



# Energy Trust of Oregon Panel Discussion


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April 16, 2019

A scenic landscape featuring a red rectangular text box in the center. The background shows a vast mountain range under a blue sky with wispy clouds and several white contrails. The foreground is filled with dense green trees, including evergreens and deciduous trees. The overall scene is bright and clear, suggesting a sunny day.


# Things to Consider





# Patriot Hall - Approach

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- Preserve historic structure from 1921
  - Update building to a 700 person gymnasium + fitness spaces and classrooms
  - Daylighting, natural ventilation, renewable energy and energy studies
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# Sustainable Schools

## Issues to Consider

- Simplicity
- Maintainability
- Lower operating expenses
- Acoustics
- Comfortable learning
- Early design collaboration
- Early modeling and costing
- Passive classrooms
- Fully conditioned other areas
- Occupant control

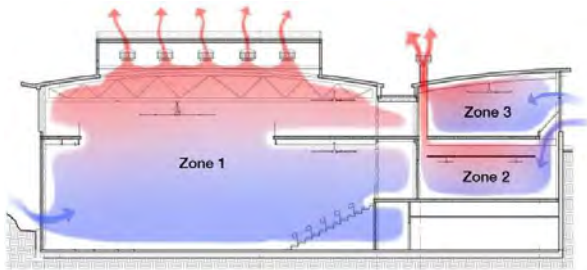




An aerial photograph of a winding asphalt road cutting through a dense, lush green forest. The road curves from the top center towards the bottom left. Several cars are visible on the road, including a white car, a blue car, and a dark car. A prominent red rectangular box is overlaid horizontally across the center of the image, containing the text "Project Approach" in white, sans-serif font.

# Project Approach





Key

- Zone 1
- Zone 2
- Zone 3
- Incoming outside air
- ↻ Stack exhaust location

Figure 5. Building section illustrates recommended air flow from zone inlets to outlets

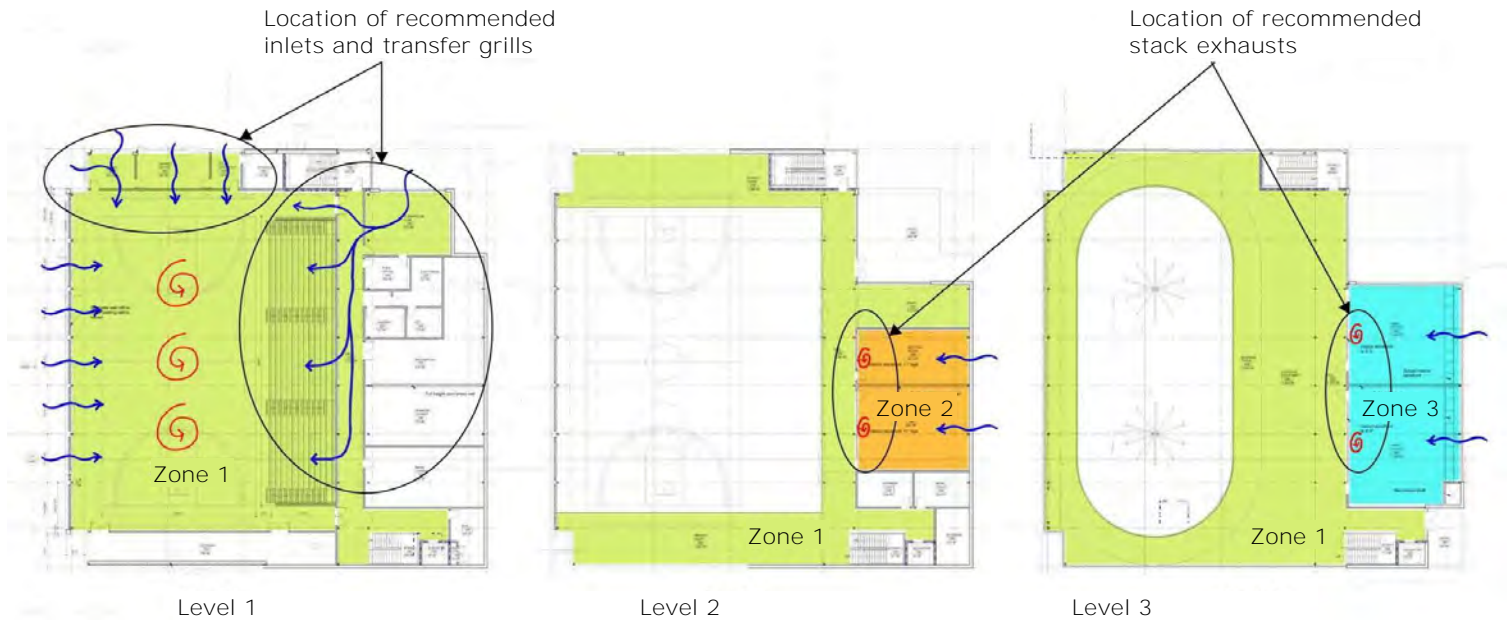


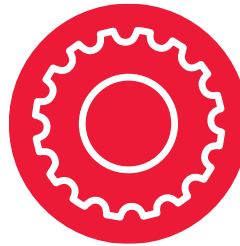
Figure 4. Stack ventilation zones and recommended air flow

# Best Project Approach

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Set Aggressive Goals



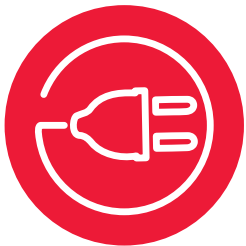
Choose Efficient Systems



Analyze the Climate



Opt for Renewables



Reduce Loads



Verify Performance

# Set Aggressive Goals

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LIVING  
BUILDING  
CHALLENGE<sup>SM</sup>



