BUILDINGENERGY BOSTON

Deep Dive: Designing a High-Performance Pool and Community Center in Boston

Brett Bentson, Utile
Petra Jarolimova, Utile
Niles Tooher, RFS Engineering

Curated by Tammy Ngo and Yossi Bronsnick

Northeast Sustainable Energy Association (NESEA) | March 23, 2026

Deep Dive: Designing a High-Performance Pool and Community Center in Boston

NESEA BuildingEnergy Boston 2026

utile

March 23rd, 2026

Who We Are & Agenda

Agenda

1. Community Centers in Boston and Dorchester Neighborhood Study
2. The Building and Goals
3. Interior and Exterior Building Envelopes
4. Interior Environment
5. Building Systems
6. Joy in the Details

Brett Bentson
Principal, Utile

Petra Jarolimova
Senior Associate, Utile

Niles Tooher
Director of High Performance Building Systems, RFS

Client

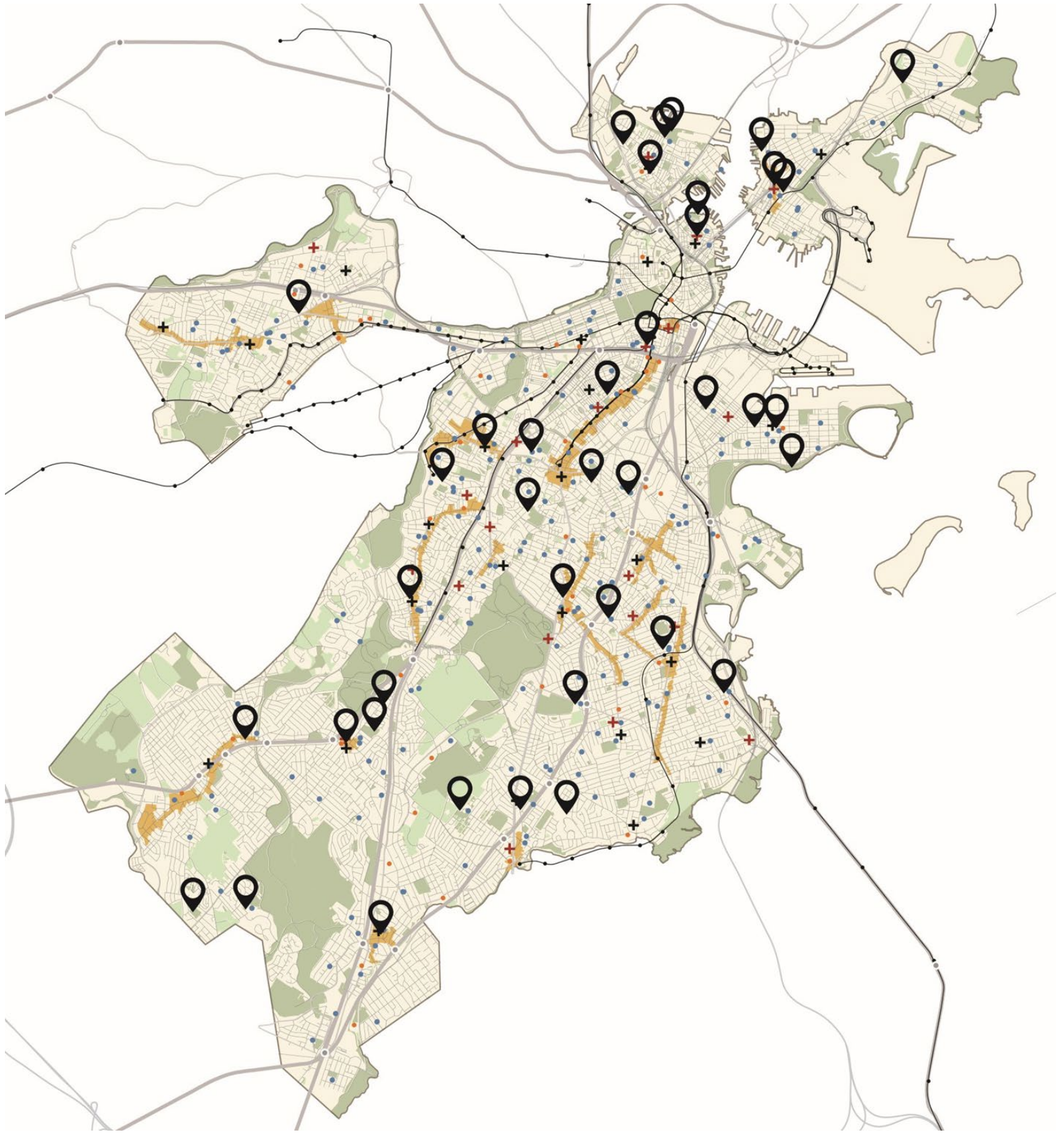
City of Boston, Public Facilities Dept
Boston Centers for Youth and Families

Design Team

Architecture - Utile
MEP/FP/IT/SEC/AV - RFS
Aquatics - Weston & Sampson
Energy Engineering - RFS
LEED - EnviEnergy
MEP Commissioning - RFS
Envelope Commissioning - BEA
Structural Engineering - RSE
Civil - Samiotes
Landscape - Ground
Geotech - McPhail
Cost Estimating - RLB

Public Community Centers in Boston

Boston Center for Youth and Families

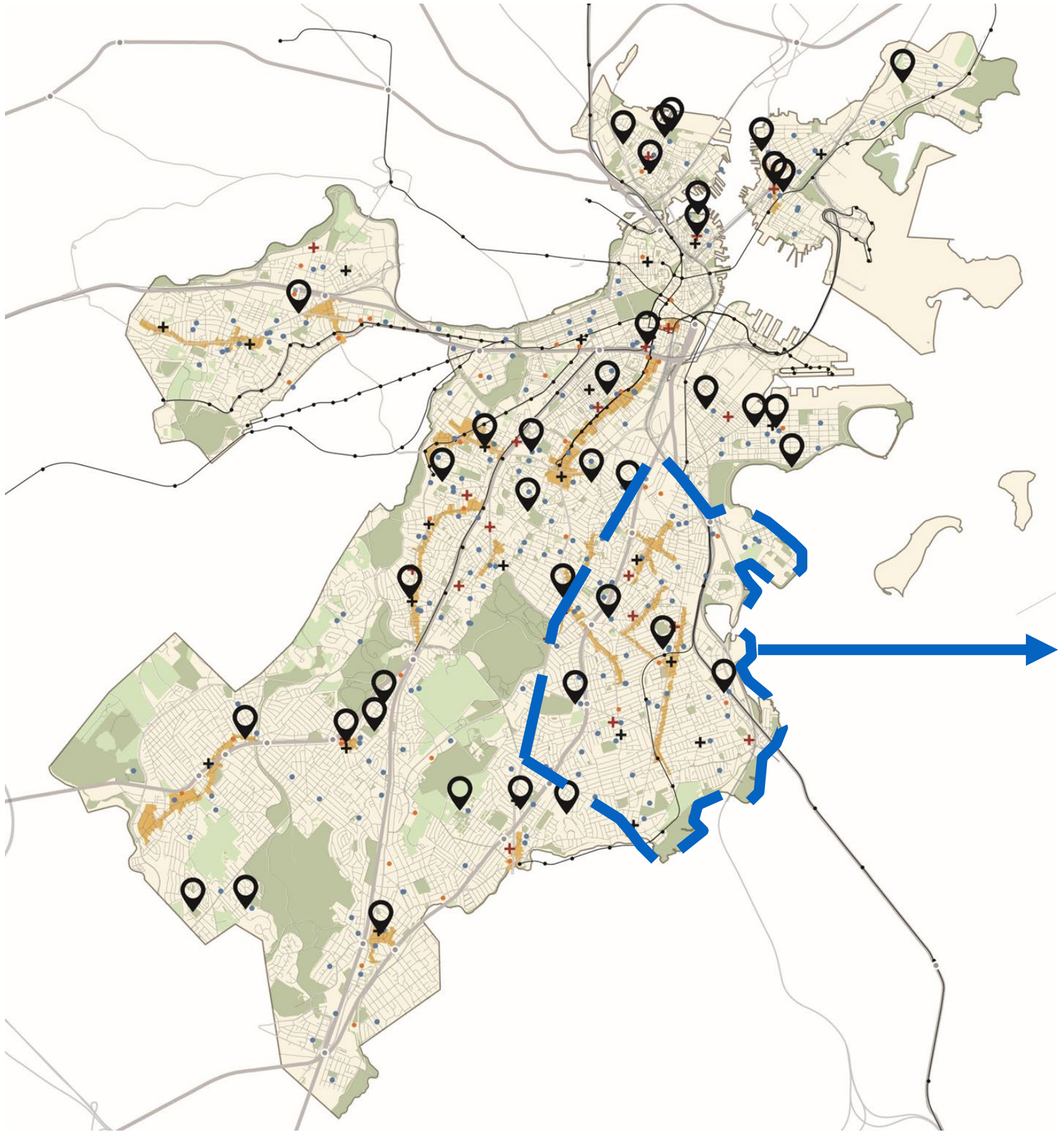


The City of Boston operates 35 community centers open to the public, free of charge serving youth, teens, adults, families, and seniors.

Most community centers are co-located with another use (most frequently a public school), which limits their programming and hours of operation.

