# Centre for Advanced Building Envelope Research (CABER)

## Advanced Building Science Camp Open Mic Night

Dr. Cynthia Cruickshank

April 17, 2023

# CABER represents a $8M investment by the federal and provincial governments to improving the efficiency of residential homes and retrofits in light of climate change.

In collaboration with CanmetENERGY-Ottawa, we are working with industry, government and academia to investigate innovative materials and design strategies for completing retrofits and building new homes in ways that prioritize energy conservation and affordability.

CanmetENERGY-Ottawa campus

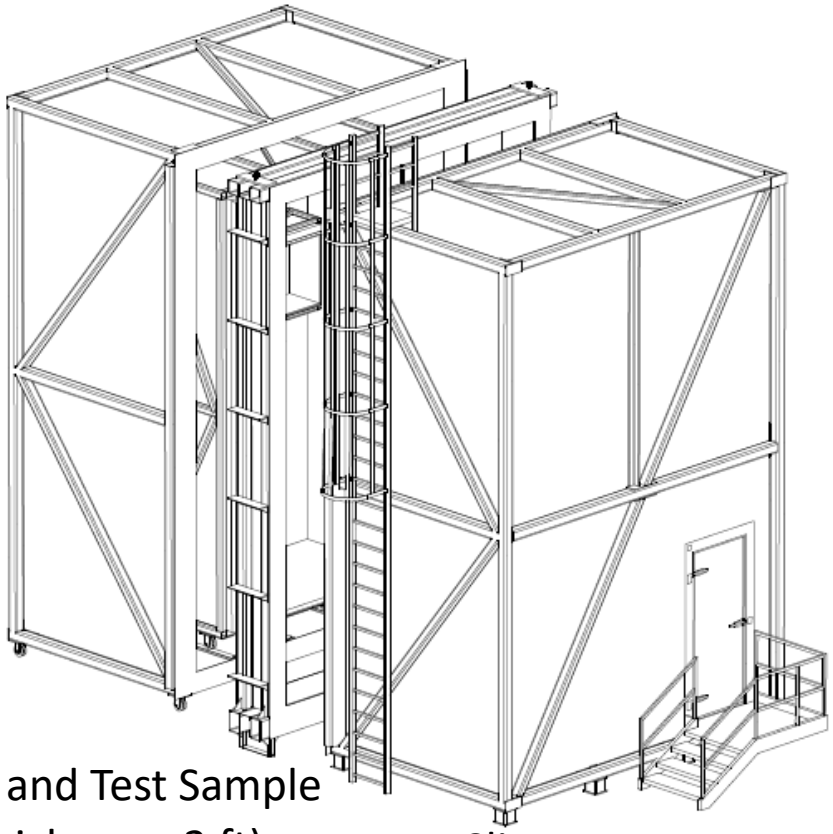
CABER Building (535 m$^2$, 13 m tall)

# CABER: Key Infrastructure

| Guarded Hot Box | Pressurized Spray Rack | In-Situ Wall Openings |
|---|---|---|
| Designed to measure the thermal performance of test assemblies over a range of temperatures and pressure gradients | Designed to observe and measure the water, moisture and air leakage of an assembly | Designed to monitor the long-term hygrothermal performance of test assemblies |

# Guarded Hot Box

The GHB will be used to **test the thermal performance and durability** of two-storey residential and commercial walls up to 4.8 m x 7.2 m.




| GHB Testing Capabilities | |
|---|---|
| Climate Chamber | Temp. range: -35°C to 55°C<br>(De)humidification: 10-90% RH<br>Fan banks to simulate wind loading<br>22 kW IR heating rack to simulate solar heating<br>Capable of being (de)pressurized to +/-1000 Pa |
| Metering Side | Temp. range: 10°C to 30°C<br>(De)humidification<br>Metering area: 3 m x 6 m |

# Guarded Hot Box

Construction is complete on the GHB, with work focused on installing the sensors, control and monitoring systems and completing calibration and commissioning tests.