MINERGIE-P<sup>®</sup>

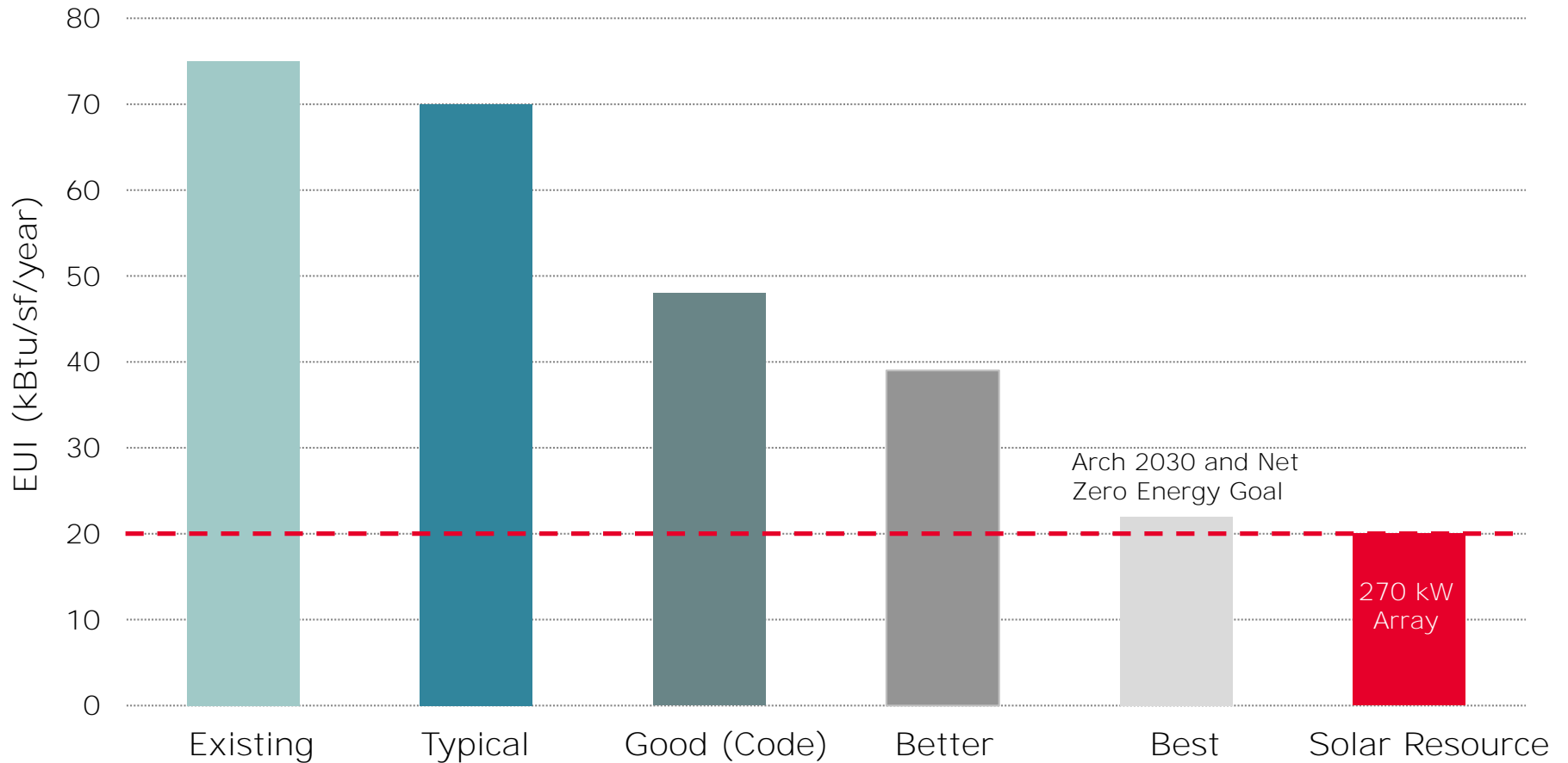




# Goal Setting

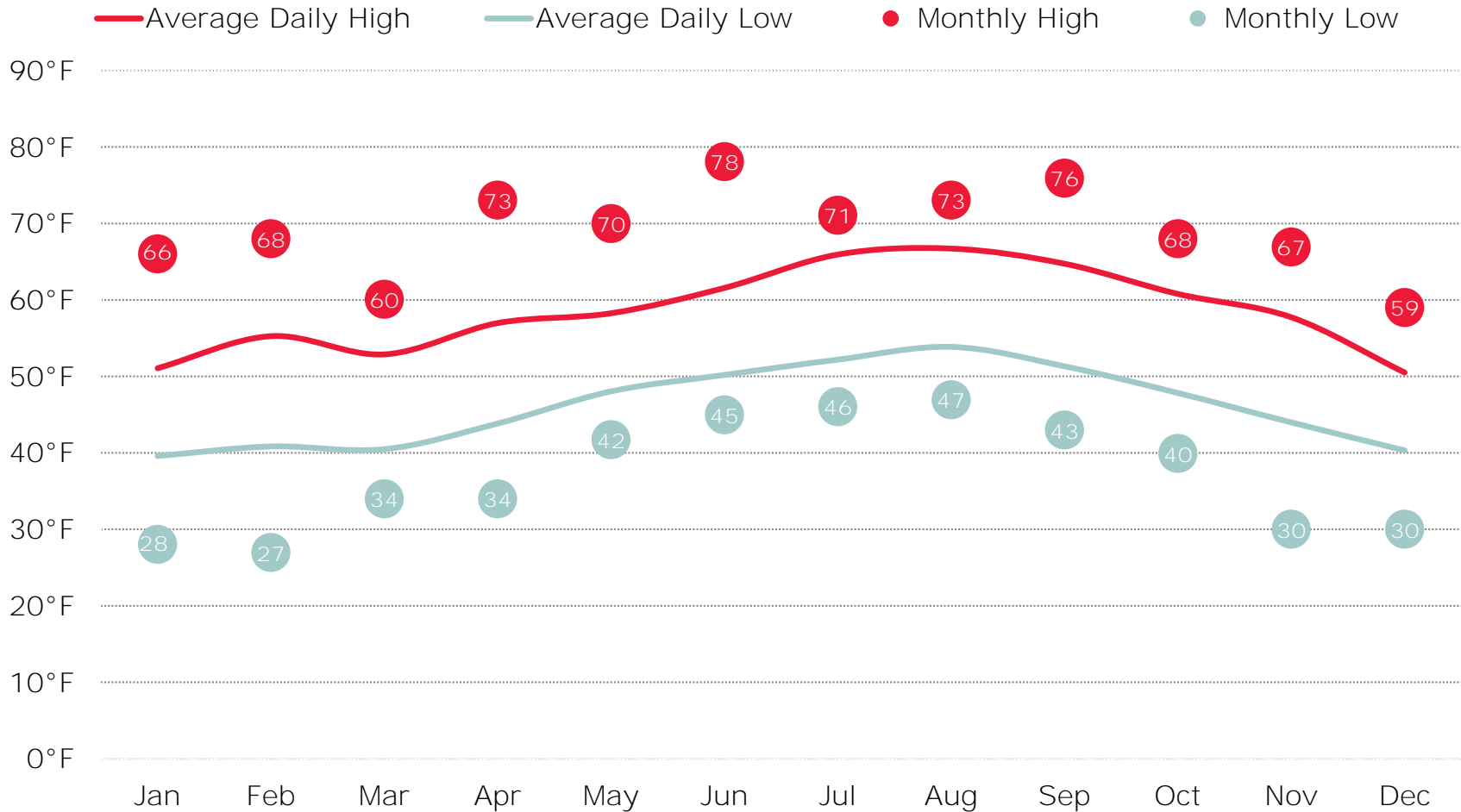
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## Energy Use Goal Setting and Solar Resource