A New Community Center for Dorchester

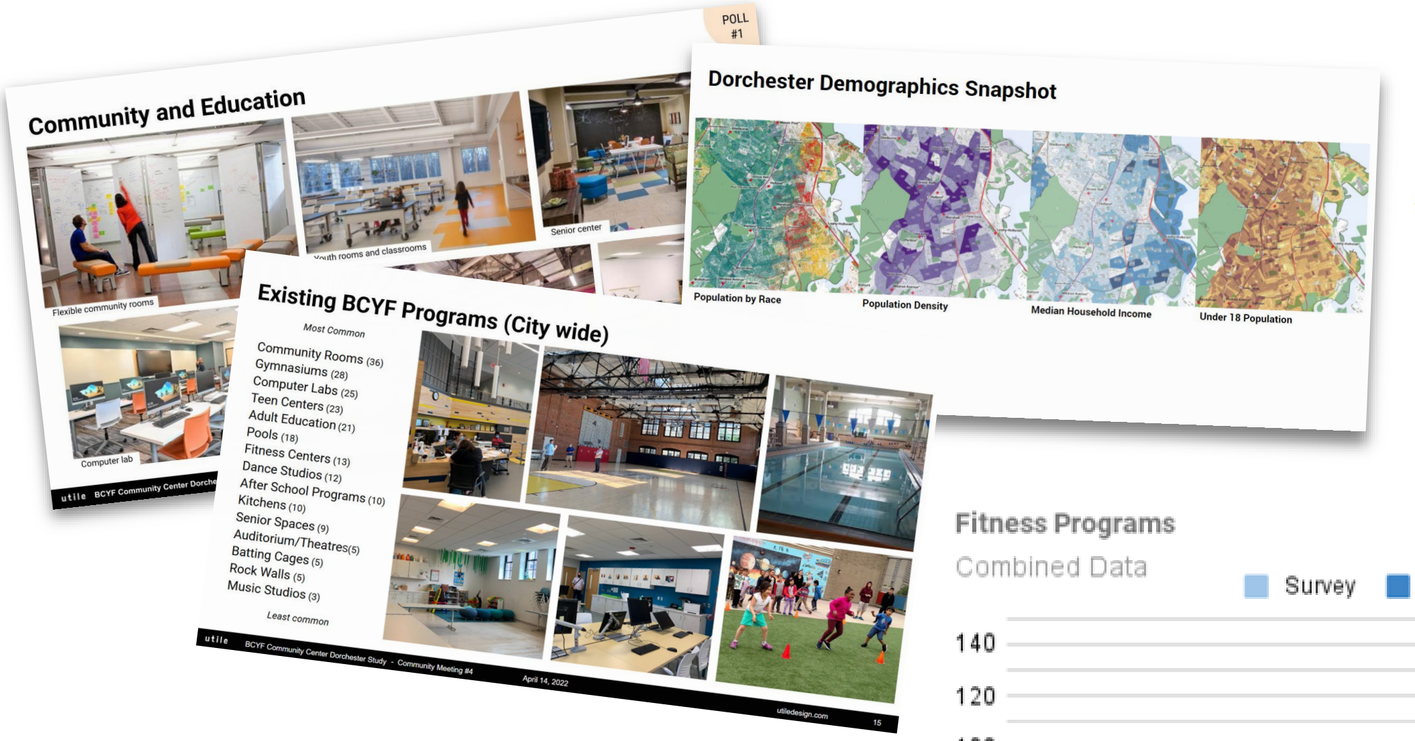
Programming and Siting Study

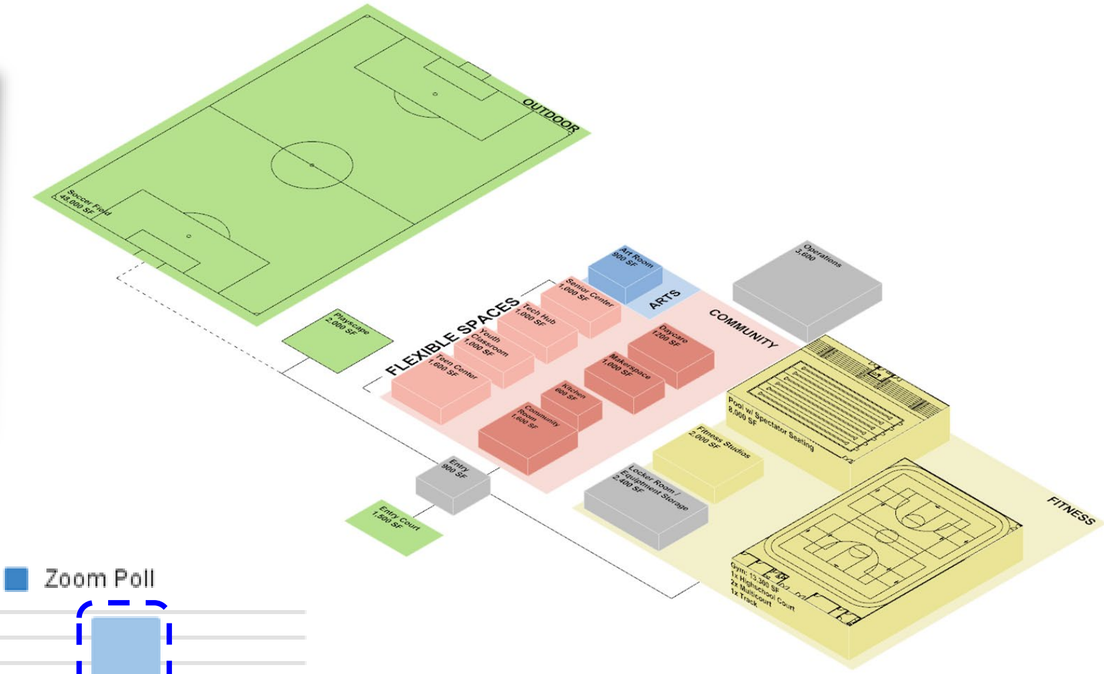


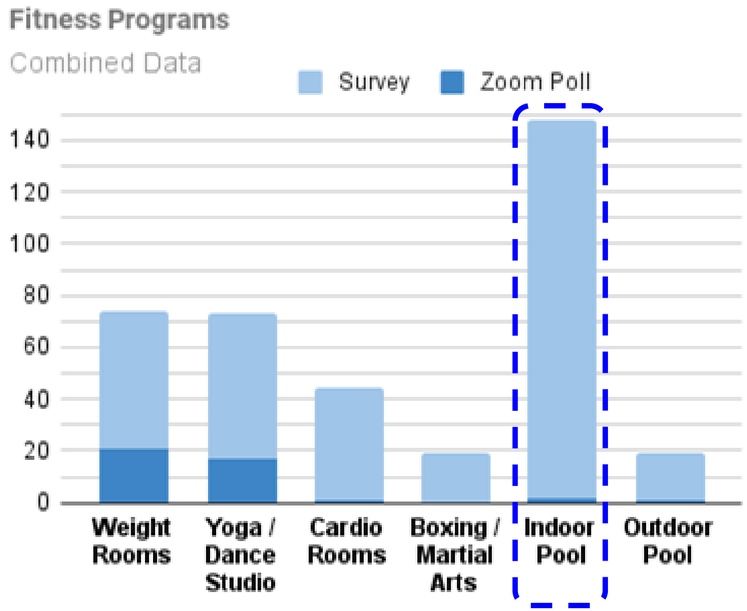
Grove Hall - Transit Catchment Area

The Grove Hall area of Dorchester strongly advocated for a new community center

A Swimming Pool is an Important Community Center Program

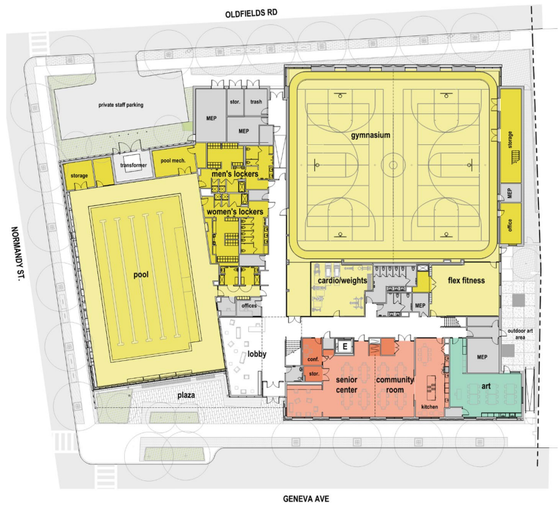




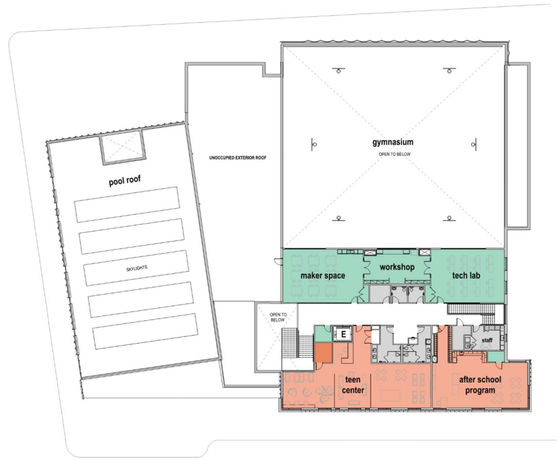


Project Site

The Building



Level 1



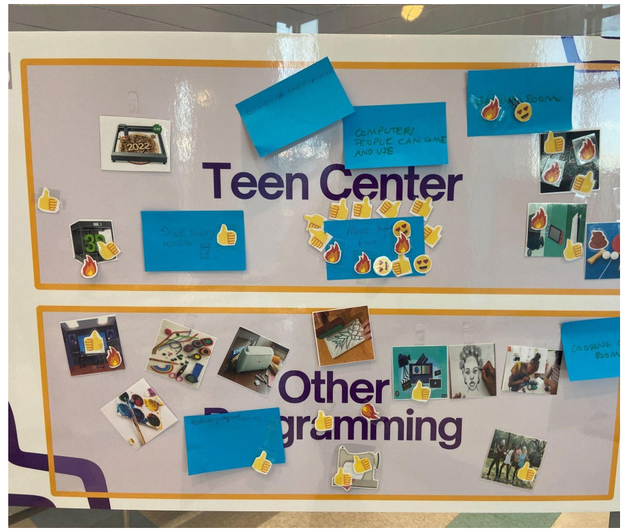
Level 2

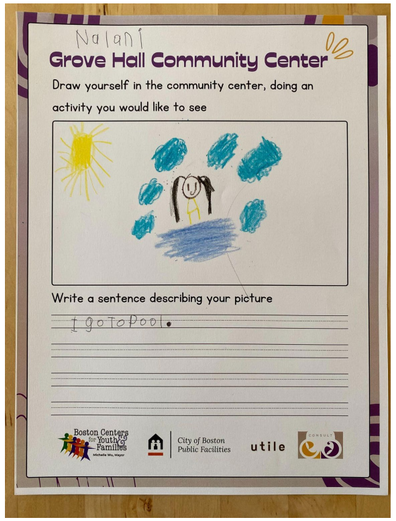
Community Engagement Workshops

Frederick Middle school

Grove Hall Senior Center

Burke High School

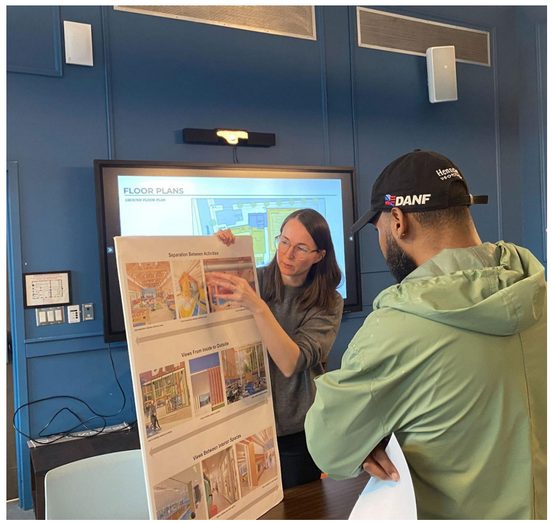




Vine st Pop up

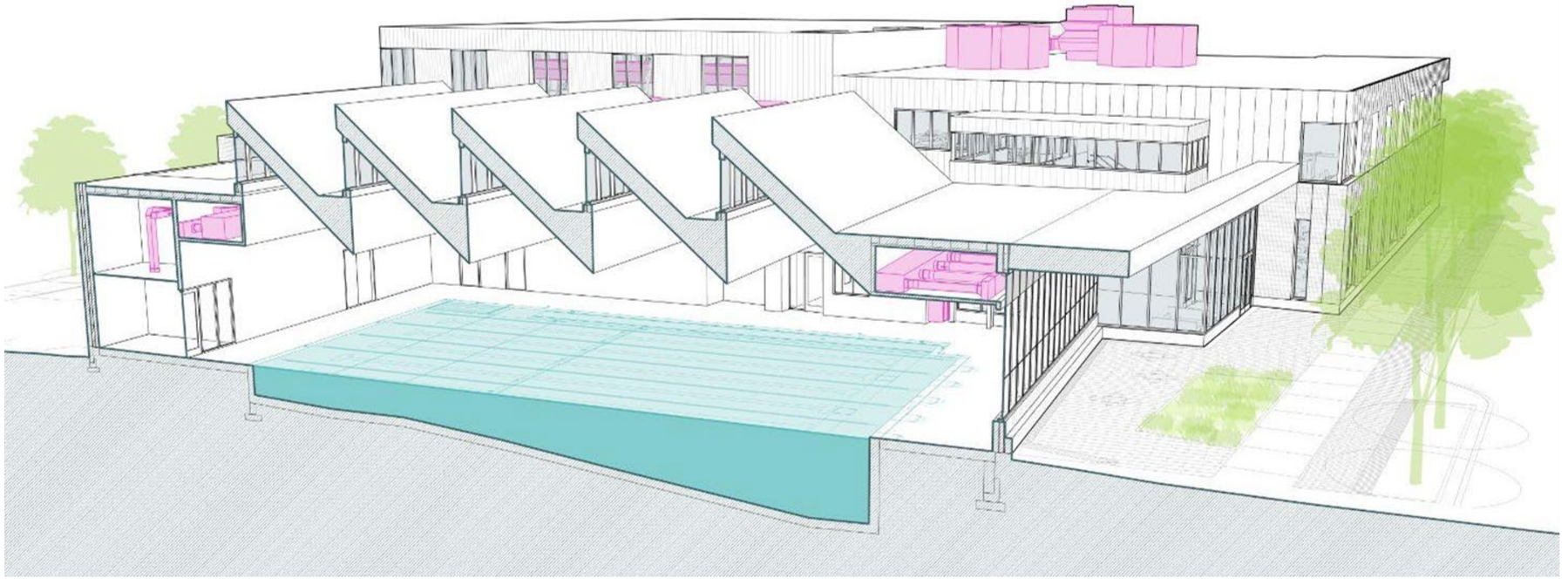
Grove Hall Senior Center #2

Frederick Middle school #2



Vine st Pop up #2

The Pool Has a Lot of Competing Goals



Full of Daylight

Views to the Street

Privacy from the Street

Calming

Playful

The Challenge with Indoor Pools

Insight—055 In the Deep End

Insight
In the Deep End[1]

An edited version of this Insight first appeared in the ASHRAE Journal.

By Joseph W. Lstiburek, Ph.D., P.Eng., Fellow ASHRAE

One of the most difficult buildings to build is a building with a swimming pool because–wait for it–there is a swimming pool inside. It gets even worse when the pool is in a ski resort on a mountaintop (**Photograph 1**). Ah, I love the rich people and their problems.

Or, even better, let's make it a recreation center in the middle of North Dakota that has a limited construction budget. We are always asked to deal with recreation centers with swimming pools and no budget. How about an indoor water park attached to an ugly hotel? The problem is pretty much the same whether you are in the middle of Ohio in a hotel with an indoor pool, a ski resort recreation center in the middle of Colorado, an indoor water park in the middle of Wisconsin or in a rich guy or girl's house in Whistler, B.C., or pretty much anywhere.

Pick an extreme external climate and add an extreme internal climate. And then, if you are really unlucky, involve a famous architect.[2]

