OCCUPANT ENGAGEMENT IN ACHIEVING NET ZERO

GETTING TO ZERO NATIONAL FORUM

18 APRIL 2018
Why Occupant Engagement is Important
King Open/Cambridge St Upper School & Community Complex
Cambridge Net Zero Policy

Net Zero Emissions

Lead by example

No combustion on site. Building systems fully electric.
Project Overview

• Two Schools, Public Library, Community Programs, Outdoor Pool, & District Administration

• 270,000 sf

• 4 stories

• High hours of operation
Energy Reduction Strategies

- Geothermal Heat Pumps
- Displacement Ventilation
- DOAS
- LED Lighting & Low LPDs
- Daylight controls
- User Engagement
TYPICAL K-8 School

KOCSUS Geothermal & Efficient MEP Systems

KOCSUS Occupant Engagement

PV Generation

EUI (Energy Use Intensity)
Occupant Energy Impact:
27% Full Occupant Impact
69% Partial Occupant Impact
KOCSUS ENERGY BY END USE

- Lighting: 9%
- Space Heating: 36%
- Space Cooling: 11%
- Equipment: 18%
- Water Heating: 8%
- Ventilation: 8%
- Other: 10%

King Open and Cambridge Street Upper School Energy By End Use

- Lighting: 17%
- Space Heating: 9%
- Space Cooling: 13%
- Equipment: 27%
- Water Heating: 1%
- Ventilation: 29%
- Other: 4%

Occupant Energy Impact:

- Full Occupant Impact: 69%
- Partial Occupant Impact: 27%
Step 1: Plan
Step 2: Educate
Step 3–5: Know, Ask, Listen
Step 6: Respond
Step 7: Prioritize
Step 8: Repeat

Engagement Process
Step 1: Plan
Schematic Design
- Establish NZE Champions Group
- NZE Champions Workshop
- Surveys of existing building conditions

Design Development & Construction Docs
- Meet with NZE Champions group in each phase to discuss design as it develops

Feasibility Phase
- A/E team bootcamp
- User meetings with all groups
- Collect usage data (schedules, equipment, etc)

Construction
- Workshop with all staff and students start to get used to what to expect
- Training before move-in

Post Occupancy
- Operations Manual: user cards, phone app
- Curriculum incorporation
- Yearly training
Step 3–5: Know, Ask, Listen
Know Your Occupants

Teachers

Students

Administration

Public
Know Your Occupants

- Teachers
- Students
- Administration
- Public
Know Occupant Choices

- Schedule
- Temperature
- Lighting
- Glare
- Equipment (plug loads)
Know How Occupants Think?

**Schedule:** I come in at time X and I leave at Y

**Temperature:** I am usually (hot)(cold)(ok)

**Lighting:** I like it (bright)(dark)(no preference)

**Glare:** I will (complain)(suffer in silence)

**Equipment:**
- I MUST have (computer, laptop, mobile phone, lamp, fan, space heater)
- I would like to have (radio, space heater, fan, personal coffee maker, (insert ridiculous request here))
Know How Occupants Think?

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What do Occupants Want?

A comfortable space
Available whenever they want to be there
With all the equipment they need
What does the Owner Want?

- The project to use less energy
- Happy occupants
- Easy to maintain systems and controls
How to Get Information

**Ask** for their help and ideas.

**Listen** to their ideas. Don’t come at them with already developed solutions before you even know them or their needs and challenges.

Be flexible and don’t be pushy.

If you think they are being stubborn keep asking why that item is important. Get to the heart of the issue then solve the real challenge with the least possible energy.
ONE REASON PEOPLE RESIST CHANGE IS BECAUSE THEY FOCUS ON WHAT THEY HAVE TO GIVE UP, INSTEAD OF WHAT THEY HAVE TO GAIN.