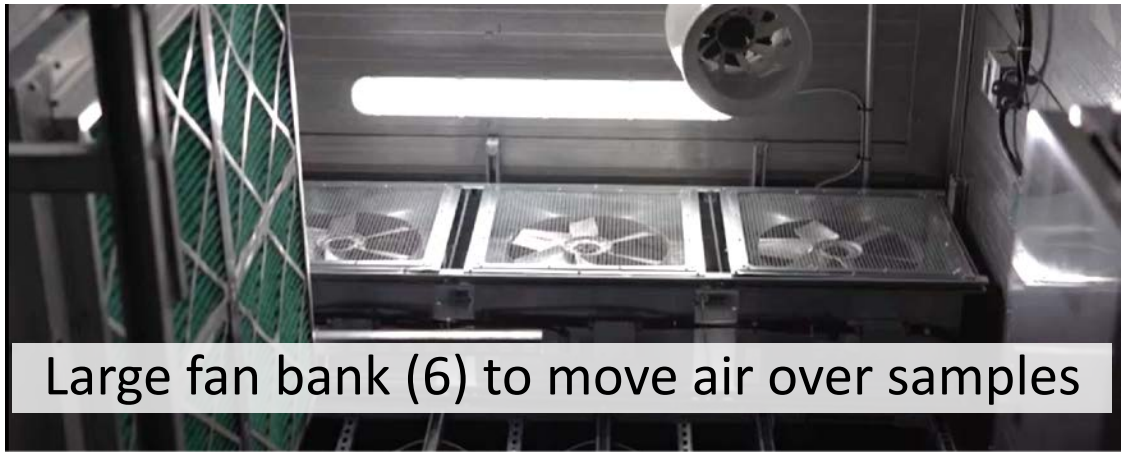
# Sensors

- Over 1800 channels of installed data acquisition to measure temperature, humidity, pressure, heat flux
- Use of quick connects to easily connect and disconnect instruments within samples
- Over 200,000 ft of installed thermocouple wire in CABER that allows us to take approx. 1000 different temperature measurements

- Blue connectors are temperature sensors
- Approximately 6-8 of these boards in the facility

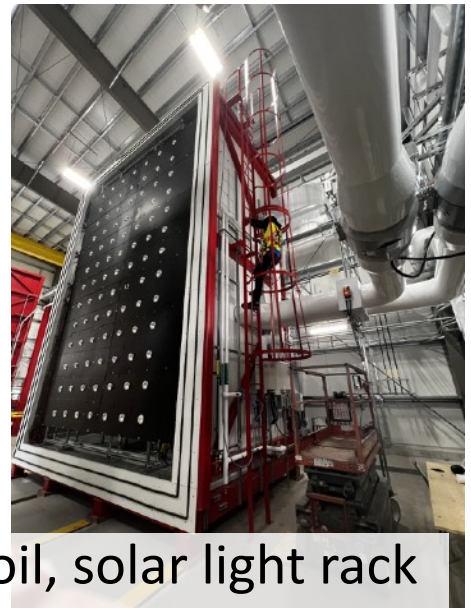
# Inside the Climate Chamber

- The climate box is a key component of our guarded hot box experiment
- Equipment required to control “outdoor” conditions (temperature, humidity, pressure)



