BEC – What’s new?

October 13, 2020
The Building Envelope Campaign helps building owners and managers design more energy-efficient buildings.
Better Buildings Alliance Tech Teams

- Building Envelope
- Energy Management Information Systems
- Lighting & Electrical
- Plug & Process Loads
- Space Conditioning
- Renewables Integration
- Refrigeration
Connecting Better Buildings partners with advanced building envelope technology solutions

✓ Technology verification studies
✓ Specification documents
✓ Case studies and fact sheets
✓ Calculators and analytic tools

Envelope technologies account for approximately 30% of the primary energy consumed in commercial buildings, playing a key role in determining levels of comfort, natural lighting, ventilation, and how much energy is required to heat and cool a building.
Building Envelope Campaign Goals

- **Motivate action and increase awareness** of the value of investing in high performance building envelope technologies for both new and existing commercial buildings

- **Recognize leaders** adopting and achieving high performing building envelope systems

- **Demonstrate and document** energy and cost savings with integrated design, construction, commissioning, and maintenance from implementation of high performing envelope systems
How are we going to achieve the goals?

- Broad Industry Engagement
- Supporters
  - Access technical expertise regarding envelope technologies
  - Partner with the BEC technical team to spread the word about the campaign
  - Gain recognition through the BEC website
- Participants
  - Access campaign resources and technical expertise in evaluating envelope options
  - Stay informed on envelope technologies and resources produced through the campaign
  - Gain recognition through the BEC website, achievement of awards, and participation in case studies (pending submitting validation information and building completion)
    - Projects completed since January 2019 are eligible to submit
### Recognition Tiers and Categories

#### Existing Building – Envelope Retrofit

<table>
<thead>
<tr>
<th>Recognition Tiers</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Retro 30</strong></td>
<td>Building envelope heat loss/gain reduction of 30(^a), due to implementation of building envelope improvements</td>
</tr>
<tr>
<td><strong>Retro 50</strong></td>
<td>Building envelope heat loss/gain reduction of 50(^a), due to implementation of building envelope improvements</td>
</tr>
</tbody>
</table>

(a) Reduction may consist of any energy retrofit measure that involve the building envelope thermal performance (R-value, Air leakage, Attachments, etc.)
New Construction

<table>
<thead>
<tr>
<th>Recognition Tiers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Novel 20</td>
</tr>
<tr>
<td>Building envelope heat loss/gain reduction of 20(^a) over code(^b), due to incorporation of emerging high-performance envelope technologies</td>
</tr>
<tr>
<td>Novel 40</td>
</tr>
<tr>
<td>Building envelope heat loss/gain reduction of 40(^a) over code(^b), due to incorporation of emerging high-performance envelope technologies</td>
</tr>
</tbody>
</table>

\(a\) Follow ASHRAE Advanced Energy Design Guides Reduction
\(b\) Most recent national energy code (ASHRAE 90.1 - 2016)
Recognition Tiers and Categories

Additional Recognition

<table>
<thead>
<tr>
<th>Role Models</th>
</tr>
</thead>
<tbody>
<tr>
<td>An additional level of recognition will be available to those buildings which meet a campaign recognition tier and also incorporate an additional advanced strategy or technology into their building envelopes, serving as role models within the industry.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Honorable Mentions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buildings which do not meet a campaign recognition tier but still make a noteworthy impact on the campaign (e.g., substantial square footage) may apply for an Honorable Mention.</td>
</tr>
</tbody>
</table>
Participants – 34 Registered

- eSai LLC
- LANL *
- Better Building Works LLC
- Melrose Energy Commission
- Community College of Allegheny County
- H2M architects + engineers
- Flad Architects
- Tenderloin Neighborhood Development Corporation (TNDC)
- Judicial Council of California
- Arlington County Department of Environmental Services
- GLHN Architects & Engineers, Inc.*
- Parkway School District **
- Boulder Associates
- BG3 Architecture, LLC
- Baseys Roofing & Sheet Metal
- Fair Building Technology, LLC
- Mathis Consulting
- IMPACT Industrial Services ***
- Mass General Brigham
- VHA Energy Engineer’s Advisory Board (VA) ***
- Bullitt County Public Schools
- RWDI