# Climate Analysis – Average Monthly Temps

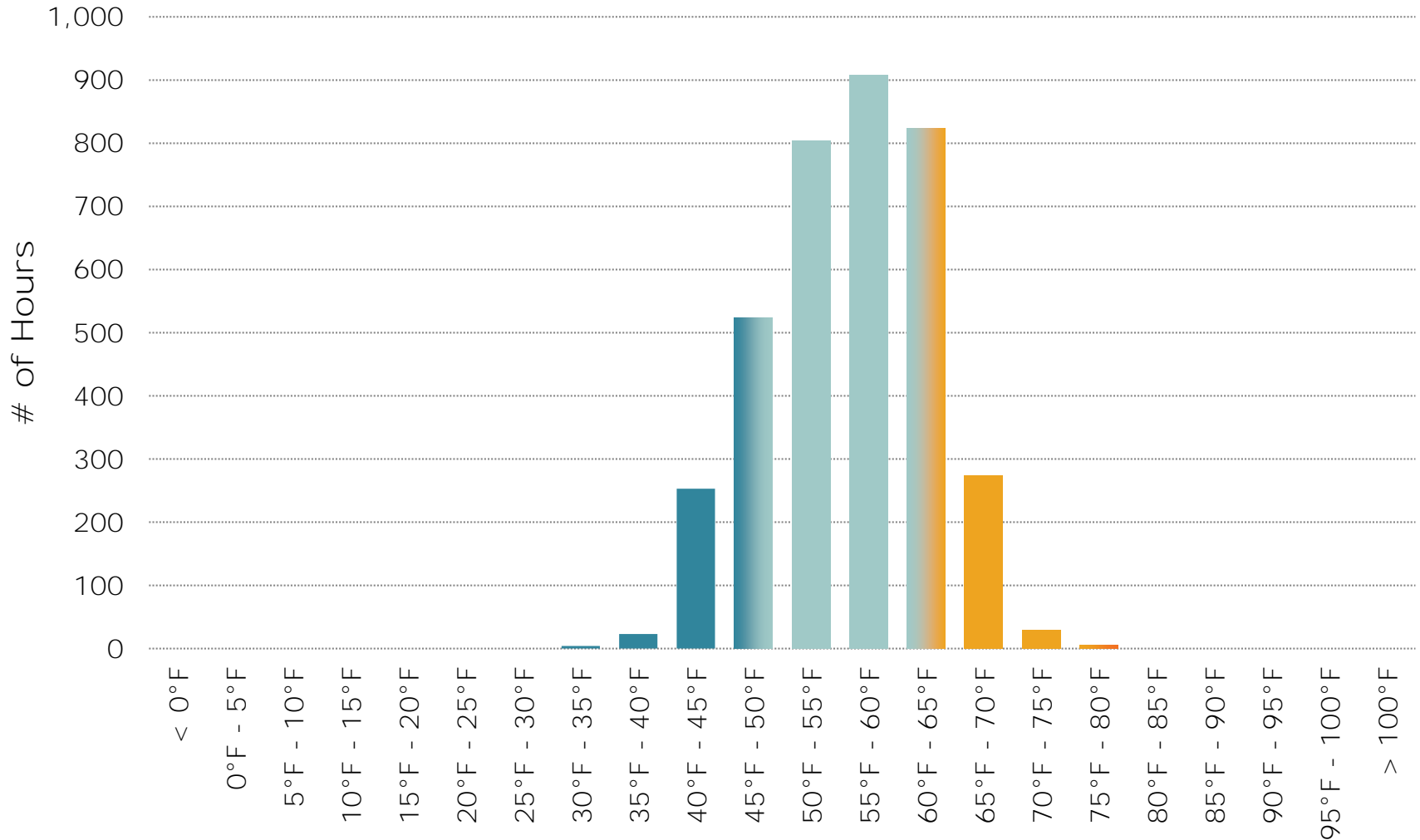
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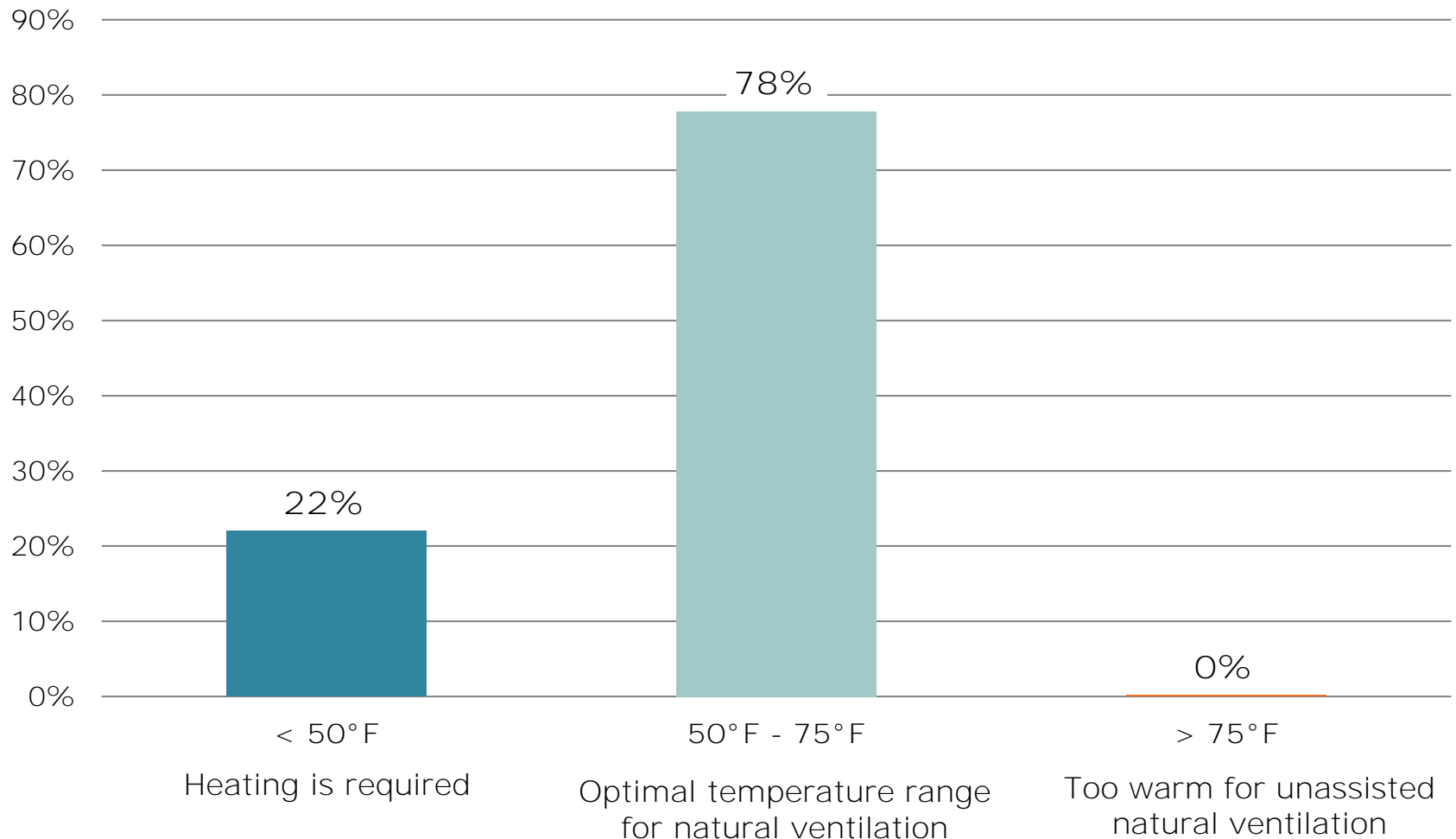
# Climate Analysis – Daytime Temperature BINS

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# Climate Analysis – Passive Cooling Effectiveness

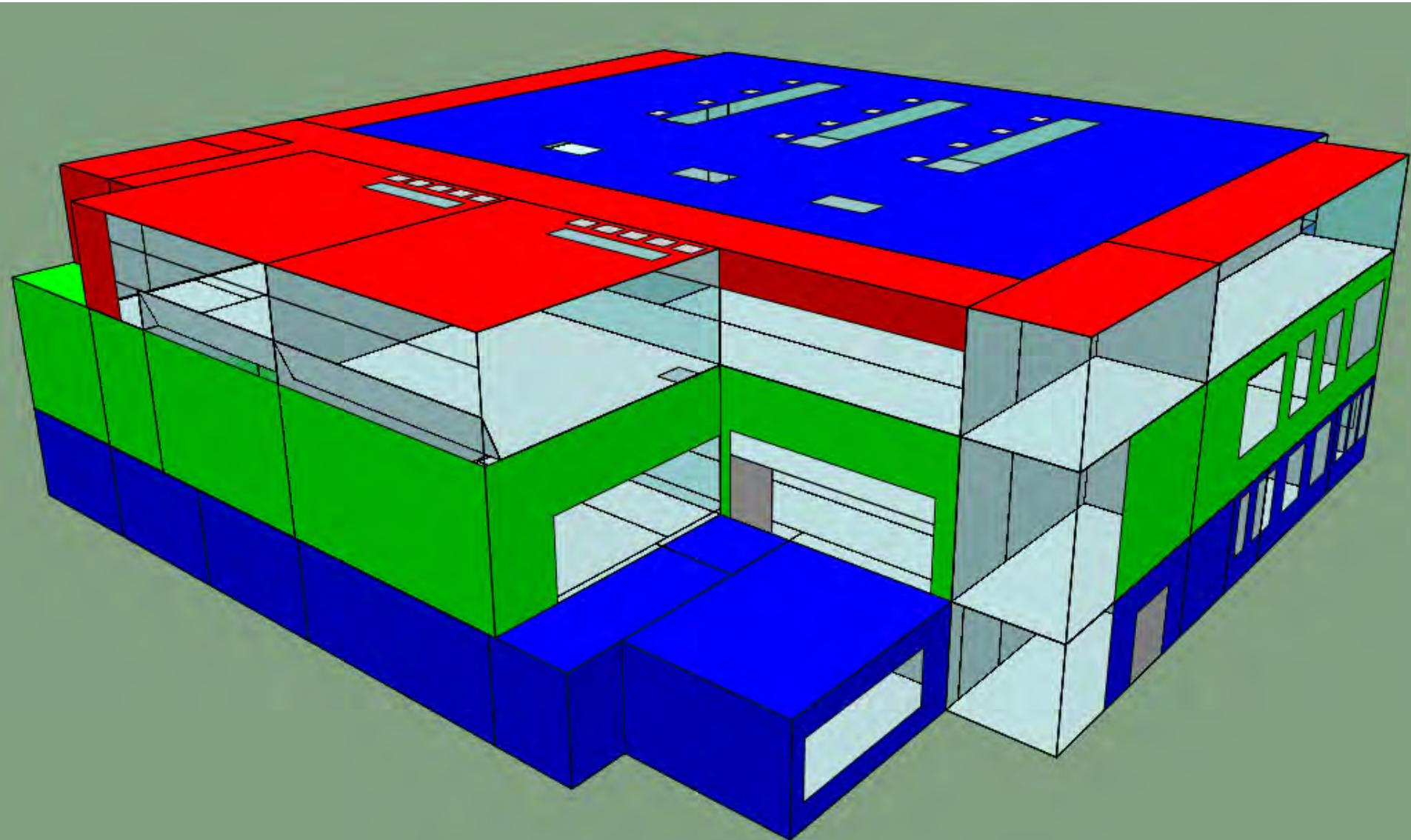
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# Energy Efficiency Measures

