RDH BUILDING SCIENCE LABORATORIES

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Making Buildings Better™

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R-22966.000
CPCI Air Permeance Testing| Summary Letter

DATE May 10, 2022

REGARDING **Summary of CPCI Precast Panel Air Permeance Testing**

Dear Mr. Sylaj,

As requested by the Canadian Precast / Prestressed Concrete Institute (CPCI), RDH Building Science Laboratories (RDH) conducted air permeance testing on two types of precast wall assemblies:

1. Single Wythe Precast Concrete Wall Assembly (a single 102 mm concrete wythe)
2. Double Wythe Insulated Precast Concrete Wall Assembly (64mm exterior concrete wythe, 76mm layer of XPS insulation and a 76 mm interior concrete wythe)

Testing was performed following ASTM E2357, "Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies" and documented in RDH's testing report dated March 18, 2022. This letter provides a summary of that report and discussion on the test results.

Test Wall Specimens

As specified in the ASTM E2357 standard, each type of precast wall assembly was considered using two different test specimens, one constructed of only concrete panels and joints (the "opaque wall"), and a second constructed with specified penetrations, such as a window, pipe penetration, duct penetration and electrical penetrations (the "penetrated wall"). This resulted in a total of four test wall specimens.

Figure 1 : Photographs of both the opaque and penetrated single wythe precast test wall specimens

Each test wall specimen measured 2400mmx 2400mm in area and consisted of a horizontal joint the entire width of the panel, and two staggered vertical joints, one from the bottom and one from the top, both ending at the horizontal joint. All of the precast panel joints were installed as a two-stage drained joint with an interior continuous bead of silicone sealant, and an exterior bead of silicone sealant that was drained at the bottom of both vertical joints.

Test Method

The test method rigorously tests the air permeance of the assembly, requiring air leakage tests before and after wind load conditioning that imposes the test specimen to different wind pressure loads. In this test program the wall specimens were first subjected to sustained wind loadings simulated via positive and negative loading of 600 Pa (for one hour each). The walls were then subjected to a cyclical loading in which the pressure was cycled between zero and positive 800 Pa (1000 cycles of approximately 5 seconds each) followed by cycling between zero and negative 800 Pa (again 1000 cycles). Finally, the wall specimens were subjected to wind "gust" loadings of positive and negative 1200 Pa, each applied as a single cycle of approximately five seconds duration. The ASTM E2357 test method was designed to put wind stresses on the air barrier system (including all of its materials, joints, and seals) and determine if there was any increase to the air permeance following wind loading.

Test Results and Discussion

None of the four test wall specimens in this test program exhibited an increase in air leakage following the wind load conditioning. In all cases the air leakage before and after conditioning was less than 0.2 Lps/m^2 – the code allowed maximum for air leakage for an air barrier assembly (National Building Code of Canada 2020, sentence 9.36.2.9.1.c., tested following ASTM E2357). ***This test program confirms and demonstrates that single wythe precast and double wythe insulated precast concrete wall assemblies (with properly installed two-stage, drained joints) meet and exceed the air barrier system requirements of the National Building Code of Canada.***

For more information regarding the test program, and results, please review RDH's complete testing report, "ASTM E2357 Air Barrier System Testing Report for CPCI", dated May 10, 2022 in its entirety.

Yours truly,

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