Large fan bank (6) to move air over samples

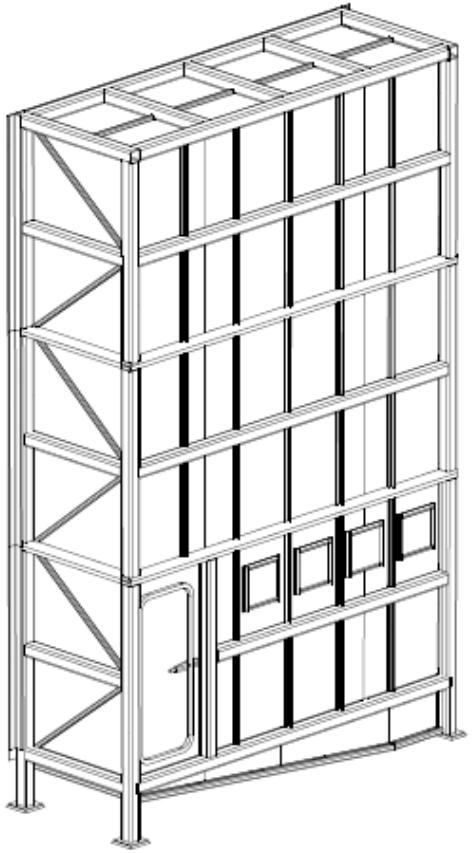
Two fan coil units to blow cold air

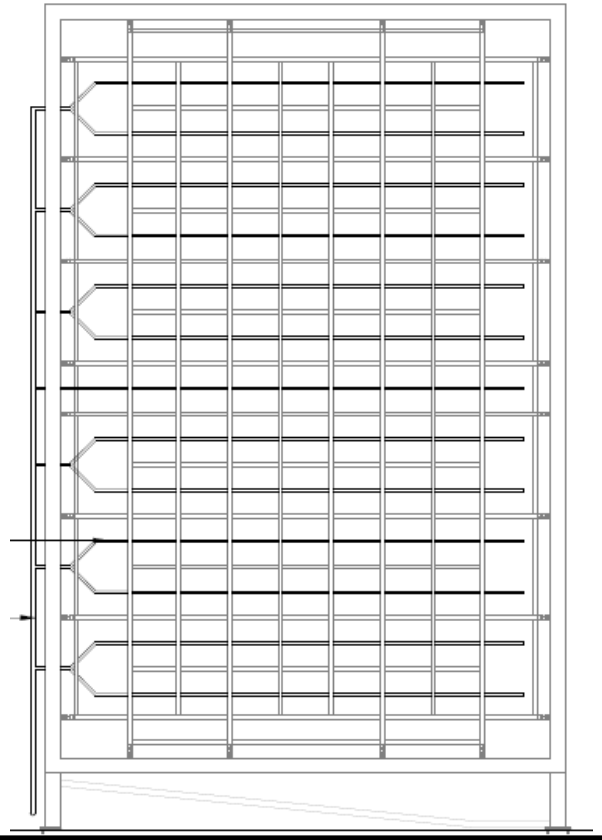


Humidifiers (2), AHUs (2) with heating coil, solar light rack (91 thermal lamps), air velocity sensors

# Pressurized Spray Rack

The PSR will be used to **test the air, water and vapour sealing** of two-storey residential and commercial walls up to 4.8 m x 7.2 m.





| PSR Testing Capabilities | |
|---|---|
| Rain Simulation | • 96 – 3/8” nozzles<br>• Grouped in 6 – 16 nozzle control zones<br>• 1-1.5 LPM/nozzle<br>• Total flow up to 150 LPM using a variable speed pump |
| Pressurization | Can pressurized the “exterior” building façade to 1200 Pa |

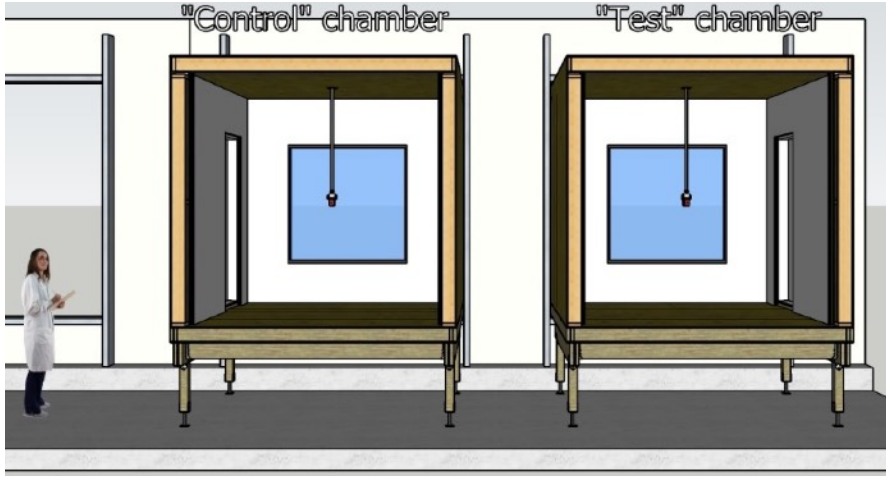
# Pressurized Spray Rack

The PSR is complete with minor commissioning work remaining.