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# Energy Modeling

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- Used to develop and test design
- Evolved in step with design
- Used sounding board to push for design revision as needed
- Used to understand the heating and cooling loads
- Used to iteratively test design strategies that reduce loads to validate passive design solutions (insulation, mass, natural ventilation, daylighting)



# Efficiency Measures

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- Ventilation via dedicated outside air system, assisted by operable windows/ceiling fans
- Radiant heating system
- LED lighting with daylight and occupancy control
- Tinted glazing to reduce solar gains
- Solar thermal system for service hot water







# Preliminary Daylighting Analysis







Figure 1. Level 1. Court level. Daylight factor measurements taken at the equivalent of a 16 by 16 ft. grid offset by 8 ft. from the east-west grid lines as drawn to provide readings at the center of each bay.



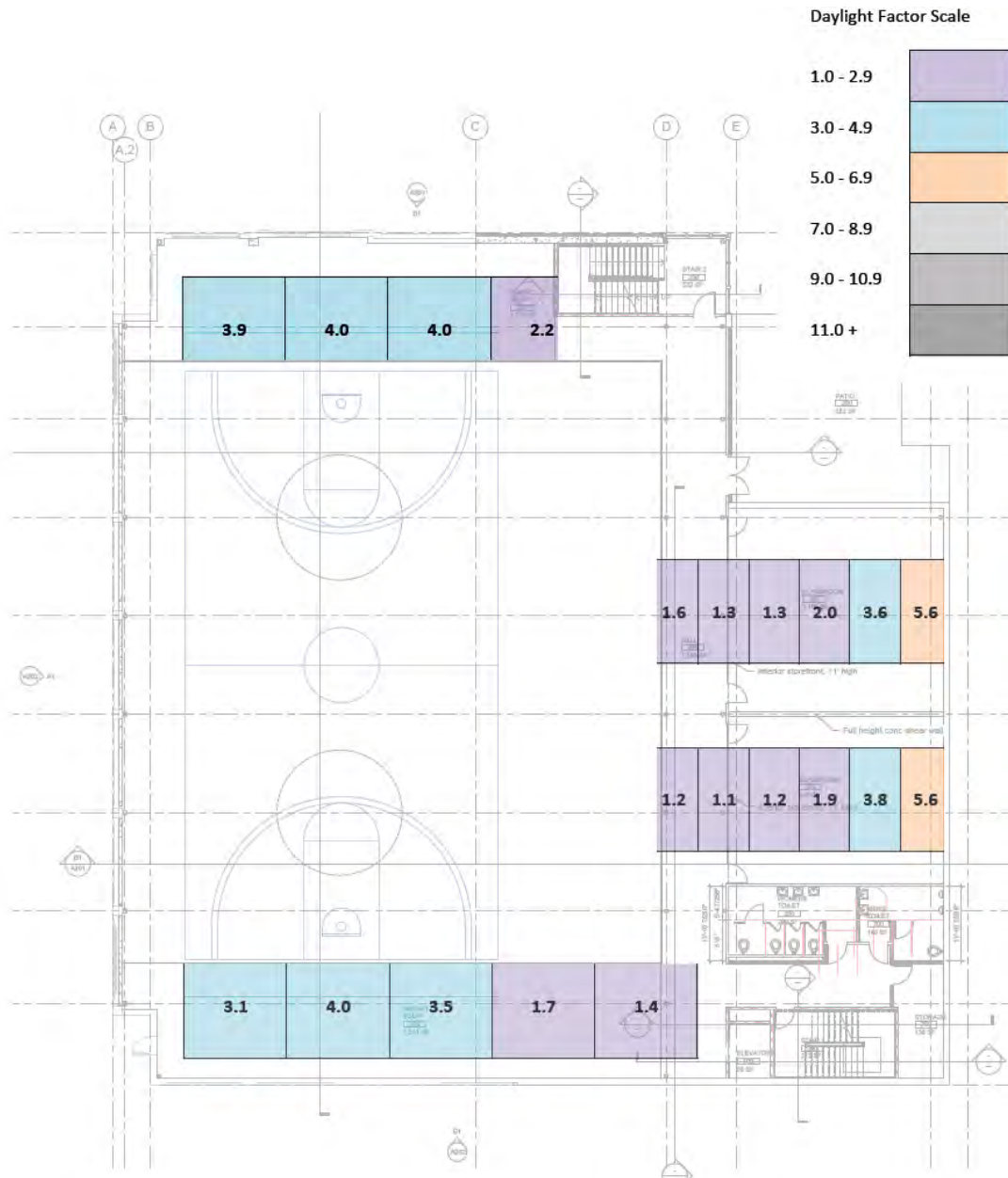


Figure 2. Level 2. Daylight factor measurements taken along the north and south areas overlooking the court at the equivalent distance of 5 1/2 ft. from the railing, and at an interval of 16 ft. between measurements. Readings were also made along the center line of each classroom extending out into the gym at 8 ft. intervals.