The problem is fundamentally pretty straightforward. We have a huge internal moisture load that, for once, you cannot blame on your mechanical engineer or HVAC contractor. There's a pool filled with water in your building for Pete's sake.[3] You can't dehumidify your way out of the problem; you can't ventilate your way out of the problem. You can localize the problem by depressurizing the pool area relative to adjacent spaces or by pressurizing a boundary space between the pool area and adjacent areas, but, in the pool area, you are pretty much toast.

I am tired of being told that there would be no problems if the pool had a cover or if the pool water temperature was kept colder. What is the point of having an indoor pool if it is too cold to use, and if you have a cover on it all the time? You may as well take a bath, and call it a day. Sheesh. All of these things–ventilation, dehumidification, depressurization, water temperature control and the use of a pool cover–reduce the load on the enclosure, but even all of them together won't avoid problems without a good enclosure.

Photograph 1: If Only They Knew–Happy folks getting wet while someone else gets a financial bath. It is not easy keeping the roof and walls dry when everything else is wet.

Let's assume that the pool area is under a positive pressure, the air in the pool area is 80°F (27°C) and the relative humidity is 70%. I call that "80 – 70 air" and you had better design the building enclosure to deal with it.

What are the outside conditions? To be safe, assume really, really cold in the winter and hot and humid in the summer. Pretend that your building is in International Falls, Minn., during the winter, and then assume it magically moves to Atlanta in the summer. If you can pull that off, you are pretty much in the clear.

1 You can imagine the fun folks had helping me pick a name for this one: "Treading Water;" "All Wet;" "Splish, Splash Taking a Financial Bath;" In Over Your Head" are a few of the runners-up.

2 Oops, that would make the building a museum. We will deal with museums some other time. To understand museums, think pool enclosures on steroids, but minus any common sense.

3 Peter is the name of one of the Apostles and it has been argued that the phrase is sometimes used as a euphemism replacing "For God's sake." In contemporary use "Pete" pretty much can mean anything or anyone and as such, is often found in consulting when the consultant is exasperated.

November 2011 © Building Science Corporation 1

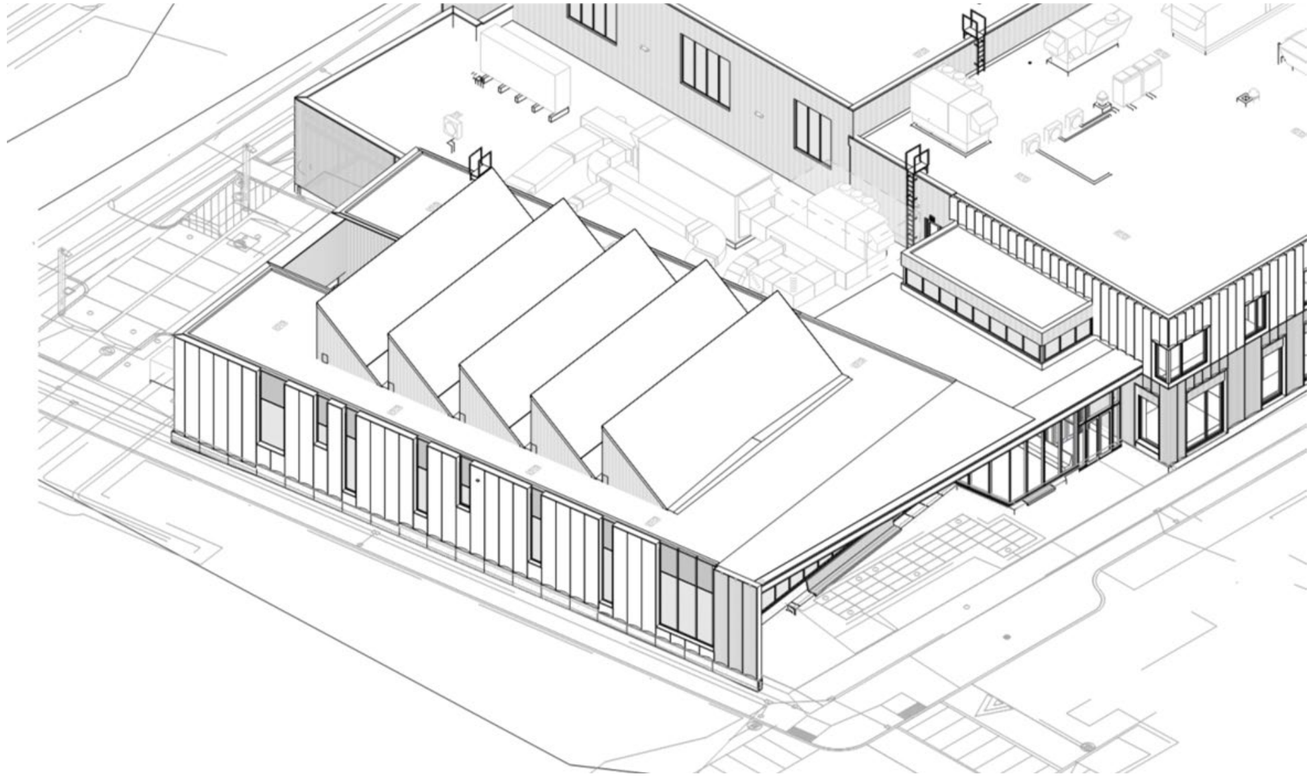
"One of the most difficult buildings to build is a building with a swimming pool because— wait for it—there is a swimming pool inside."