Once operational, we will be able to test window seals, claddings, air tightness of building envelope, etc.

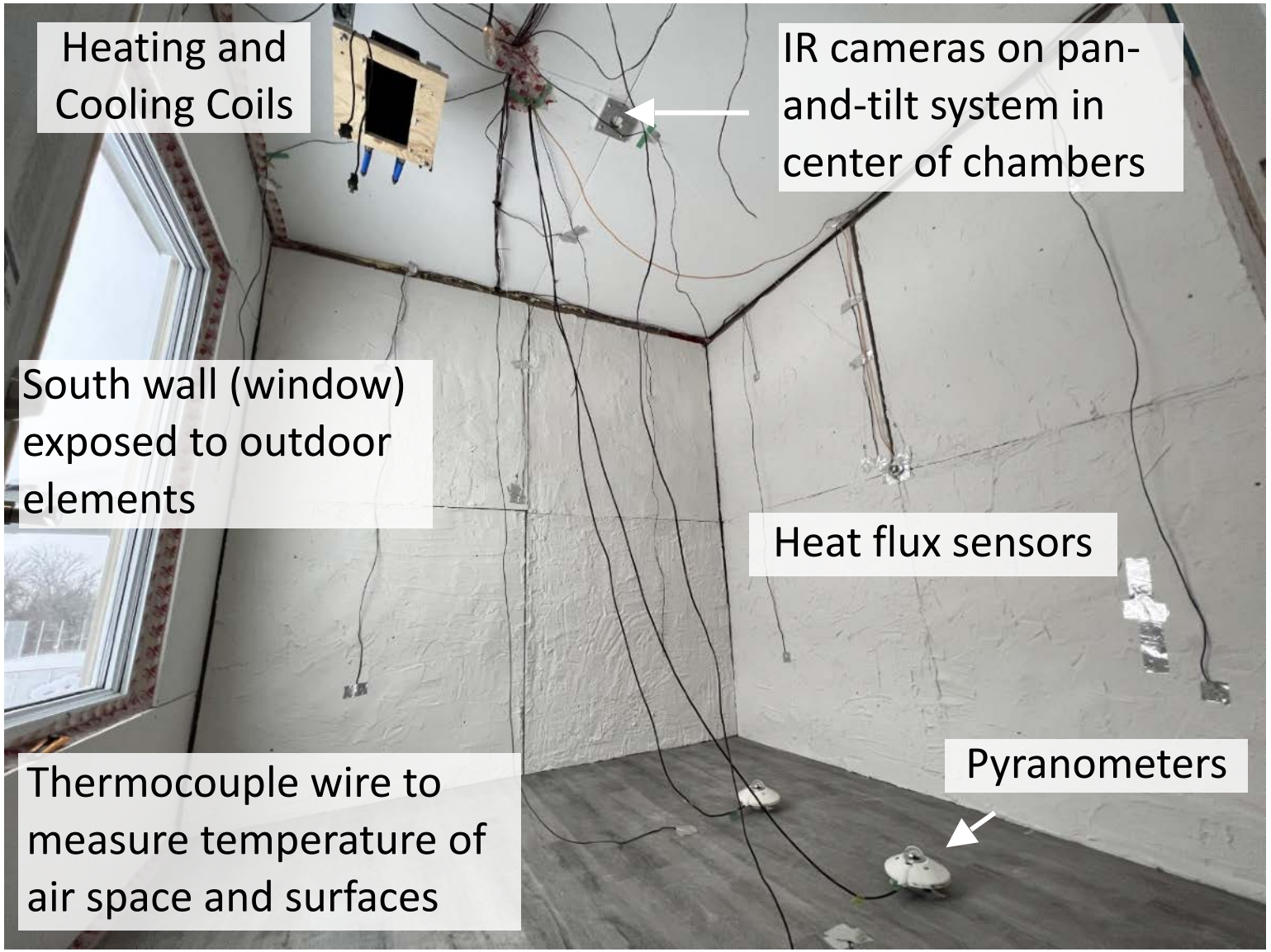
# In-Situ Wall Openings

The ISWO will be used to **test the long term resiliency of wall assemblies** for both residential and commercial walls up to 3 m x 3 m.

