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**Building Envelope Testing – Pilot Project Overview**

M. White 10-05-2020

**Project Name:** Building Envelope Testing Pilot Project

**Project Location:**  one to three buildings on campus, depending on funding approvals

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**Other Stakeholders:** Bill Rose, iWG, iCAP Energy Team

**Project Goal:** Reduce energy loss from leaky building envelopes on campus. This pilot project will demonstrate the savings through modelling are achieved through inspection, testing and installation for existing buildings. There are certainly energy savings that can be achieved with building envelope improvements, however the amount of savings are not clearly known. This pilot study will help better quantify the actual savings and help us to prioritize this type of work going forward.

**Description (by Bill Rose):** The aim of this project is to develop in-house expertise at reducing wasteful heat transfer through building envelopes, particularly through air-tightening. This skill set will be applied to:

1.     achieving energy reductions of 20%-30% in small to medium buildings

2.     assisting in scoping and directing equivalent efforts by contractors in larger buildings

3.     spreading skills and concerns to other trades which indirectly affect energy use in buildings.

4.     Coordinating with mechanical retrocommissioning, which may impact equipment size

5.     Advising departments regarding energy impacts of use of their buildings

ASHRAE Standard 211-2018 instructs how to do a commercial energy audit. [1] The team should be familiar with the standard, whether they choose to apply the standard or not.

The energy audit includes use of a blower door. The team should be trained in the use of this equipment which should be available to the team. I recommend equipment that allows the use of 1, 2 or 3 fans for the test. The team should become skilled in conducting:

1.     basic blower door test which produces a single airtightness value for the building

2.     zone pressure testing, which measures airtightness in ancillary spaces such as attics, basements, mechanical spaces, and attached garages or sheds

3.     smoke testing during pressurization or depressurization to determine sites of air leakage

4.     infrared thermography to compare pressurized leakage against unpressurized.

5.     The retrocommissioning team should conduct duct tightness testing. If they do not, then duct tightness testing falls to the envelope team.

A target value for blower door test results is 0.25 cubic feet per minute of flow per square foot of envelope surface area, counting all six sides of the building, measured at 75 Pascals of depressurization [2]. A target value for zone pressure testing for unused spaces is half of the pre-intervention value.

The team should have an eye out for any anomalous conditions which might affect energy use.

[1] <https://www.ashrae.org/File%20Library/Technical%20Resources/Bookstore/previews_2016437_pre.pdf>

[2] <https://www.airbarrier.org/technical-information/whole-building-air-tightness-testing-2/>

**Background:** Per Energy002, “The iWG recommends that Facilities & Services seek funding to pilot Building Envelope Inspection and Testing, as described in the SWATeam recommendation. The proposed buildings should be carefully considered and replaced with other buildings if warranted.” The iCAP Energy Team said, “We recommend that Building Envelope Inspection, Testing and Maintenance be performed as a method to improve building energy conservation to support the iCAP 2050 goal of zero GHG emissions. Building Envelopes should be commissioned for all new construction projects. Existing Buildings should be inspected, tested, deficiencies addressed and maintained to achieve the best energy conservation possible for the building envelope.”

The estimated budget for this pilot project is $180,000. This budget will support team training as well as the envelope inspection, testing, corrections when needed and reporting. Funding will be requested from Student Sustainability Committee.

Pilot project outline:

1. Research, Discovery and Analysis

2. Planned improvements/repairs

3. Retesting as needed

4. Study energy consumption before and after

*Further info provided by iCAP Energy Team:*

Based on residential projects, we believe a 20-30% reduction in energy is achievable

An ASHRAE grade building envelope energy audit should be performed. Basically this is an inspection and testing to assess the airtightness of the building. A team should be established for this pilot project using area contractors. The team will perform the research, discover and analysis via building drawing review, segmented pressure testing, thermographic scanning, smoke testing and overall building pressure testing to assess the as found conditions of the building envelope. Appropriate corrections to the envelope will then be implemented using either a contractor or F&S staff based upon scope and timing. Testing will be performed to validate the corrective measures were successful. Energy consumption will then be compared over time to assess the results.

A typical team will be comprised of:

2 Sheet Metal workers

1 Carpenter

1 Architect

1 Supervisor

The following buildings are suggested for this pilot project:

1. Bruce Nesbit African American Cultural Center is a new building suggested to be inspected, tested and validated. BNAACC Building number (1528) is 7,149 gross square feet and was completed in 2019.

2. The Computing Applications Building (CAB) Building number (0108) built in 1950 is 36,280gsf

3. The Ceramics Building, Building number (0055) is 46,330 GSF was built in 1915