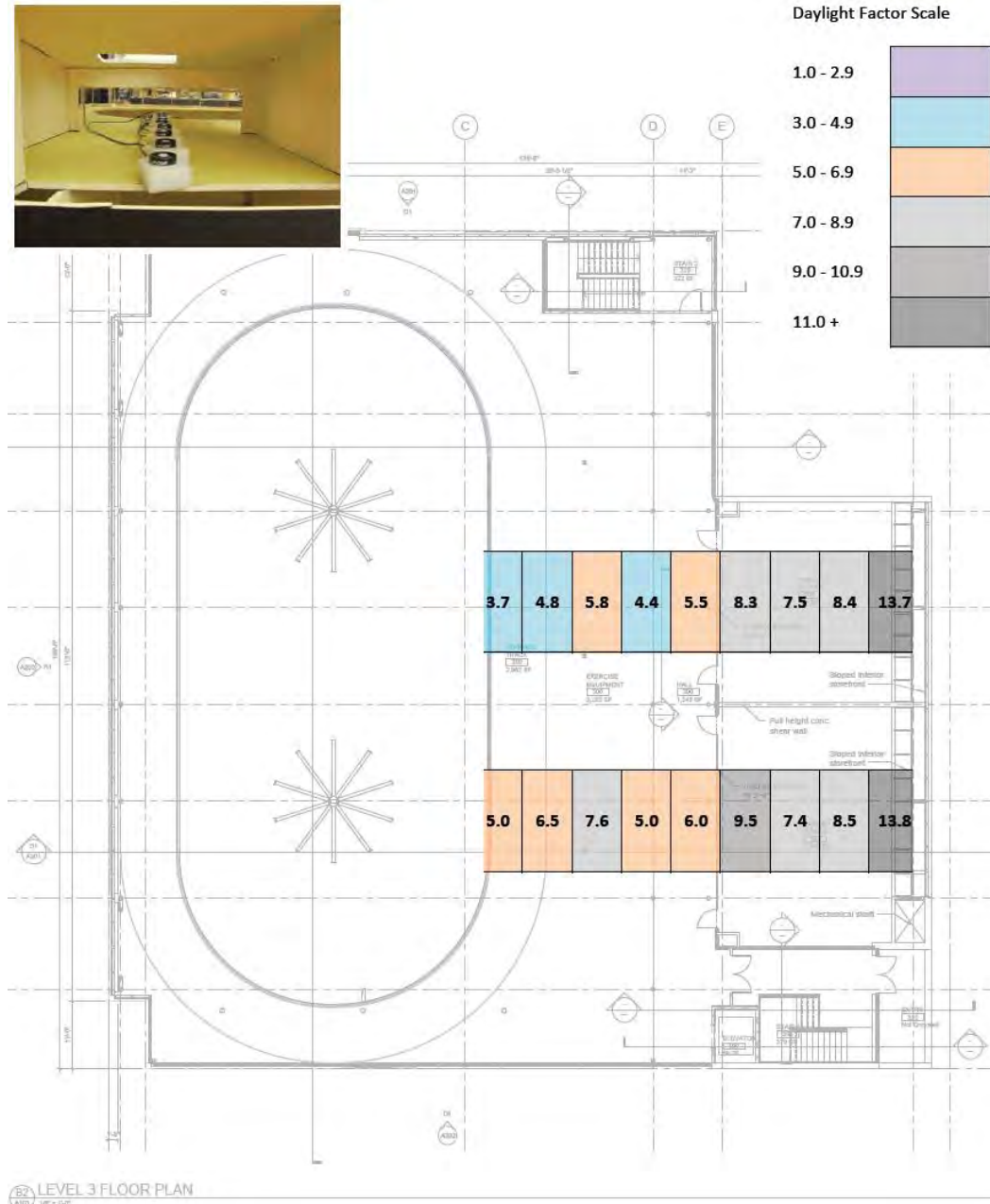
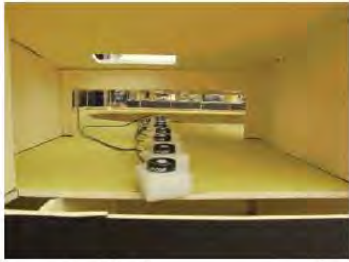


Figure 3. Level 3. Daylight factor measurements taken along the center line of each studio space at the equivalent of 8 ft. intervals from the window wall and extending out to the track.

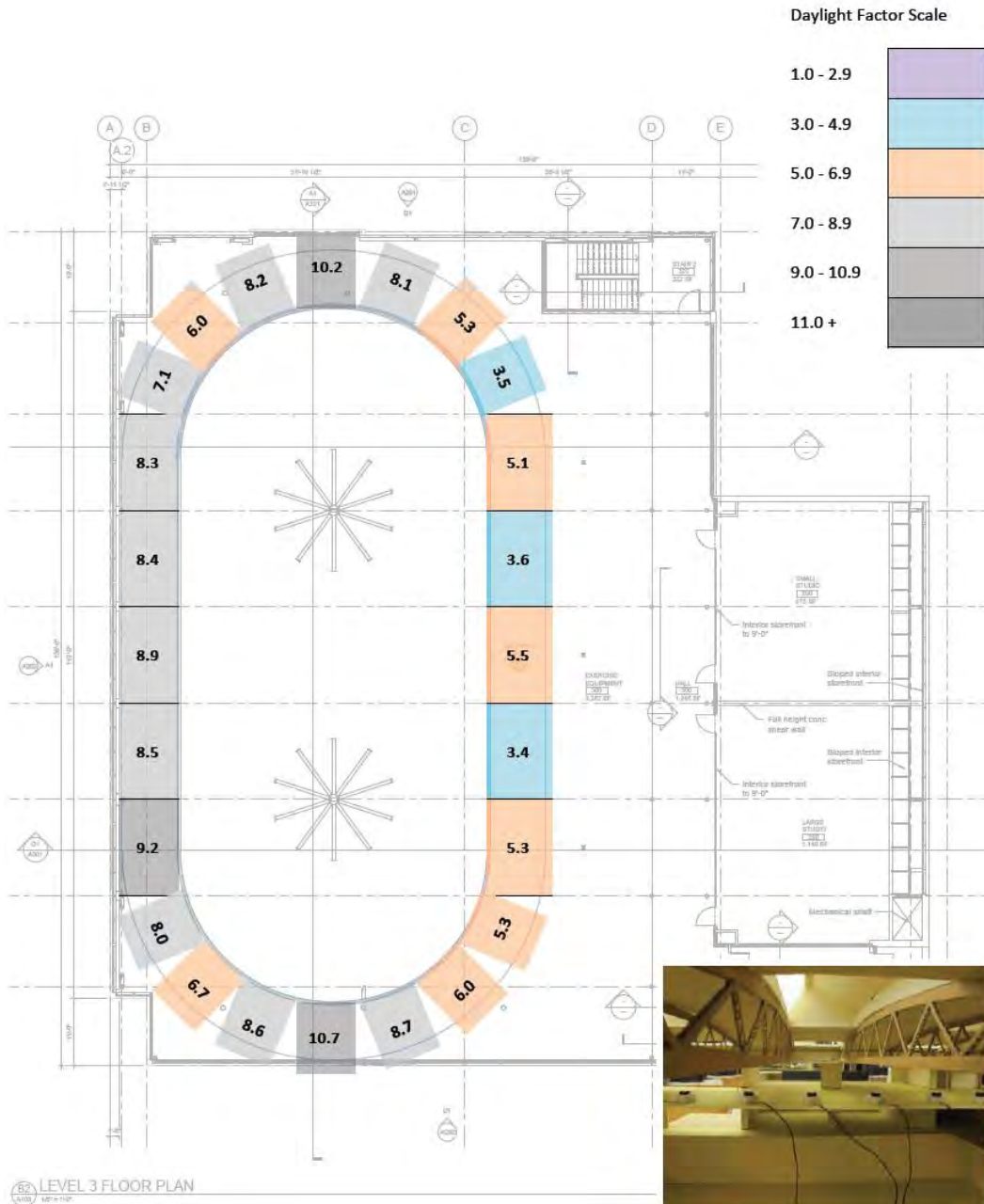


Figure 4. Level 3. Daylight factor measurements taken around the track at the equivalent of 5 1/2 ft. from the railing, or half the distance between the railing and the west wall. The interval between measurements along the straightaways is the equivalent of 16 ft.