**Totals**

- Over 200 buildings
- Over 17 million sf

* 500,000 sf
** 1 million sf
*** 10 million sf
Supporters – 43 Registered

- Becker Morgan Group, Inc.
- Fabreeka International, Inc.
- ThenDesign Architecture
- Tremco Commercial Sealants & Waterproofing
- Tremco Construction Products Group
- New Buildings Institute
- BA Consult
- Brandeis University
- Spray Polyurethane Foam Alliance
- Entegrity
- Structural Insulated Panel Assn. (SIPA)
- NEXUSbec, inc.
- Judicial Council of California
- Lawrence Berkeley National Laboratory
- Walter P. Moore
- American Primitives
- Newmark Knight Frank
- Fanning Howey
- Sunshine Sustainable Design
- Central Maine Community College
- SOPREMA
- Neudorfer Engineers
- CalBarrier, LLC
- Power Shield, Inc.
- OAC Services, Inc.
- Ghafari Associates
- NRG Insulated Block
- Arc Green Consultant
- Jacobs
- ARES Consulting
- University of Maryland
- EPS Industry Alliance
- Carlisle Construction Materials
- US Greenfiber LLC
- Arkema, Unc.
- Owens Corning
- Air Barrier Association of America
Input data for the Building Envelope Campaign tool

Building Description

Building Characteristics  Saved Buildings

Building Description

Name or description of building:

My Building

Review and acknowledge
Input data for the Building Envelope Campaign tool

**Climate**

Select the climate zone where building is located

- 5B - Cold

Select the state where building is located

- Arizona

On average, Arizona has a 4 year delay adopting new construction code.

Select the built environment

- Suburban
### Geometry

Select the type of building. Default values represent reference building geometries, so please change as needed to match your building.

<table>
<thead>
<tr>
<th>Conditioned Floor Area</th>
<th>Building Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>488599 ft²</td>
<td>156 ft</td>
</tr>
</tbody>
</table>

**Building Floors**

12

**Total Surface Area of the Walls (including windows)**

<table>
<thead>
<tr>
<th>North</th>
<th>South</th>
<th>East</th>
<th>West</th>
</tr>
</thead>
<tbody>
<tr>
<td>22464 ft²</td>
<td>22464 ft²</td>
<td>14976 ft²</td>
<td>14976 ft²</td>
</tr>
</tbody>
</table>

**Window Area**

<table>
<thead>
<tr>
<th>North</th>
<th>South</th>
<th>East</th>
<th>West</th>
</tr>
</thead>
<tbody>
<tr>
<td>14976 ft²</td>
<td>14976 ft²</td>
<td>9984 ft²</td>
<td>9984 ft²</td>
</tr>
</tbody>
</table>
Input data for the Building Envelope Campaign tool

How to handle complex geometries?
To calculate the total window and wall area for each orientation when the building is not a square or rectangle. Simply sum the area of the window and wall faces for a given orientation.

South Wall Façades

West Wall Façades
### Input data for the Building Envelope Campaign tool

#### Building Components/Material Properties

Default values for “Existing Building” are based on estimate code at time of construction. Please change as found necessary.

**Existing Building**

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall R-value</td>
<td>6.3</td>
<td>Painted Surface – Light</td>
</tr>
<tr>
<td>Roof R-value</td>
<td>18.8</td>
<td>Black Membrane</td>
</tr>
<tr>
<td>Window U-factor</td>
<td>0.59</td>
<td></td>
</tr>
<tr>
<td>Window SHGC</td>
<td>0.39</td>
<td></td>
</tr>
</tbody>
</table>

[Click here to access R-value calculator](#)
Input data for the Building Envelope Campaign tool

Build Your Wall Assembly

The capacity of an insulating material to resist heat flow. The higher the R-value, the greater the insulating power.

1. What type of **Cladding**?

   - Painted Surface – Light: 0.1 in

2. What type of **Intermediate Material**?

   - Concrete blocks: 8 in
   - Sprayed Polyurethane Foam: Closed Cell: 3 in

3. What type of **Interior Cladding**?

   - Gypsum Board: 0.6 in

Submit  Cancel
### Building Components/Material Properties

Default values for “Existing Building” are based on estimate code at time of construction. Please change as found necessary.