- Joseph Lstiburek

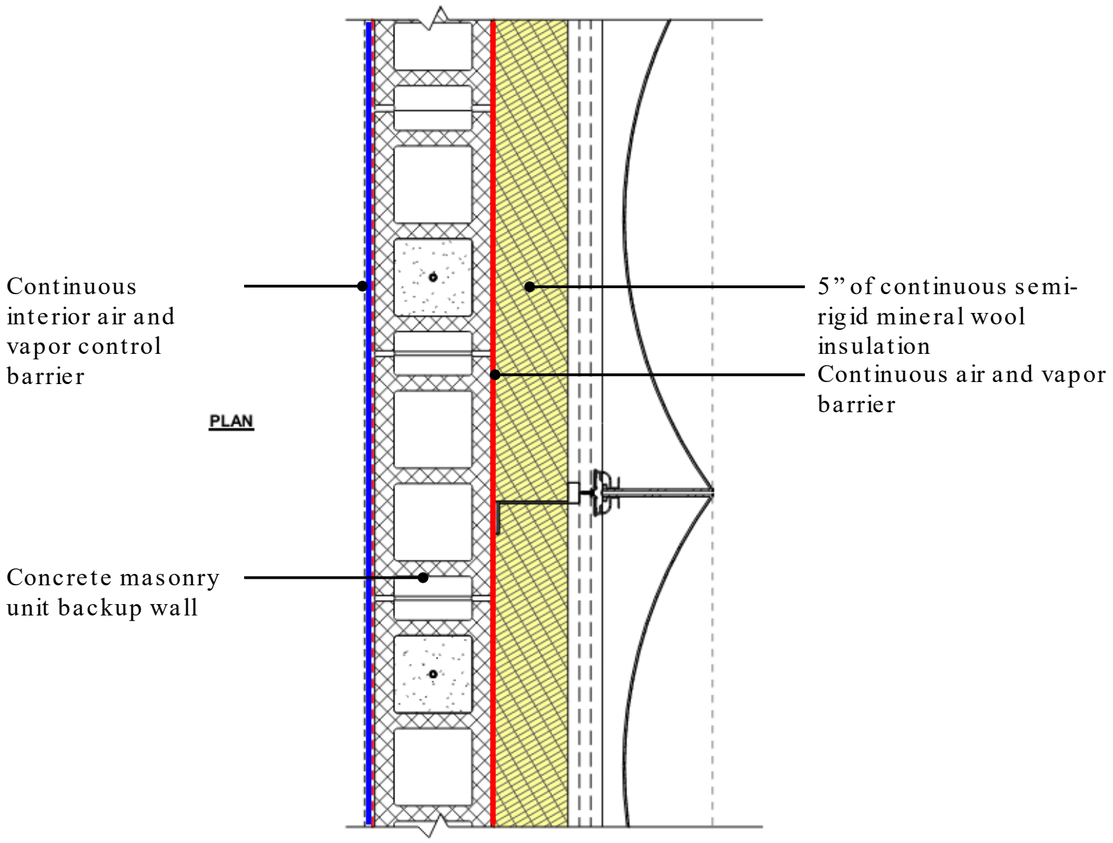
Indoor Pool Envelope Considerations

Envelope Considerations:

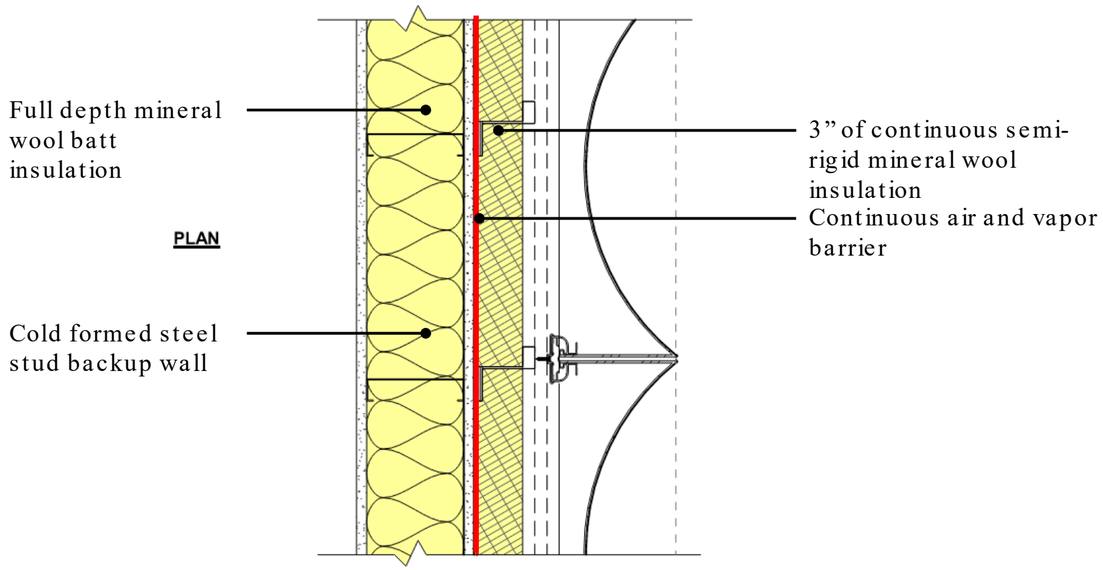
- Keep surface temperatures above dew-point
- Utilize a continuous warm-side air and vapor control layer
- Eliminate thermal bridging
- Provide interior vapor and air control separating pool from rest of building