# Silkscreen Glazing Performance by Color [Double, Low-E, Air]

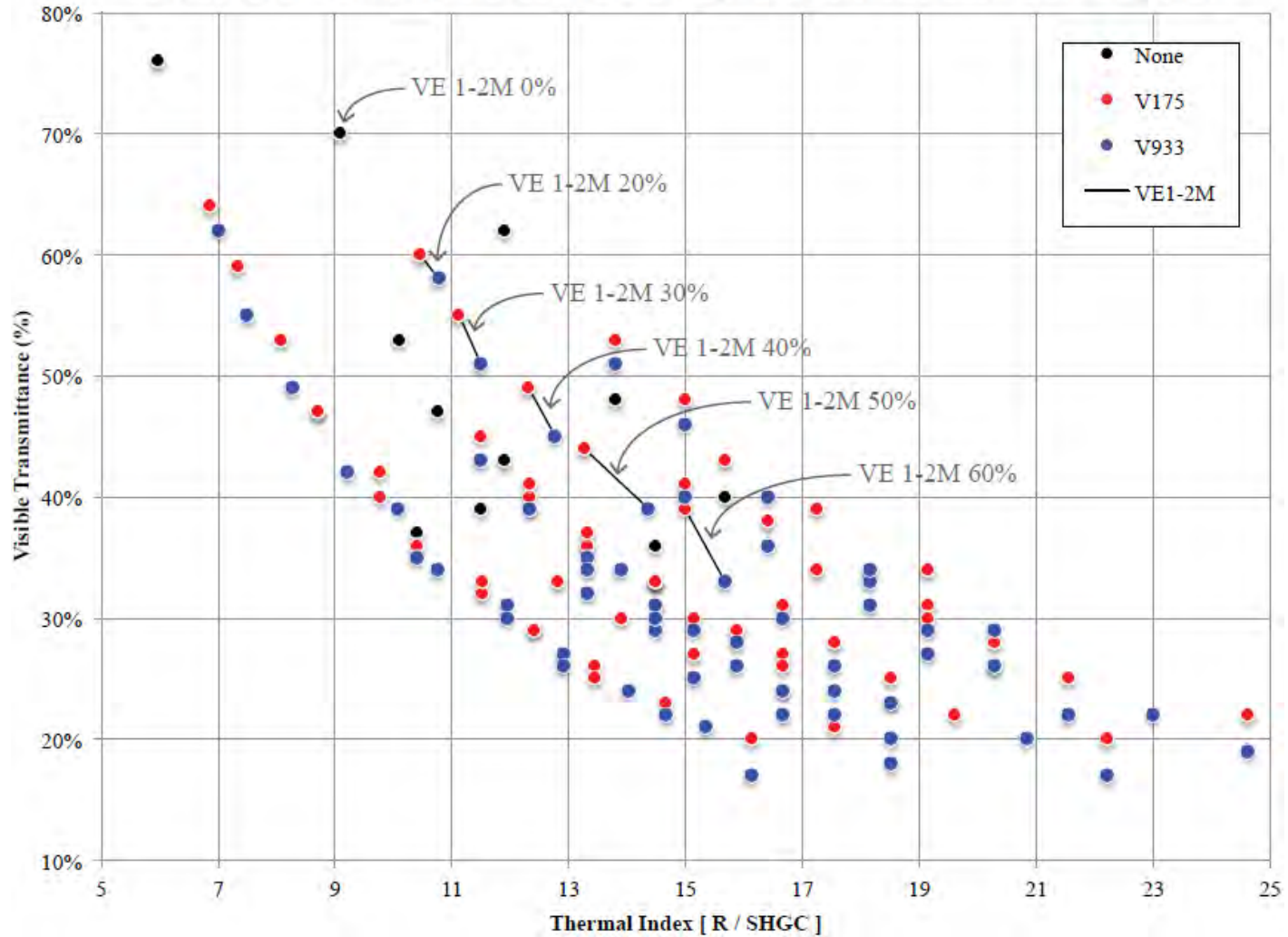


Figure 1. Silk-screen glazing performance displayed by ceramic frit color: white - V175, warm gray - V933, and no frit.

## Silkscreen Glazing Performance by Coverage [Double, Low-E, Air]

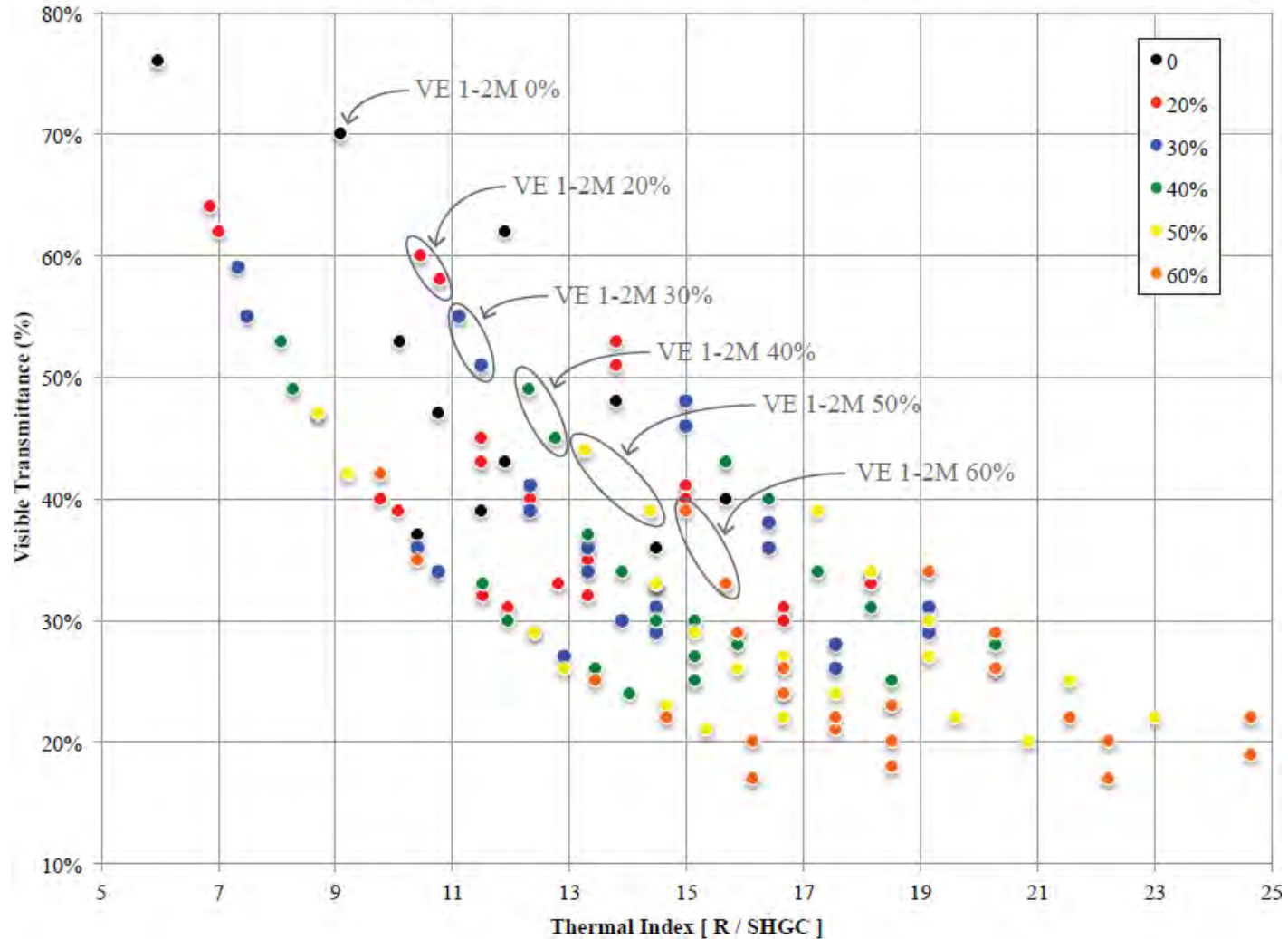


Figure 2. Silk-screen glazing performance displayed by ceramic frit coverage percentage.

