**Advanced Building Construction: Measurement and Verification (M&V) for Topic 1, Phase 1**

As part of the ABC FOA topic Integrated Building Retrofits, a cohort of Phase 1 projects were funded to design and prototype a technology or approach that provides a deep energy-saving retrofit solution for one or more building energy systems. Towards the end of Phase I, there will be a data request to help understand how the wide variety of projects compare to each other on a technical level. Please fill out the applicable rows within the M&V tables based on the technology type developed and applicable testing performed.

# Technology Type: Wall Panel

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Performance Metric** | **Test Type** | **Test Standard (Please Highlight Selected Test or fill in the blank)** | **Completed (Y/N/NA)** | **Results (Please attach reports)** | **Notes** |
| Standard Test Methods for Determining Thermal Performance | Material | [ASTM C518](https://www.astm.org/Standards/C518) | Yes. | Estimated whole-wall performance of R-27.6 (excluding cavity insulation); also U. Minnesota field testing for ~four months. | THERM Simulations. See Draft PNNL Report “Wall Upgrades for Energy Retrofits: A Techno-Economic Study” (September 2021). |
| Wall Panel | [ASTM C1363](https://basc.pnnl.gov/library/astm-c1363-19-standard-test-method-thermal-performance-building-materials-and-envelope) |
|  | Other: \_Field Testing and \_\_\_\_ |
| Standard Test Methods for Determining Air Leakage Rate | Material | [ASTM E2178](https://www.astm.org/Standards/E2178.htm) | Yes – modified ASTM E779. | Attached. | We performed blower-door tests on a ~8’x20’ mock-up wall we constructed with the roof, floor, two non-test walls, door, and window sealed shut under several conditions described in the report. In addition, we measured ~8.3 CFM50 when \*all\* the walls were sealed internally.  Opaque area of the two test walls = 116 ft2. |
| Wall Panel | [ASTM E283](https://www.astm.org/Standards/E283.htm) |
| [ASTM E2357](https://www.astm.org/Standards/E2357.htm) |
| Field | [ASTM E779](https://www.astm.org/Standards/E779.htm) |
| [ASTM E1827](https://www.astm.org/Standards/E1827.htm) |
| [ASTM E1186](https://www.astm.org/Standards/E1186.htm) |
|  | Other: \_\_\_\_\_\_\_\_ |
| Standard Test Methods for Determining Water Penetration | Material | [ASTM E96](https://www.astm.org/Standards/E96) | No. |  |  |
| Wall Panel | [ASTM E331](https://www.astm.org/Standards/E331.htm) |
| Field | [ASTM E1105](https://www.astm.org/Standards/E1105.htm) |
| [AAMA 501.2](http://www.bdg-usa.com/aama-501.2.html) |
|  | Other: \_\_\_\_\_\_\_\_\_ |
| Criteria for Moisture-Control Design Analysis in Buildings | Simulation | [ASHRAE 160 (model comply with ASTM E3054)](https://webstore.ansi.org/Standards/ASHRAE/ANSIASHRAE1602016) | Yes. | Mold indices of 0.0 for all but Very Cold and Marine Climates, 0.1 for those two. | WUFI Simulations completed by ORNL. See Draft PNNL Report “Wall Upgrades for Energy Retrofits: A Techno-Economic Study” (September 2021). |
|  | Other: \_\_\_\_\_\_\_\_\_ |
| Moisture Management Plan | NA | Moisture management detailing at connection points – Roof to wall, Window to wall, Wall to foundation, etc.) | Yes. | Several design decisions and features address these factors, including: 1) window and door trim and flashing details; 2) panel block tongue-and-groove design at interfaces; 3) starter strip weeps; 4) decision to incorporate a WRB; 5) cornice receiver detail; 6) corner details; 7) fall-facing profile of the panel blocks. | The details are confidential / proprietary information; happy provide more detail under a standard Fraunhofer NDA. |
| Other (Please provide relevant info) |  |  |  | Field testing at the U. Minnesota Outdoor Test Facility found no evidence of water intrusion or damage over the course of ~four months of field testing. |  |

# Technology Type: HVAC/Water Heating

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| --- | --- | --- | --- | --- |
| **Test Type** | **Test Standard (Please Highlight Selected Test or fill in the blank)** | **Completed (Y/N/NA)** | **Results (Please attach reports)** | **Notes** |
| ASHP Efficiency Performance Rating | [AHRI Standard 210/240](https://www.ahrinet.org/App_Content/ahri/files/STANDARDS/AHRI/AHRI_Standard_210-240_2023.pdf)[[1]](#footnote-1) | N/A |  |  |
| [Cold Climate Air-Source Heat Pump Specification (Version 3.0)](https://neep.org/sites/default/files/media-files/cold_climate_air-source_heat_pump_specification-version_3.0_final.pdf) |
| Other: \_\_\_\_\_\_\_ |
| Water Heater Efficiency Performance | [10 CFR Part 430 Subpart B Appendix E](https://www.ecfr.gov/cgi-bin/text-idx?SID=ba7571b3e2f5b67196776e52876a4cff&mc=true&node=ap10.3.430_127.e&rgn=div9) | N/A |  |  |
| [A Specification for Residential Water Heaters](https://neea.org/img/documents/Advanced-Water-Heating-Specification.pdf)  [Advanced Water Heating Specification V 7.0](https://neea.org/img/documents/Advanced-Water-Heating-Specification.pdf) |
| Other: \_\_\_\_\_\_\_ |
| Other (Please provide relevant info) |  | N/A |  |  |

1. AHRI Standard 210 or 240 is preferred, but if that is not possible, a heating COP test at 47F and 17F is required. If you deviate from AHRI Standard 210/240, please provide a description of the test plan and setup. [↑](#footnote-ref-1)