Designing a Robust Exterior Envelope

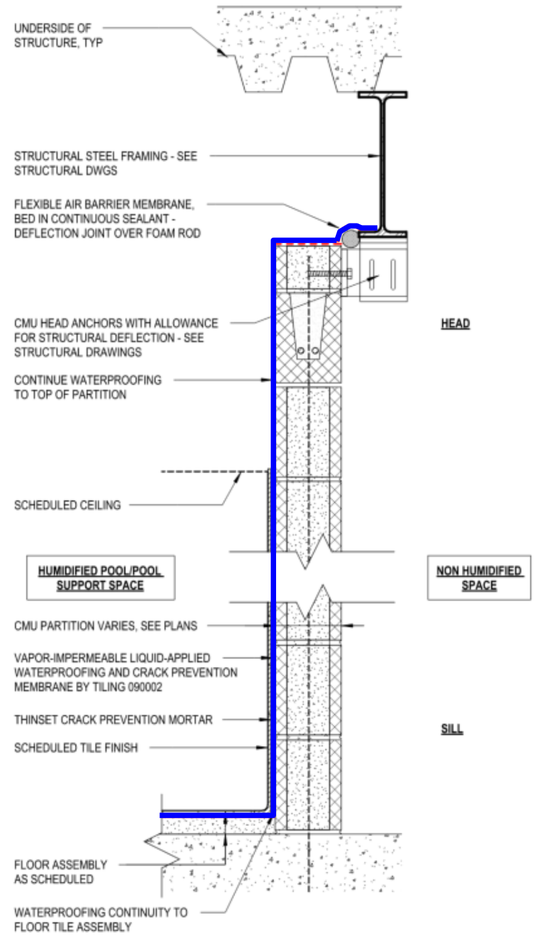


Typical Exterior Wall Assembly at Pool

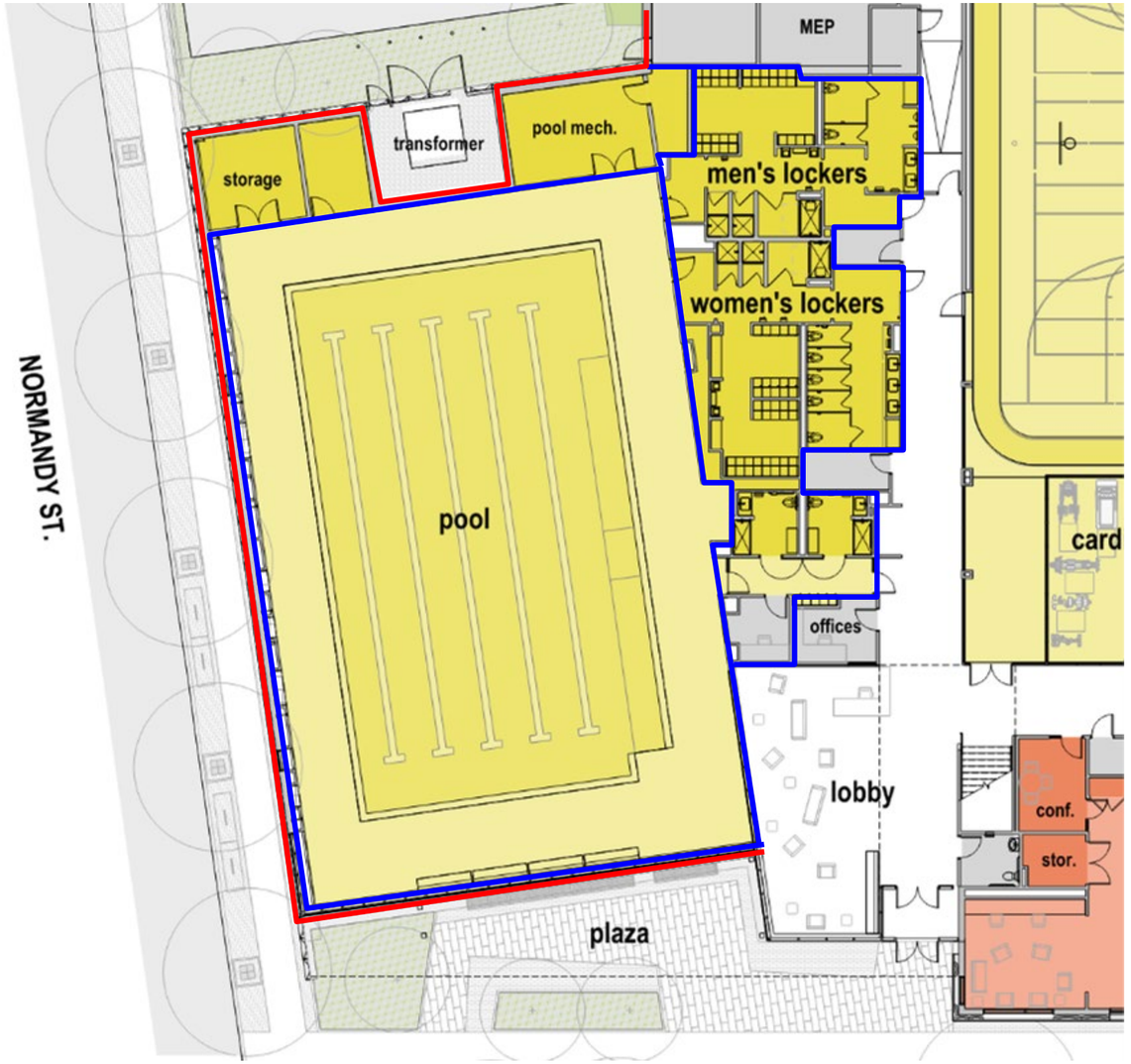


Typical Exterior Wall Assembly at Remainder of Building

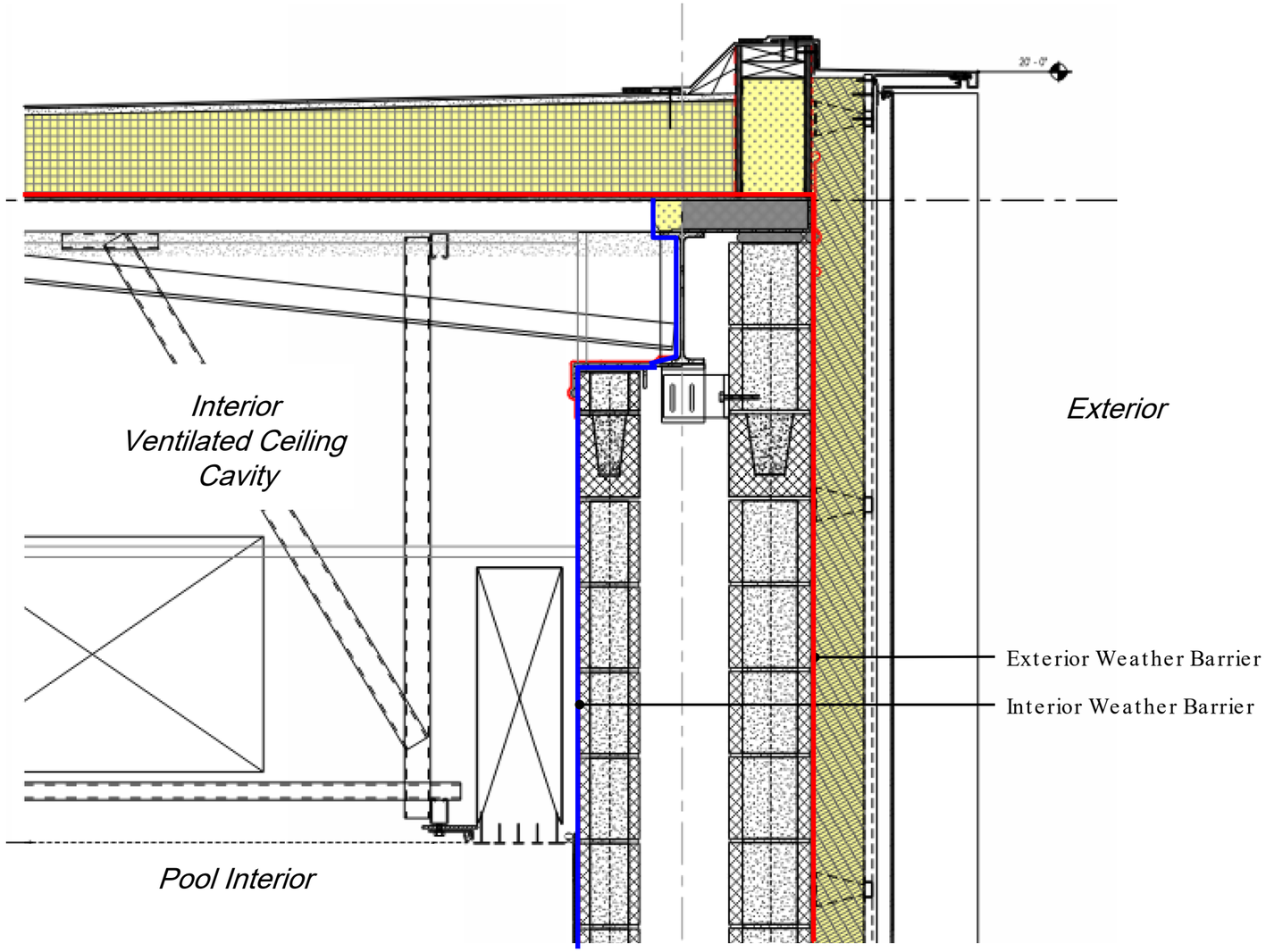
Controlling Air and Vapor Within the Building



Section at Interior Wall Air and Vapor Control Layer



Typical Wall to Roof Transition Detailing Strategy



Section A -A

Windows for Daylight and Views

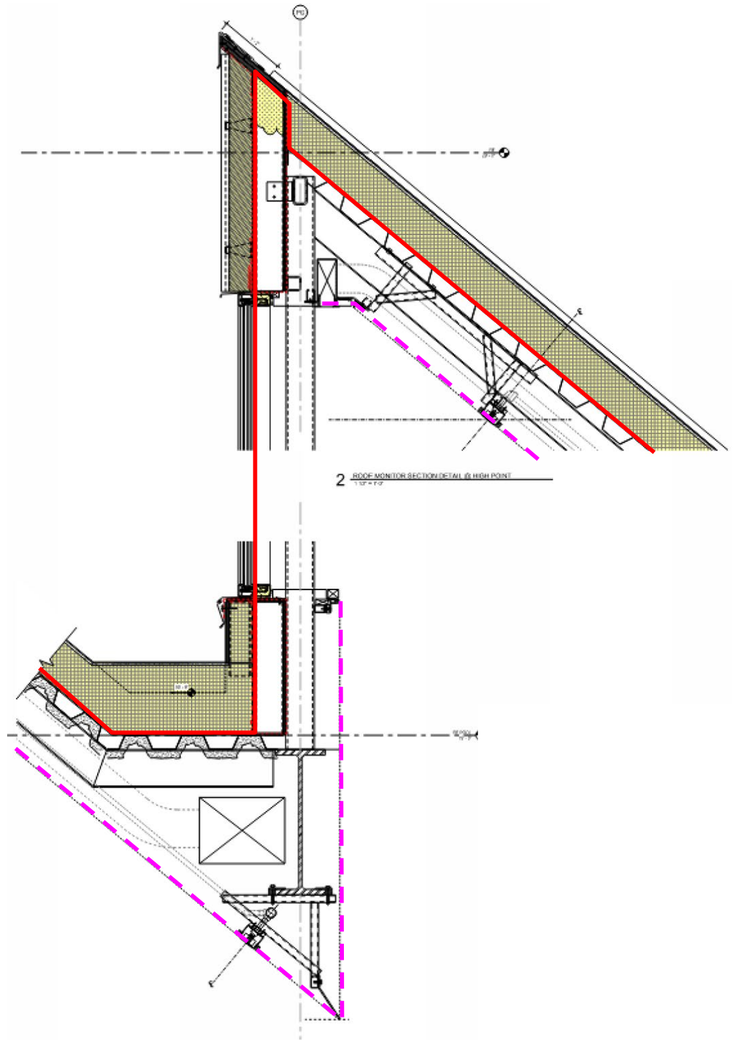
Strategies

- South - Curtain Wall with frit for privacy shaded by large exterior canopy
- West - narrow windows with frit to control glare and provide privacy
- Roof - monitors to provide even northern light for daylighting

Maximize Daylight, Minimize Glare

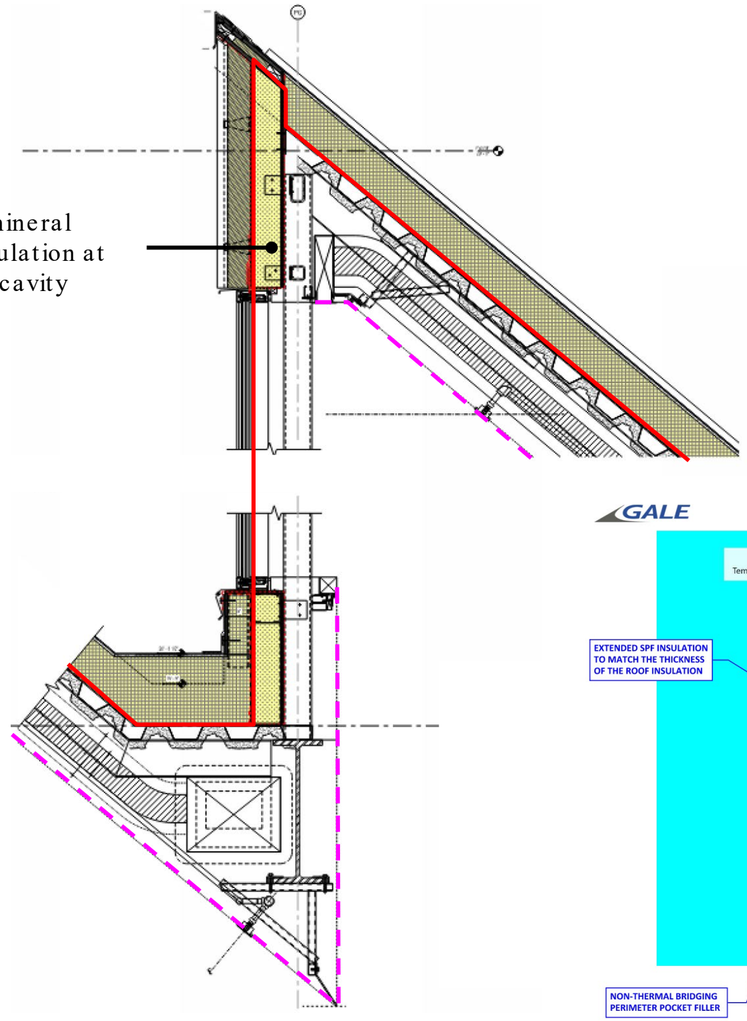
Climate Studio Daylight Analysis

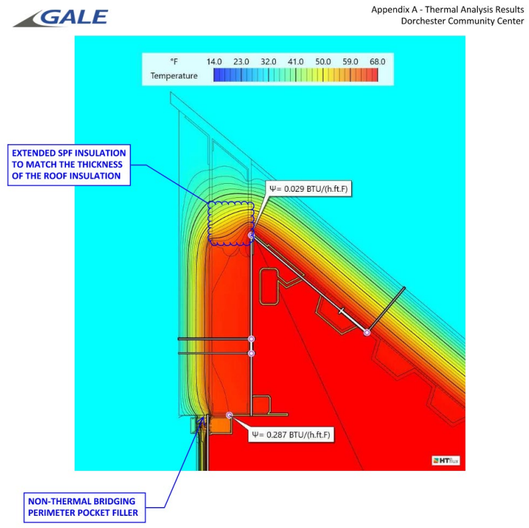
Roof Monitor Detailing Strategy and Analysis