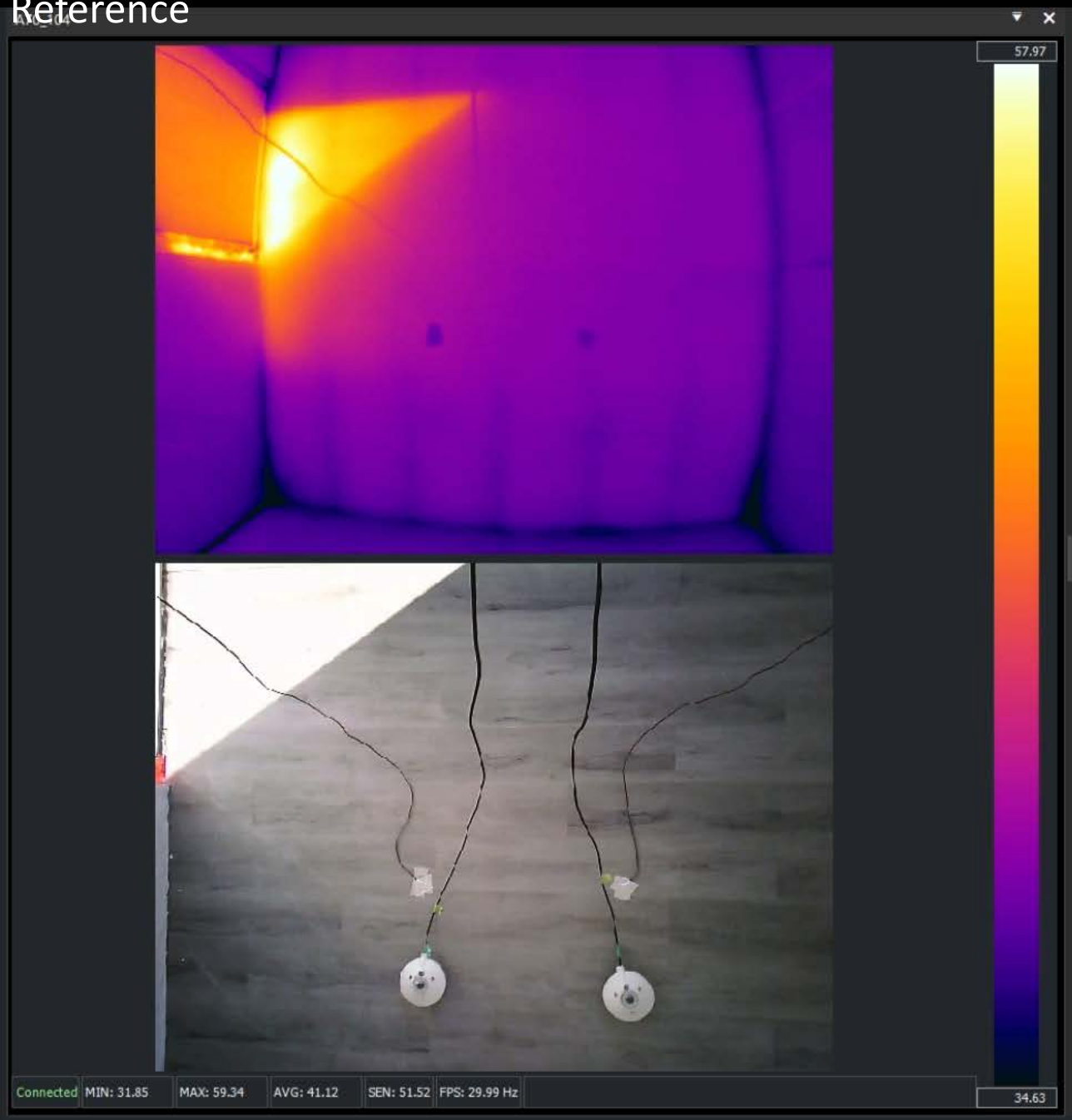


# Inside In-Situ Chamber

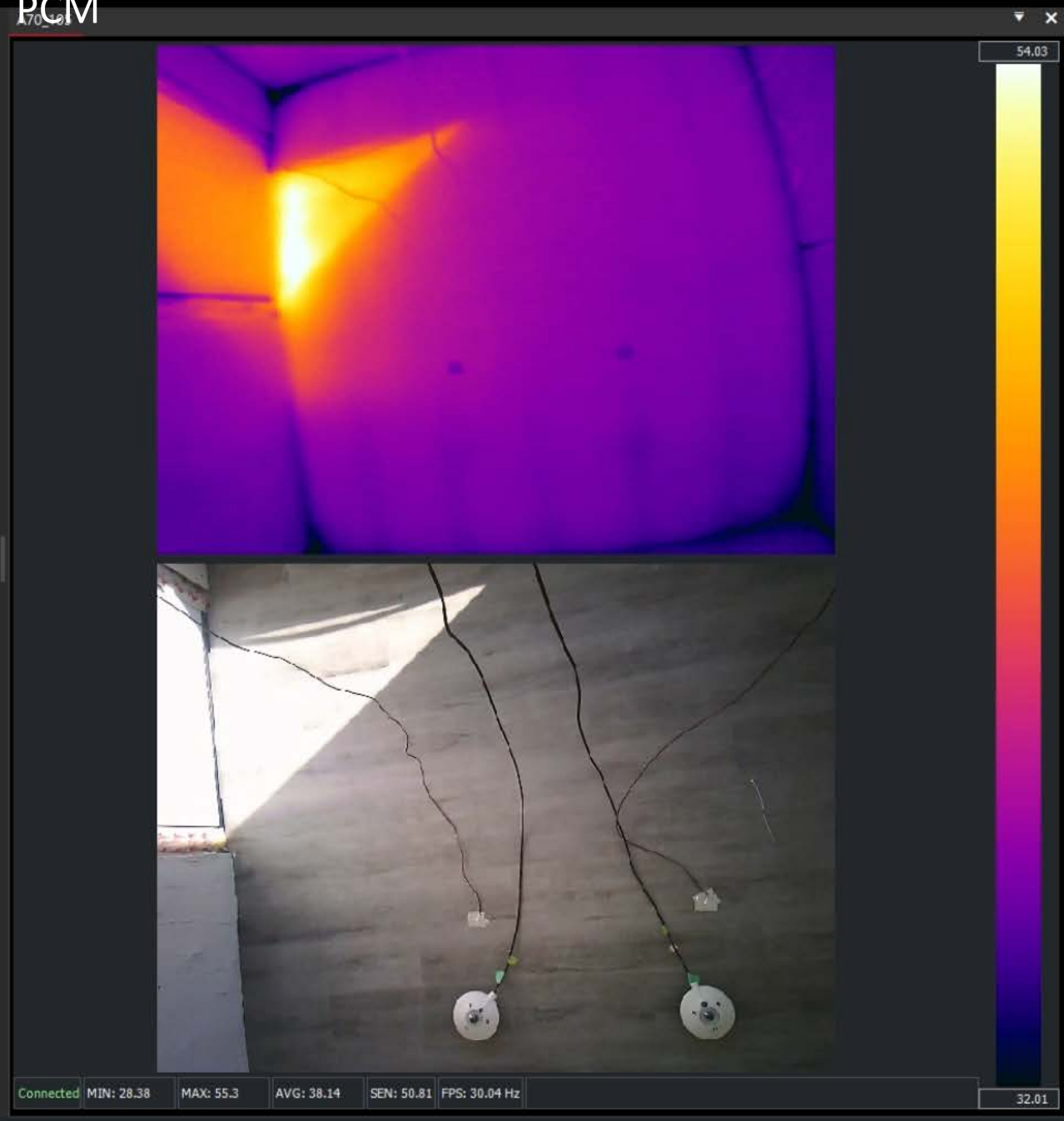
Inside with the door closed, we monitor the temperature conditions, the solar energy coming into the space and the energy moving throughout the space.