#### Existing Building

<table>
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<tr>
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<tr>
<td>Window $U$-factor</td>
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<td></td>
</tr>
<tr>
<td>Window SHGC</td>
<td>0.39</td>
<td></td>
</tr>
</tbody>
</table>

*Click here to access R-value calculator.*

---

**Building Description**
- Building Type
- Climate
- Geometry

**Building Components**
- Material Properties

**Advanced Options**

**Review and acknowledge**
How to handle multiple façades?
Input data for the Building Envelope Campaign tool

\[
R_{\text{tot}} = \left( \frac{A_1}{A_{\text{tot}}} \frac{1}{R_1} + \frac{A_2}{A_{\text{tot}}} \frac{1}{R_2} + \ldots + \frac{A_n}{A_{\text{tot}}} \frac{1}{R_n} \right)^{-1}
\]

Area façade (1) = \( A_1 \)

\( R \)-value wall (1) = \( R_1 \)

Area façade (2) = \( A_2 \)

\( R \)-value wall (2) = \( R_2 \)
Input data for the Building Envelope Campaign tool

Building Description
- Building Type
- Climate
- Geometry

Building Components / Material Properties

Advanced Options

Review and acknowledge

Have you conducted a blower door test?
- Yes
- No

Building Airtightness Value

1.07 scfm/ft²

Have you taken any additional steps to improve the airtightness of your building?
- Yes
- No

A 10% improvement in airtightness has been assumed.
### Input data for the Building Envelope Campaign tool

#### Building Description
- Building Type
- Climate
- Geometry
- Building Components
- Material Properties

#### Advanced Options

**Would you like access to advanced inputs?**

Yes | No

<table>
<thead>
<tr>
<th>Advanced Options</th>
<th>Thermostat Setpoint Options</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Heating Setpoint</td>
</tr>
<tr>
<td></td>
<td>70.0 °F</td>
</tr>
<tr>
<td></td>
<td>Heating Setback</td>
</tr>
<tr>
<td></td>
<td>60.0 °F</td>
</tr>
</tbody>
</table>

Review and acknowledge

26
Input data for the Building Envelope Campaign tool

Review and acknowledge

Click ‘Yes’ here to indicate that you have reviewed the Security & Privacy Notice.

The information collected over the course of the campaign will be accessible only by the campaign team, and will only be published without identifying information and/or in aggregate (with the exception of case studies developed in partnership with the building owner/manager). Click ‘Yes’ to indicate that you agree to share your data.

Check Results  Save Building
### My Building

#### Existing Building

**Baseline**

- BEP $\text{kBtu}^2/\text{ft}^2$: 46.9
- Wall R-Value: 6.3
- Wall Facade Material: Light Painted Surface
- Roof R-Value: 18.8
- Roof Surface Material: Black Membrane
- Window U-Factor: 0.59
- Window SHGC: 0.39
- Air Leakage Rate $\text{scfm}^2/\text{ft}^2$: 1.07

#### Retrofit Improvements

- BEP $\text{kBtu}^2/\text{ft}^2$: 27.9
- Wall R-Value: 20
- Wall Facade Material: Light Painted Surface
- Roof R-Value: 30
- Roof Surface Material: Black Membrane
- Window U-Factor: 0.3
- Window SHGC: 0.39
- Air Leakage Rate $\text{scfm}^2/\text{ft}^2$: 0.96

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**Building Envelope Performance (BEP)**

Congratulations! you meet the requirements to receive the Retro 30 award.