60% Construction Documents

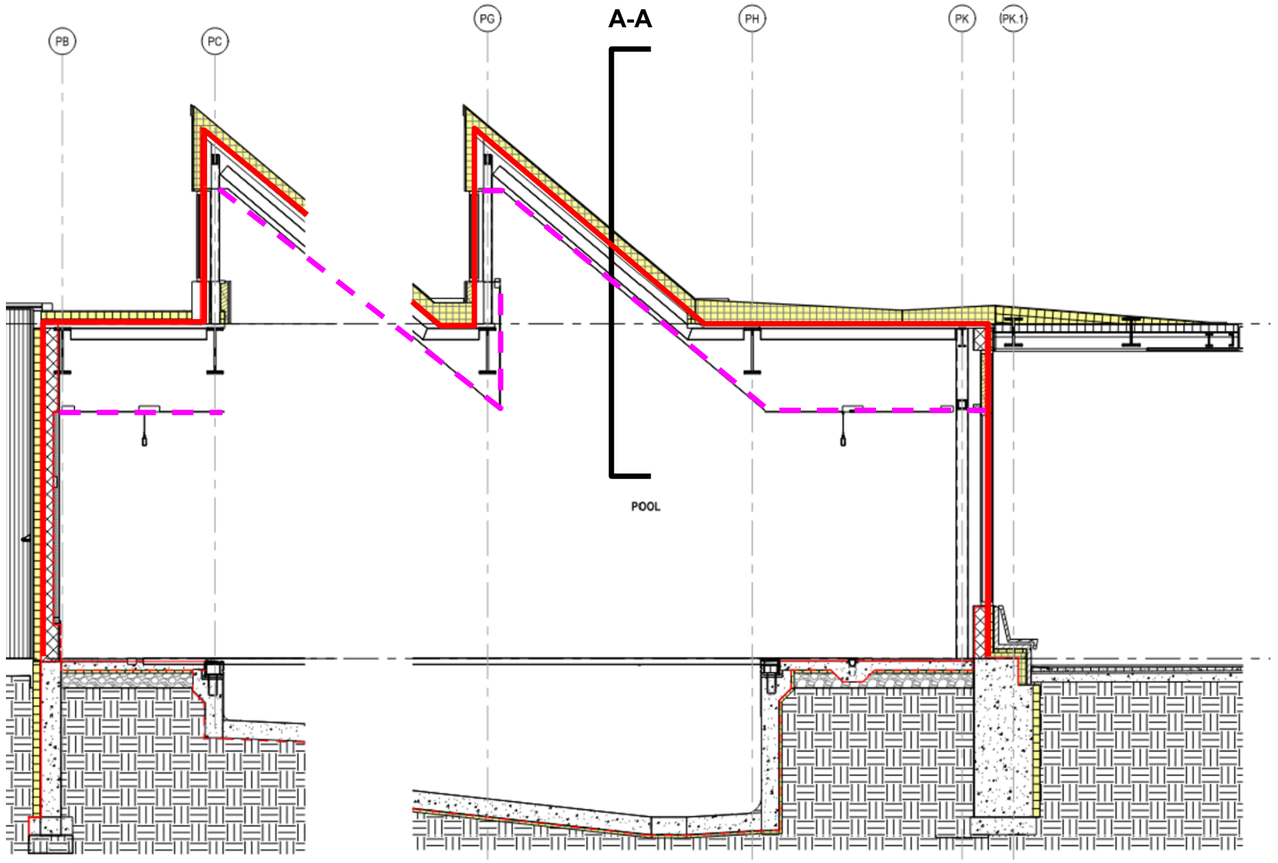
Added mineral wool insulation at framing cavity



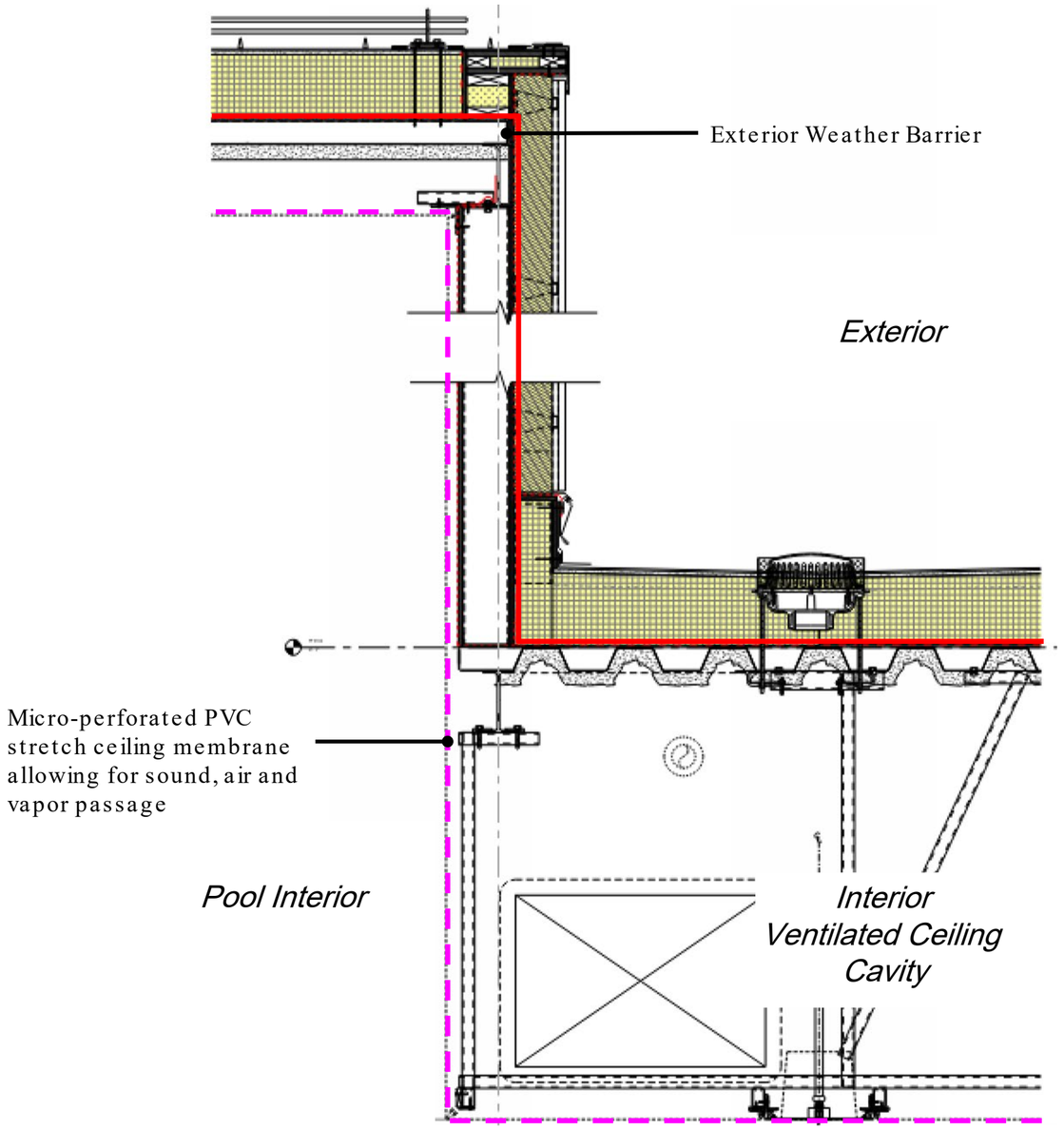


100% Construction Documents (with Thermal Analysis Feedback)