Keys to Success

- Occupants make or break the energy use
- It is not about what they have to give up, it is about getting the same thing (or better!) in a different way
- Do not pressure them to agree to something. If they do not really buy in, they will not stick with it after they move in.
- For Net Zero, our models are only best guess predictions, so be accurate, not optimistic!
Step 6: Respond

Step 7: Prioritize

1 2 3

Step 8: Repeat
### Prioritize

#### Plan for Temperature Controls Based on Survey Results

**Thermostat Locations:**
Each private office will have a thermostat. Open office areas will have a thermostat per open area grouping.

**Temperature Range:**
The temperature range will be set to the following: Summer: 74 deg. Winter: 68 deg. Thermostats will allow +/- 2 deg.

**Humidity:**
The system will remove humidity in the summer to make sure the relative humidity is no higher than 60%. Lower humidity will help the building feel cooler.

**Windows:**
The windows will not open in the building. Open windows mess up the thermostats and humidity control. If the heating/cooling system is still running, they also result in wasted energy. Shading will be provided on the windows to prevent extra heat from the sun during the summer. This will help keep spaces cooler too.

**After Hours:**
There will be override switches for each heating/cooling unit and they will need to be activated by zone. Overrides will provide heating and cooling for a period of 1 hour each time it is activated.

### Respond

#### How We Feel

<table>
<thead>
<tr>
<th>Theme</th>
<th>Question</th>
<th>Overall Summary Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>How We Feel</td>
<td>Currently how comfortable are you?</td>
<td>55% Mostly comfortable</td>
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<tr>
<td></td>
<td></td>
<td>45% Often uncomfortable</td>
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<td></td>
<td>Comfort By Season</td>
<td>Summer: 38% are comfortable</td>
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<td></td>
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<td>Spring: 56% are comfortable</td>
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<td></td>
<td></td>
<td>Winter: 48% comfortable</td>
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<td></td>
<td>Impact of Humidity</td>
<td>On average higher humidity makes us feel hotter</td>
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<tr>
<td></td>
<td>How Often do you change your thermostat?</td>
<td>58% change it at least 1 time per day</td>
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<tr>
<td>How We Get Comfortable</td>
<td>Where do you set your thermostat</td>
<td>Summer: 68-72.5 average range</td>
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<tr>
<td></td>
<td></td>
<td>Winter: 66.5-71.5 average range</td>
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<tr>
<td></td>
<td>Opening windows</td>
<td>55% open windows for temperature control</td>
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<td>57% only leave them open for a few hours</td>
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<td>Varying clothing</td>
<td>Most occupants vary their clothing to stay comfortable</td>
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<td></td>
<td>However in summer, 22% are still too hot</td>
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<td>Other means of temperature control</td>
<td>52% use other means to be more comfortable. These are split between warming up and cooling down.</td>
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<td>After Hours</td>
<td>When do you work after hours and what kind of temperature control do you expect?</td>
<td>Most off hours are worked on weekday evenings</td>
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<td>While 50% are ok with no heat/cool during this time, 35% would prefer to have an override for temporary control</td>
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KOCSUS Engagement Process & Design Strategies
Engagement Process

- On-site observation
- Storytelling
- Imagine your new space
Engagement Process
Net Zero Champions Workshop

EDUCATE

ASK

LISTEN
KOCSUS Strategy

School Hours vs Community Use

13.6% energy savings
KOCSUS Strategy

Temperature Range (Set Point)

2% energy savings
KOCSUS Strategy

Shared Staff Team Rooms

• Designed to Support Positive User Behavior.

• Creates an environment that encourages team collaboration.

• Centralized to reduce office & kitchen equipment.

7% energy savings
KOCSUS Strategy

Centralized Copy Rooms

- Allows for flexible work flow
- Creates an environment that encourages collaboration.
- Centralizes print/copy rooms to reduce equipment. Located so that they are equidistant.
KOCSUS Strategy

Get Users To Utilize Controls

- Locate system controls for ease of use
- Balance manual and automatic controls
- Include appropriate metering