## Silkscreen Glazing Performance by Product [Double, Low-E, Air]

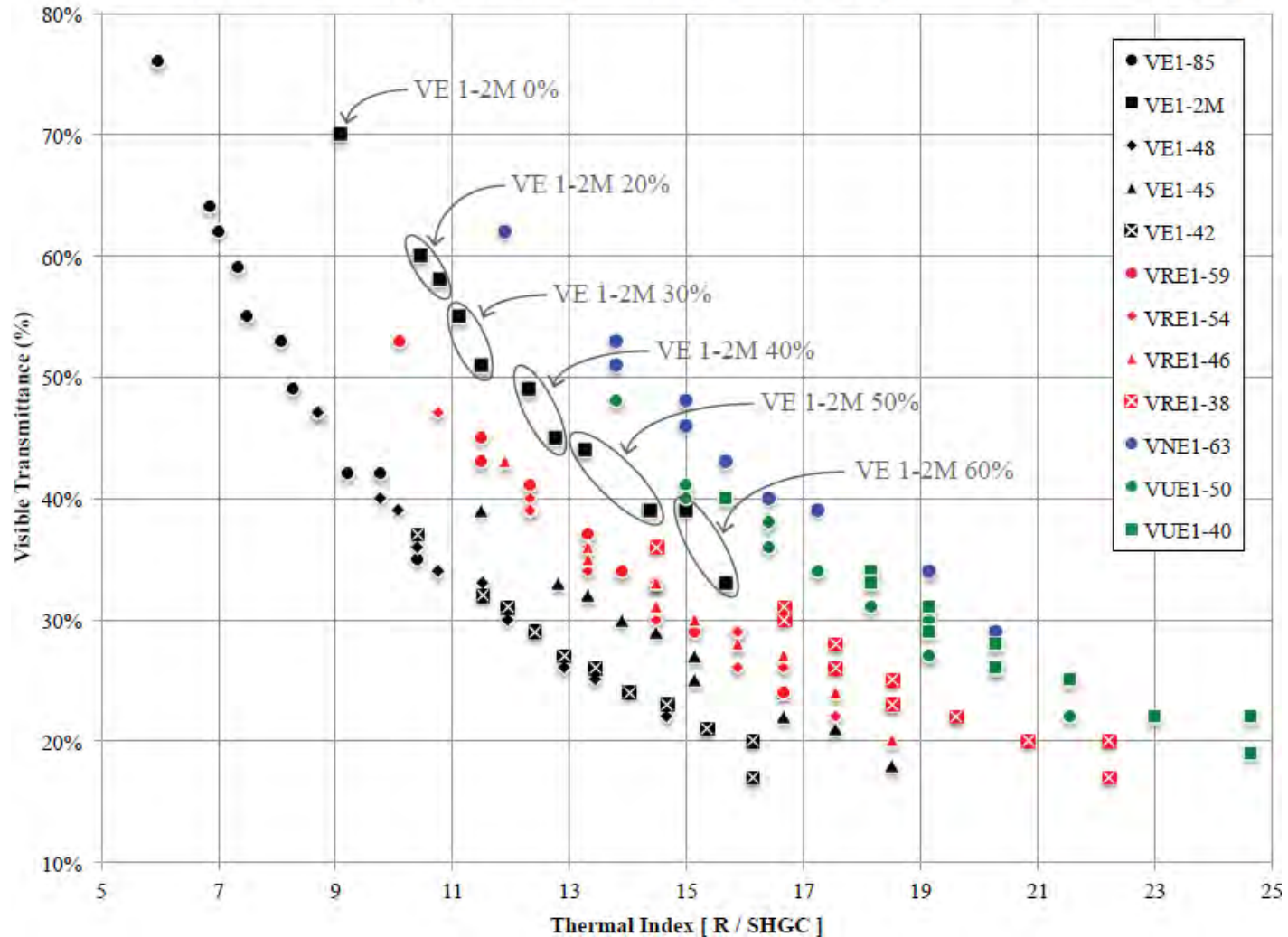
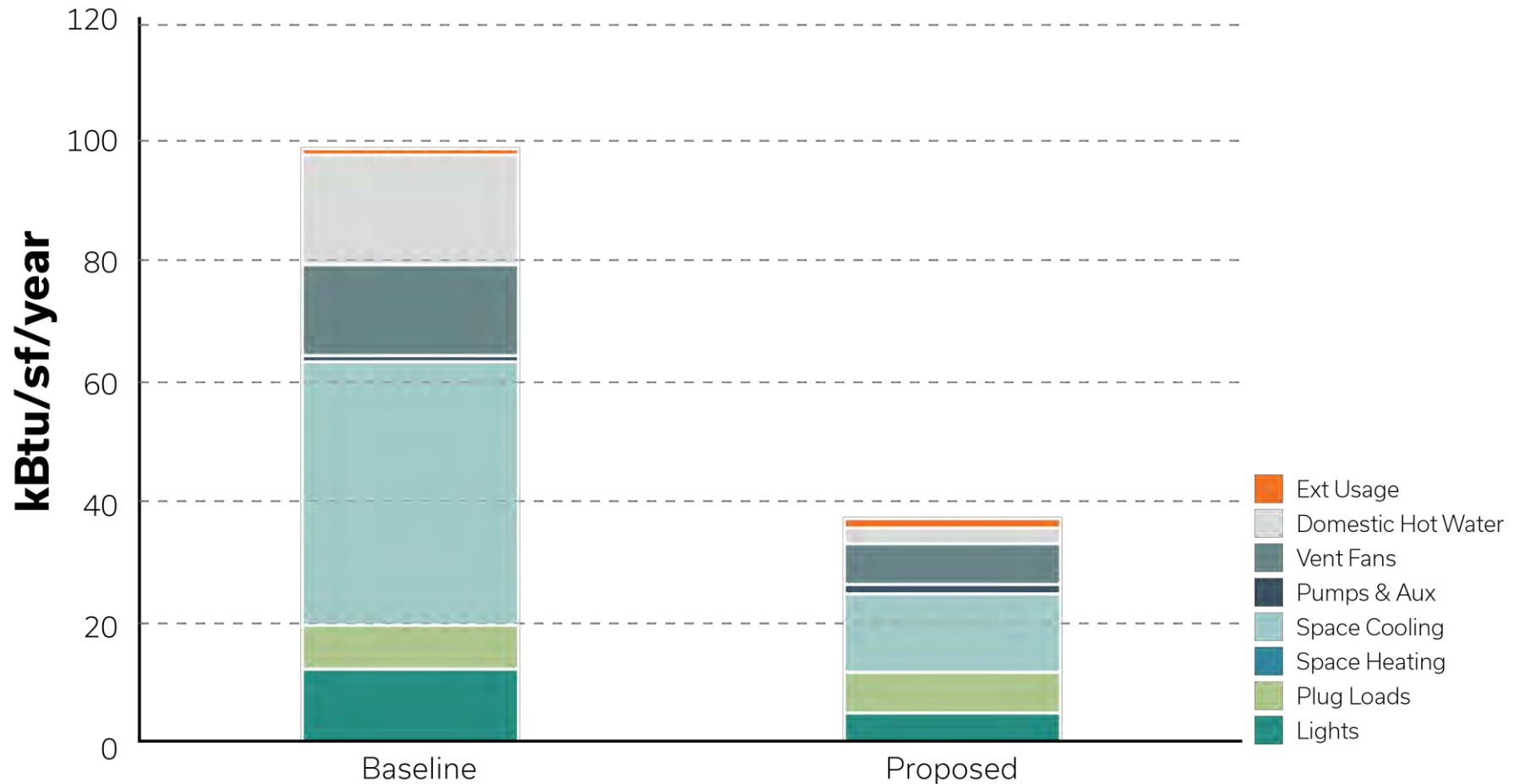


Figure 3. Silk-screen glazing performance displayed by four glazing series (marker color) and twelve glazing products (marker color & symbol).