Ventilated Ceiling Cavity



North -South Section at Pool

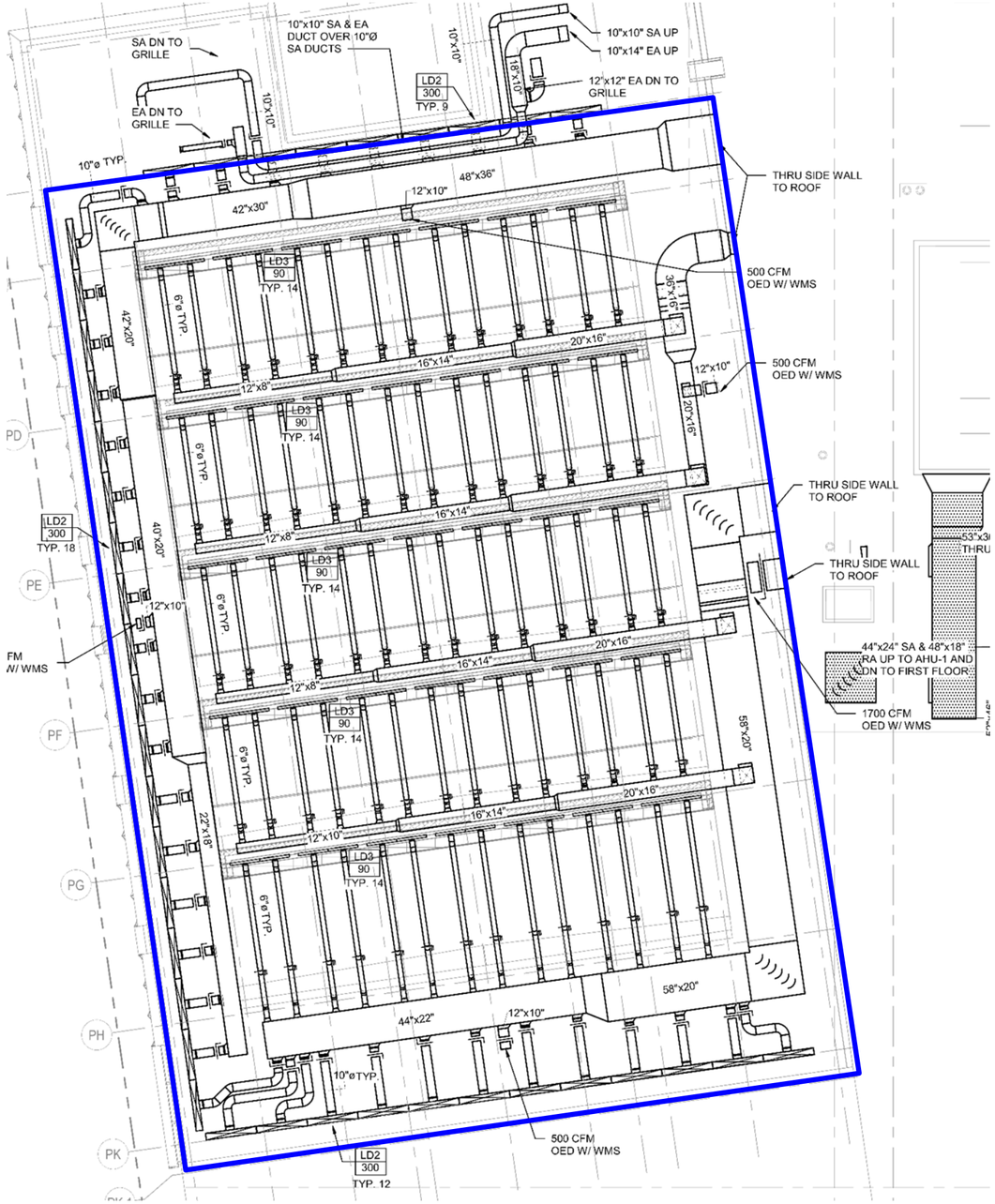


Section A -A at Pool monitor

Indoor Pool Design Considerations

Dehumidification and Water Heating Systems:

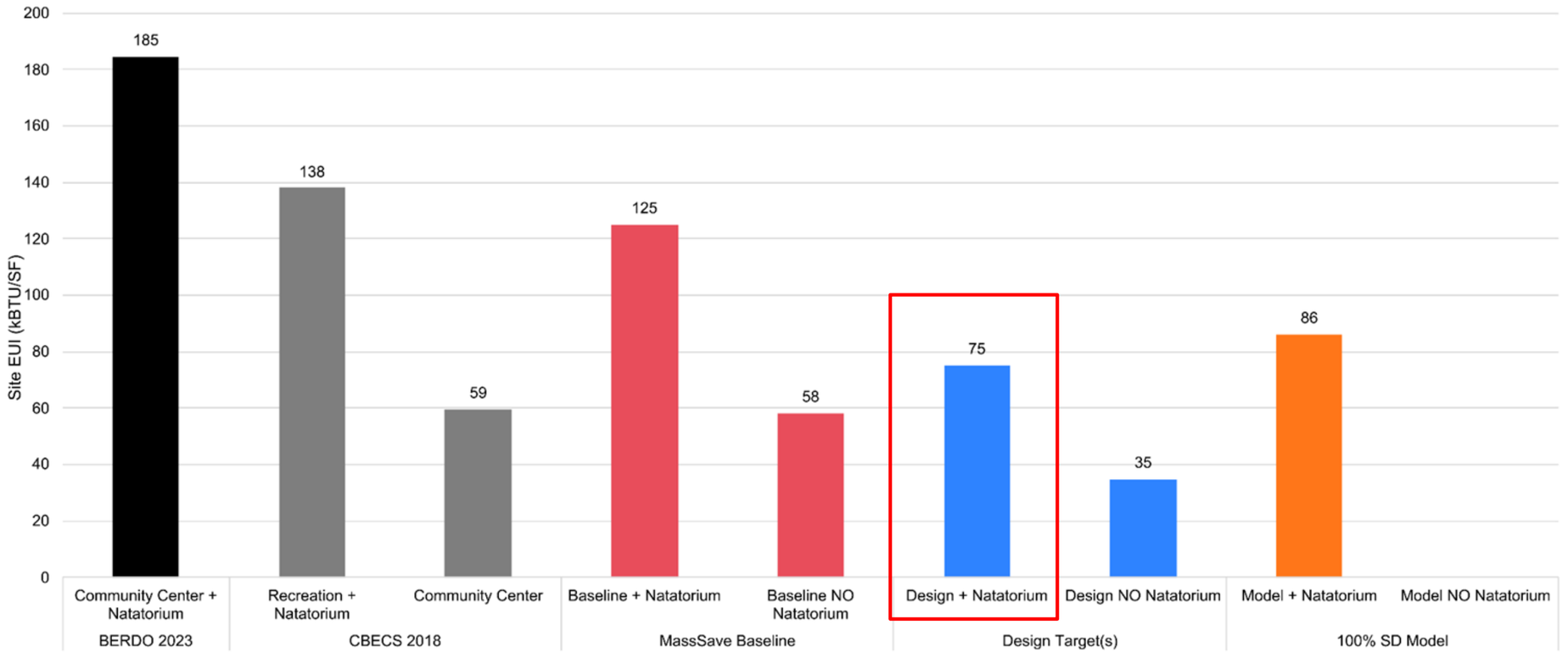
- Continuous operation
- Space conditions: 80 – 82°F | 50 – 60% RH
- Pool water temperature: 78°F
- Minimum ventilation rate: 0.48 cfm/sq.ft.
- Pressurization relative to adjacencies
  - (+) ceiling plenum
  - (-) chemical storage / filtration room
  - (-) overall



MassSave Program - Initial Goal Setting

Schematic Design Phase:

- EUI target initially set for 75 kBtu/sq.ft./yr.
- Based on benchmarking databases



System Option Life Cycle Cost Analysis

Schematic Design Phase:

Mechanical Systems

- Air-source variable refrigerant flow heat pumps
  - Combination of cassettes and ducted fan coil units
  - Packaged rooftop units
- Modular ground-source heat pumps
  - 50 – 500’ wells estimated

Natatorium Air Handling Units

- Packaged air source heat pump with electric resistance backup
- Hydronic system with air source heat recovery chiller

Domestic and Pool Hot Water Heating

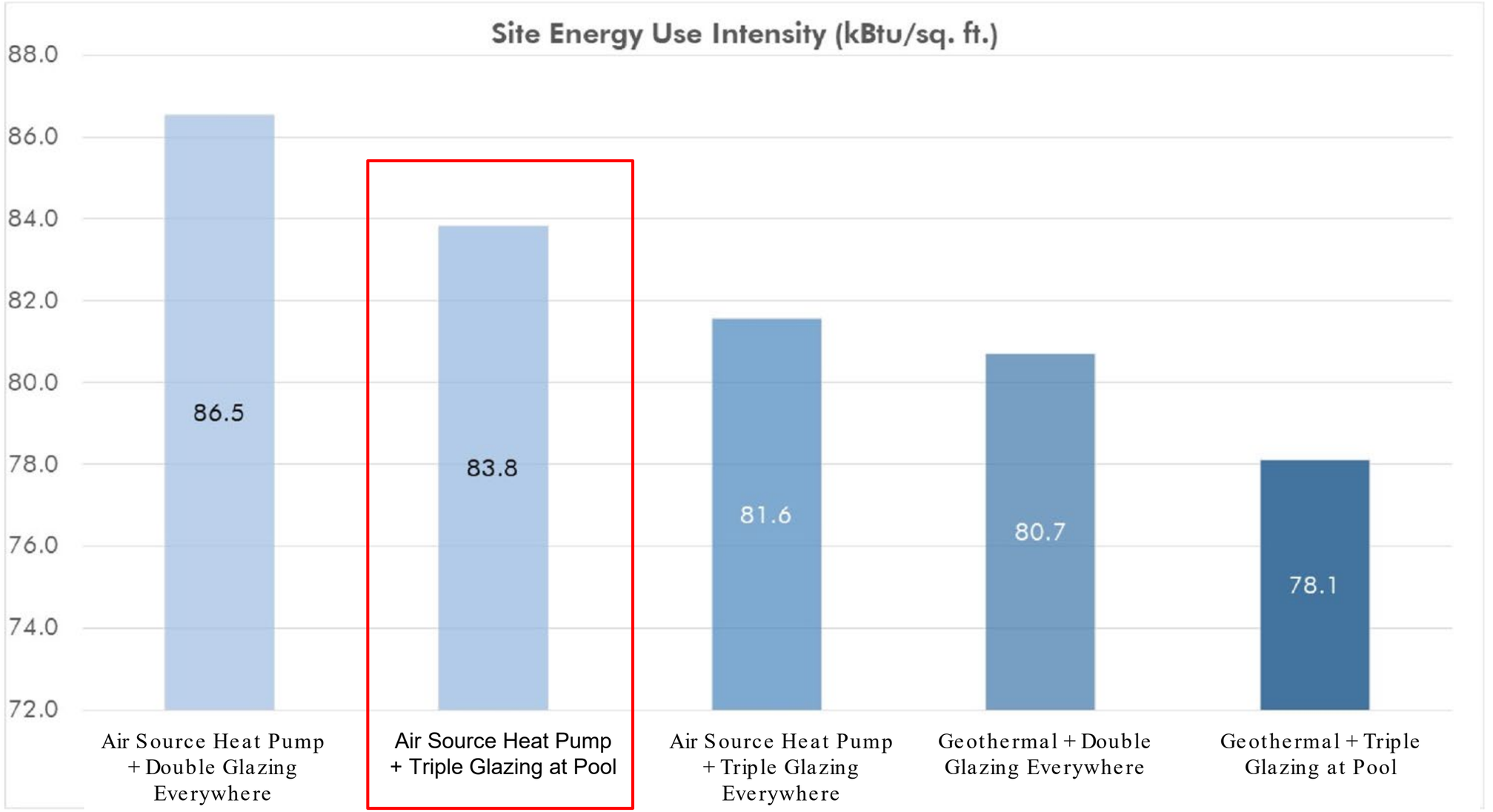
- Electric resistance heaters
- Modular air source heat pumps
- Integration of loops