### 41% Improvement
Building Envelope Performance Summary

Energy Performance Breakdown
Charts below indicate improvement potentials for various building characteristics. Improvements are displayed using the BEP-value together with award criteria.
Kristi Ennis, AIA
Principal/Director of Sustainable Design
do good work
enjoy the journey
<table>
<thead>
<tr>
<th>RANK/COMPANY</th>
<th>DOLLAR VOLUME³ ($ IN MILLIONS)</th>
<th>SQUARE FEET⁴ (IN MILLIONS)</th>
<th>PERCENTAGE OF WORK²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 HDR Architecture</td>
<td>$9,207.6</td>
<td>30.0</td>
<td>58%</td>
</tr>
<tr>
<td>2 Stantec Architecture</td>
<td>7,519.7</td>
<td>12.4</td>
<td>21%</td>
</tr>
<tr>
<td>3 AECOM</td>
<td>7,493.0</td>
<td>22.4</td>
<td>4%</td>
</tr>
<tr>
<td>4 CannonDesign</td>
<td>5,917.7</td>
<td>18.8</td>
<td>50%</td>
</tr>
<tr>
<td>5 HOK</td>
<td>6,973.4</td>
<td>10.7</td>
<td>38%</td>
</tr>
<tr>
<td>6 HKS</td>
<td>4,157.0</td>
<td>16.4</td>
<td>43%</td>
</tr>
<tr>
<td>7 NBBJ</td>
<td>3,475.0</td>
<td>5.4</td>
<td>45%</td>
</tr>
<tr>
<td>8 Perkins &amp; Will</td>
<td>2,996.1</td>
<td>7.4</td>
<td>24%</td>
</tr>
<tr>
<td>9 Kathryn Bang &amp; Partners Architects</td>
<td>2,730.7</td>
<td>4.8</td>
<td>100%</td>
</tr>
<tr>
<td>10 SmithGroup</td>
<td>2,367.6</td>
<td>9.4</td>
<td>34%</td>
</tr>
<tr>
<td>11 Leo A Daly</td>
<td>2,242.6</td>
<td>7.5</td>
<td>19%</td>
</tr>
<tr>
<td>12 HGA</td>
<td>1,551.8</td>
<td>2.8</td>
<td>50%</td>
</tr>
<tr>
<td>13 Earl Swensson Associates</td>
<td>1,375.5</td>
<td>4.3</td>
<td>75%</td>
</tr>
<tr>
<td>14 Page</td>
<td>978.0</td>
<td>1.9</td>
<td>35%</td>
</tr>
<tr>
<td>15 ZGF Architects</td>
<td>788.0</td>
<td>2.9</td>
<td>35%</td>
</tr>
<tr>
<td>16 Boulder Associates</td>
<td>764.8</td>
<td>1.9</td>
<td>100%</td>
</tr>
<tr>
<td>17 Flad Architects</td>
<td>655.4</td>
<td>1.3</td>
<td>38%</td>
</tr>
<tr>
<td>18 EwingCole</td>
<td>541.8</td>
<td>1.2</td>
<td>36%</td>
</tr>
</tbody>
</table>
Broad Industry Engagement

▪ Access technical expertise regarding envelope technologies
▪ Partner with the BEC technical team to spread the word about the campaign
▪ Gain recognition through the BEC website

Participants

▪ Access campaign resources and technical expertise in evaluating envelope options
▪ Stay informed on envelope technologies and resources produced through the campaign
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Projects completed since January 2019 are eligible to submit
BCH Lafayette Community Medical Center MOB 2

- Medical Office Building in Lafayette, CO
- 30,000 s.f., 2-story New Construction
- Built in 2019
- Climate Zone 5B
- Tenants include:
  - Colorado Retina Eye Clinic
  - Premier Eye Ambulatory Surgery Center
Hybrid Vacuum Insulated Glass

Composition:
- 6 mm clear
- ½” airspace
- VIG (4mm SNX 62/27 Clear (#4) over 4 mm clear)
- 6 mm SNX 62/27 (#2) clear
- ½” airspace
- VIG (4mm SNX 62/27 Clear (#4) over 4 mm clear)
Community Medical Center Lafayette MOB
BCH Lafayette Community Medical Center MOB 2
Community Medical Center MOB 2

Building Code
Baseline

- BEP kBtu/ft^2: 20.1
- Wall R-Value: 17.3
- Wall Facade Material: Stucco
- Roof R-Value: 30.5
- Roof Surface Material: Black Membrane
- Window U-Factor: 0.52
- Window SHGC: 0.34
- Air Leakage Rate scfm/ft^2: 0.4

New Building Improvements

- BEP kBtu/ft^2: 10.8
- Wall R-Value: 19.2
- Wall Facade Material: Brick
- Roof R-Value: 31.3
- Roof Surface Material: Gray Membrane
- Window U-Factor: 0.14
- Window SHGC: 0.19
- Air Leakage Rate scfm/ft^2: 0.4

Building Envelope Performance (BEP)
Congratulations! you meet the requirements to receive the Novel 40 award.

46% Improvement
Energy Performance Breakdown

Charts below indicate improvement potentials for various building characteristics. Improvements are displayed using the BEP-value together with award criteria.
ec.ornl.gov says

Your building has been submitted, thank you.

OK
Community Medical Center Lafayette MOB

**Broad Industry Engagement**
- Access technical expertise regarding envelope technologies
- Partner with the BEC technical team to spread the word about the campaign
- Gain recognition through the BEC website

**Participants**
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- Stay informed on envelope technologies and resources produced through the campaign
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Projects completed since January 2019 are eligible to submit.
Poll 2
Thank you to our Organizers!

The American Institute of Architects

IFMA
International Facility Management Association

IBEC
International Institute of Building Enclosure Consultants
Thank you!

- Hayley McLeod, ORNL, mcleodhd@ornl.gov
- Simon Pallin, ORNL, pallinsb@ornl.gov
- EC.ORNLE.GOV, envelopecampaign@ornl.gov