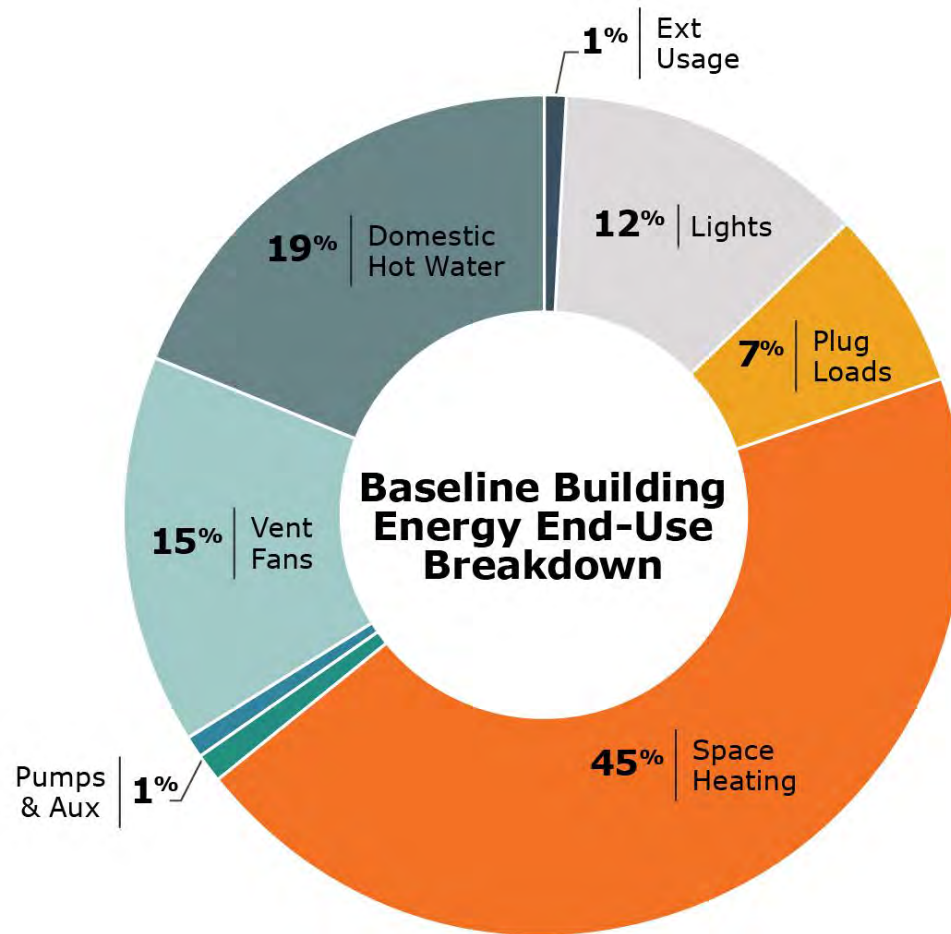
# Energy Modeled Performance

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# Baseline Building Energy Use

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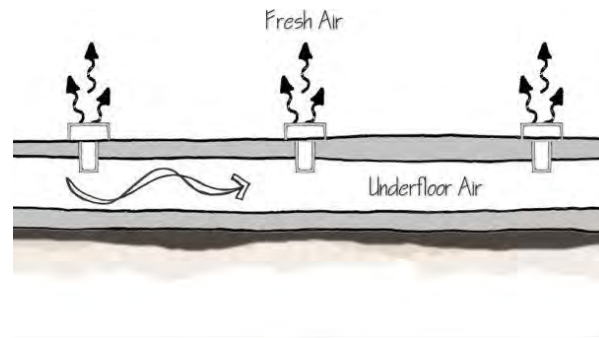


# Choose Efficient Systems

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Radiant Floor



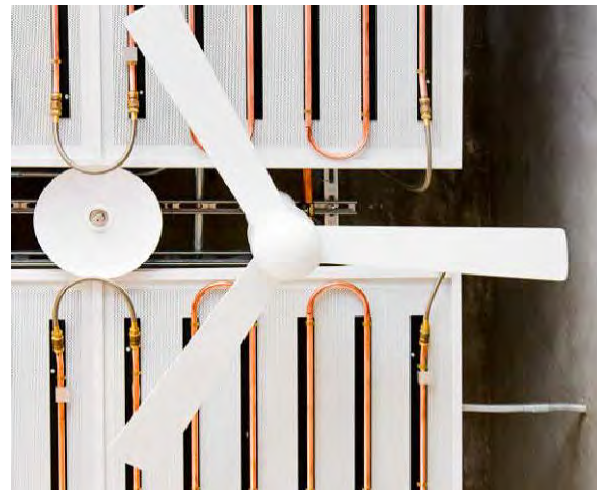
Underfloor Air



Natural Ventilation



Geothermal



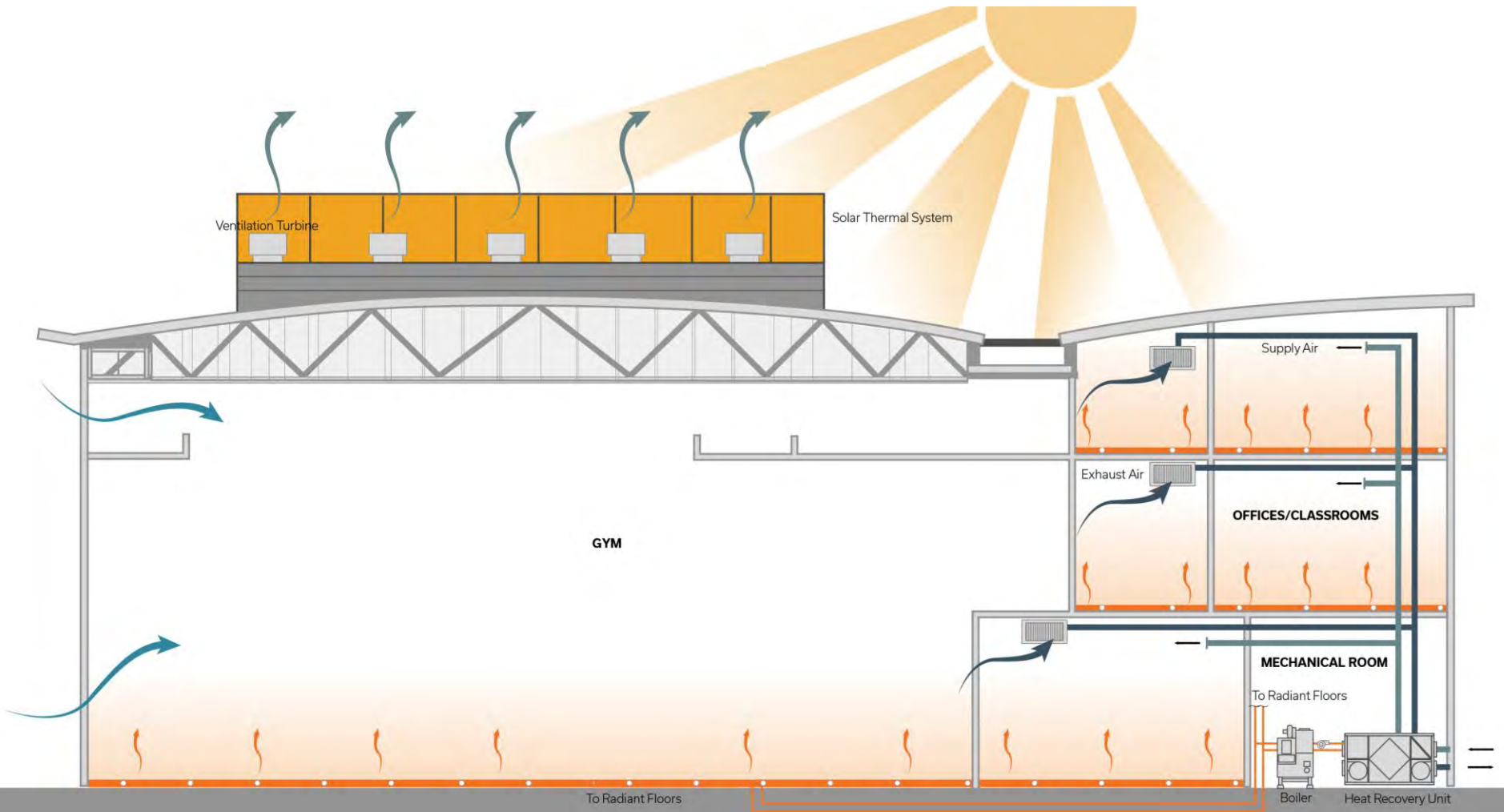
Radiant Ceilings



VRF



# Opt for Renewables



# Verify Performance

Clatsop CC Patriot Hall - EUI Benchmarking

