows for innovation, re-wrote Chapter 14, "Exterior Walls". Section 1403 "Performance Requirements", establishes basic design and construction ground rules for exterior walls.

Section 1403.2 requires exterior walls to be weather-resistant. The envelope shall include flashing (section 1405.3) and allow for drainage of water with a water-resistive barrier (section 1404.2). These criteria will protect the interior from "water condensation" and allow moisture that may enter behind exterior veneer to exit out the assembly.

Three coat cement plaster over building paper and installed over steel or wood-framed substrates fully complies with section 1403.2 and does not require water testing. Masonry and concrete walls do not require water-resistive barriers per section 1404.2.

Walls that do not have flashing (section 1405.3) and drainage provisions (section 1404.2), basically walls that fail to meet section 1403.2, will need to verify passing a water test per ASTM E 331. Barrier EIFS Systems fall under the criteria of section 1403.2.

There is no specific test designed for water or weather resistance of exterior wall envelopes that incorporate a water-resistant barrier per section 1404.2 and flashings per section 1405.3. There are water resistance tests for masonry walls, curtain wall construction and windows. The water resistance test used on curtain wall and windows is most commonly ASTM E 1105 and may be used on exterior walls with drainage per the protocol of ASTM E 2128. ASTM E 2118 is protocol specifically designed for finding and determining known water leakage problems. The protocol calls for site review procedures, review of construction documents and the interview procedure of building occupants. If the source of the leak cannot be determined, then the water test of ASTM E 1105 is appropriate to find the leak. It is recommended to use established Design Pressures and time limits for water testing, but if those limits are not able to verify the source of the leak, higher pressure and longer time periods are permissible.

MOCKUP TESTING:

Some designers and or consultants have felt necessary to test drainage type wall assemblies that are compliant with section 1403.2. While this is not required, it is also not prohibited. If mock-up testing is desired, the differential pressure should be what the "Components and Claddings" section of the code requires for that project. There are four criteria needed to determine the correct differential pressure.

- Height of the Building (average of the roof eave and the highest point of the roof)
- Importance Factor of the Building (Building Categories I-IV)
- Wind Stagnation Pressure of the Building (3-second wind gust from the code Wind Speed Map)
- Exposure (the determination of building exposure A-D)

¹ International Building Code - 2012

MOCKUP CAVEAT:

Water penetration testing of exterior walls with drainage and flashing provisions should be done with the insulation in the wall cavity, the gypsum wallboard installed and taped on the inside. This will replicate a “real life” scenario test with the code approved differential pressure.

This procedure is appropriate for the test, as the gypsum wallboard being in place will have little to no effect on window and the window flashings during normal service life. However, exterior claddings and fastener penetrations will be greatly affected by the presence or absence of gypsum wallboard (interior finishes).

The interior finish is removed after the test to verify if an uncontrolled leak has occurred. While ASTM E 1105 states the interior finish may be removed to view for leaks, this is intended for windows and doors only, and meant to view window leaks and leaks between the window frame and adjacent exterior flashings.

RECOMMENDATIONS:

If plaster assemblies or any wall systems deviate from section 1404.2, then an ASTM E331 test should be performed. Three-coat plaster assemblies complying with Chapter 25 of the code and properly flashed should not require testing unless a leak is detected AFTER completion of the assembly/system. If the cause of leak cannot be detected through a visual observation, testing under ASTM E 1105 is recommended.