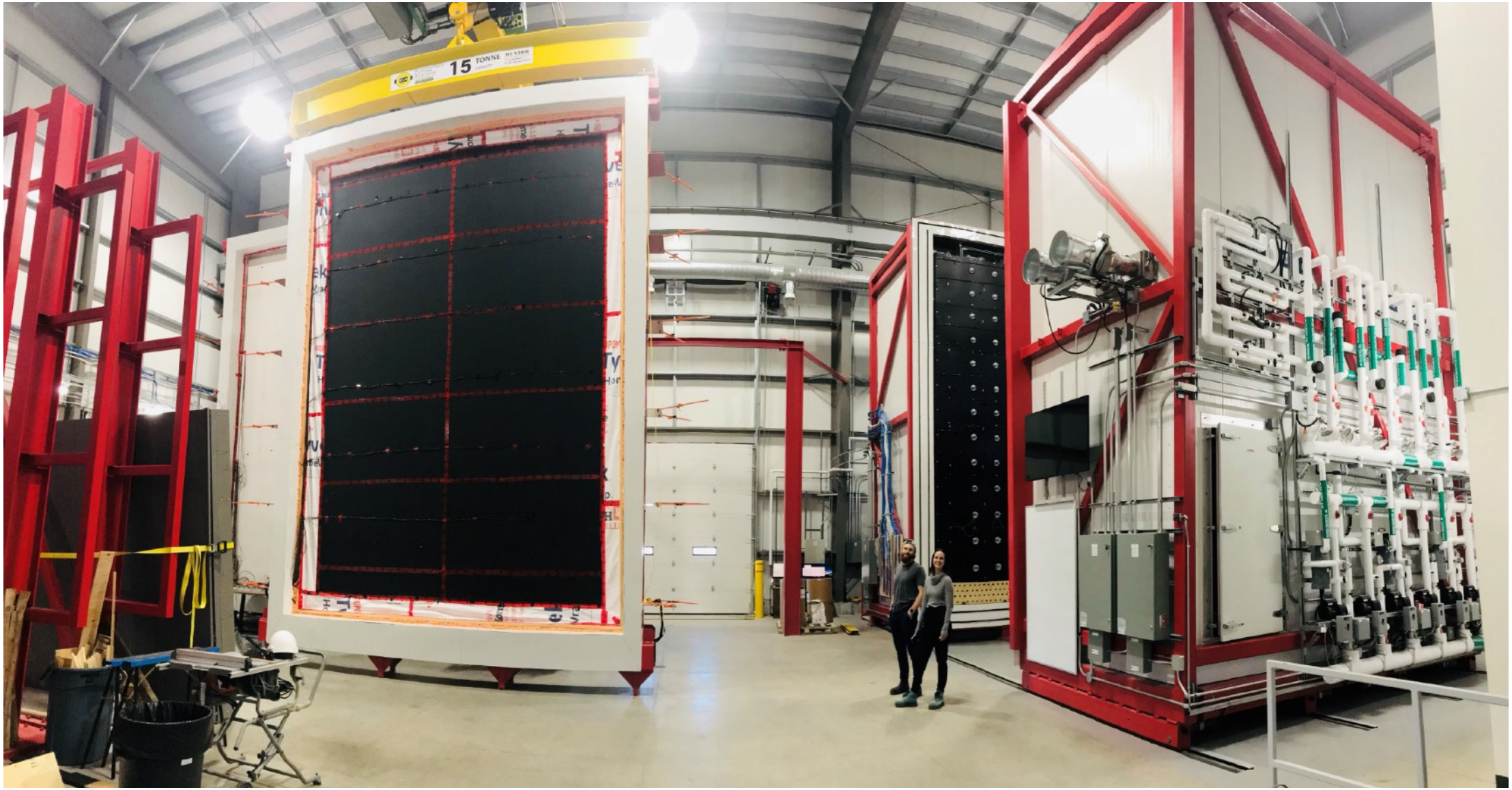
Reference




PCM



# Overall Facility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# Thank You!

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