Envelope Systems

- Double pane glazing
- Triple pane glazing
- Combination of both

Design Option Comparisons

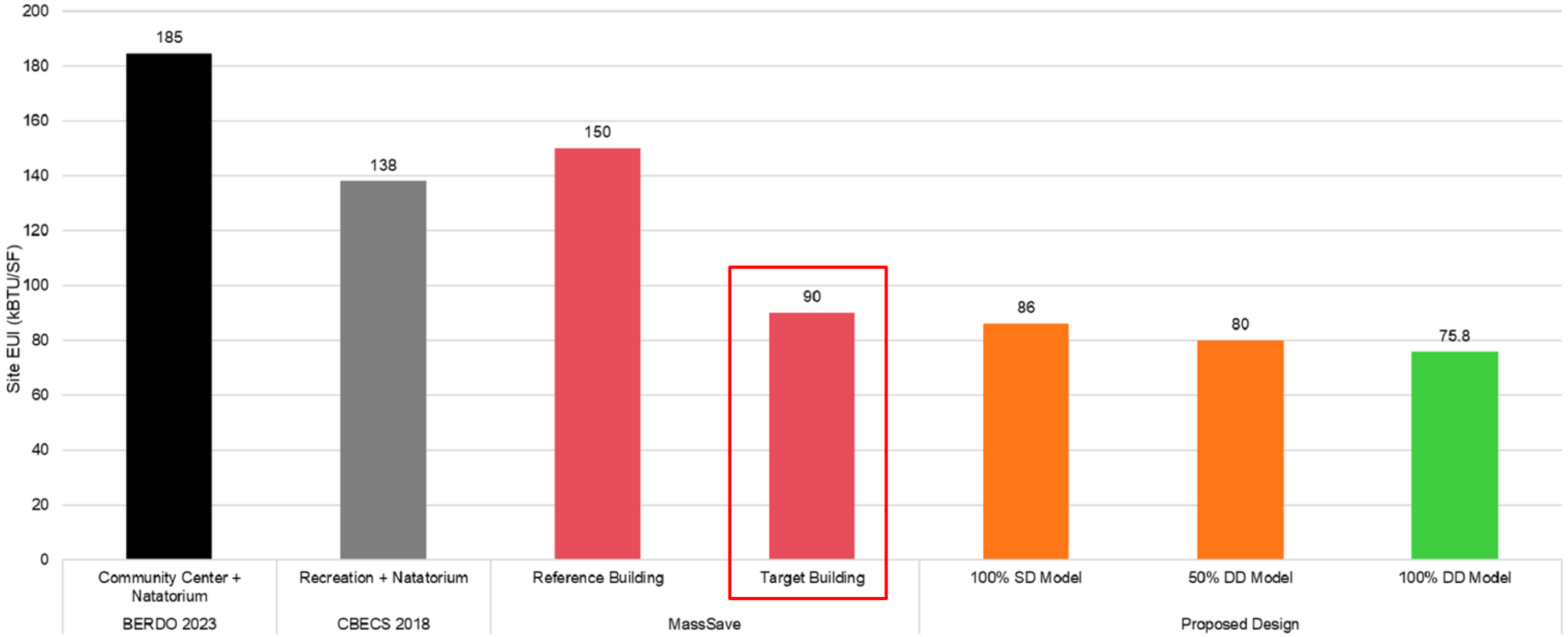
Schematic Design Phase:



Design Progress

Design Development Phase:

- EUI target increased to 90 kBtu/sq.ft./yr.
- Reduced building area: 57,000 gross sq.ft. to 42,000 gross sq.ft. with ***no change in natatorium size / volume***

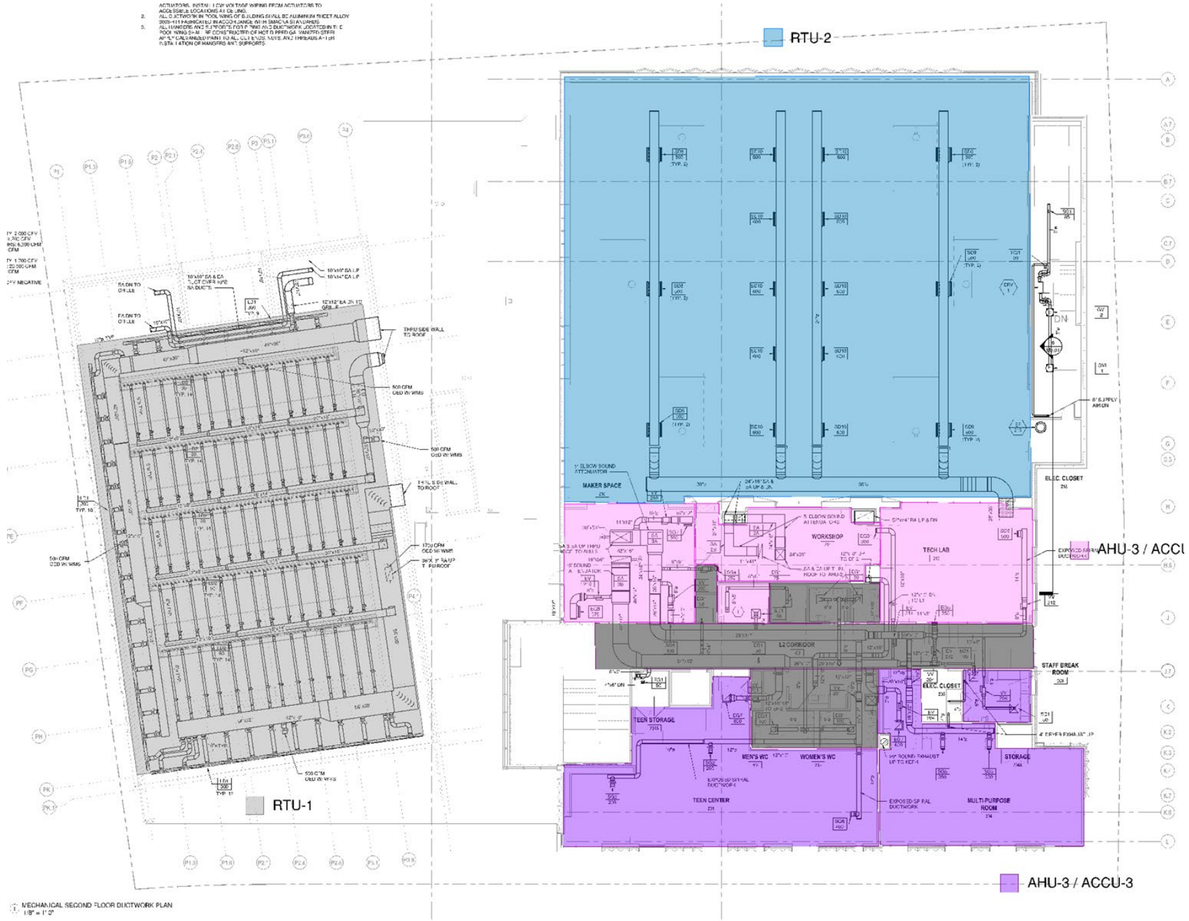


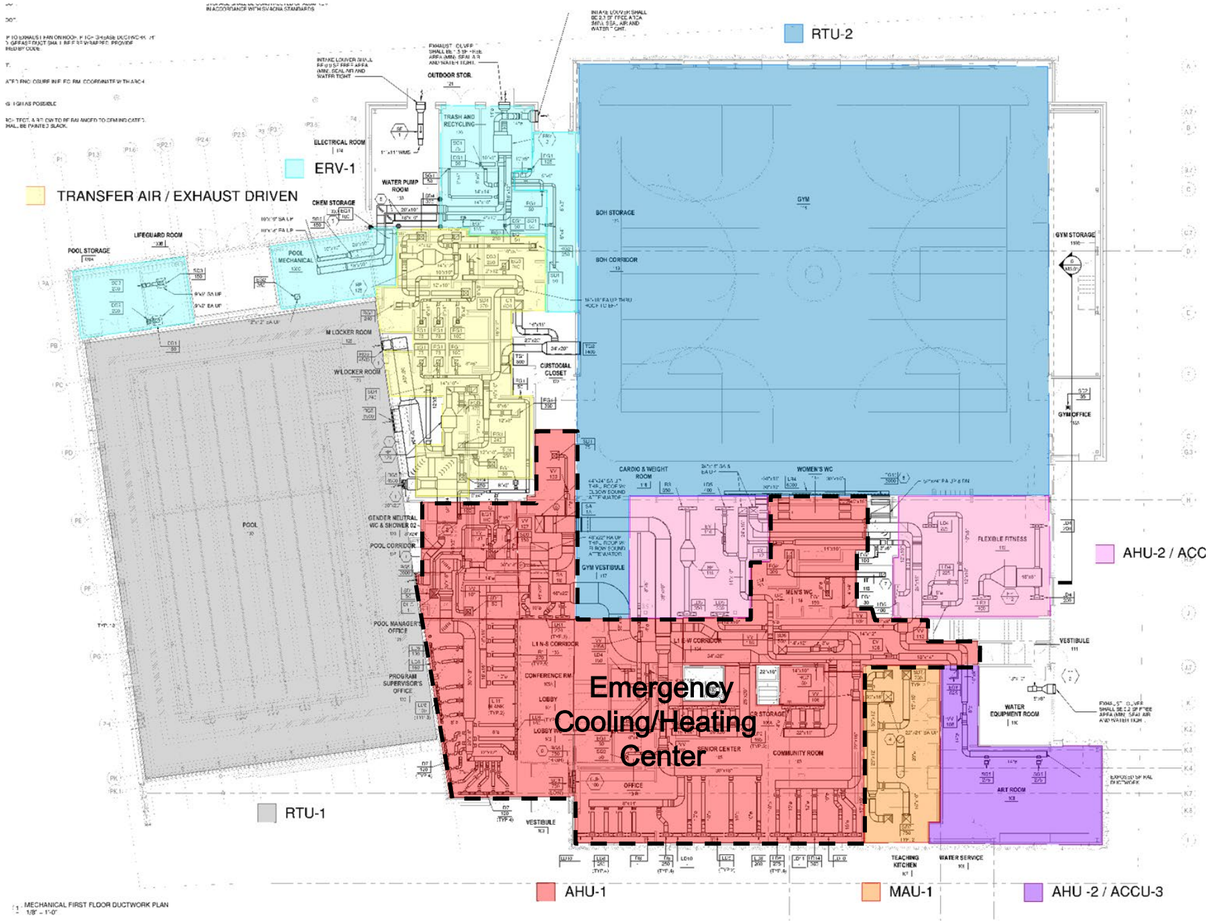
System Zoning

Program and Operations:

- Monday - Friday: 8:00 AM - 9:00 PM
- Saturday: 9:00 AM - 5:00 PM
- Sunday: Closed

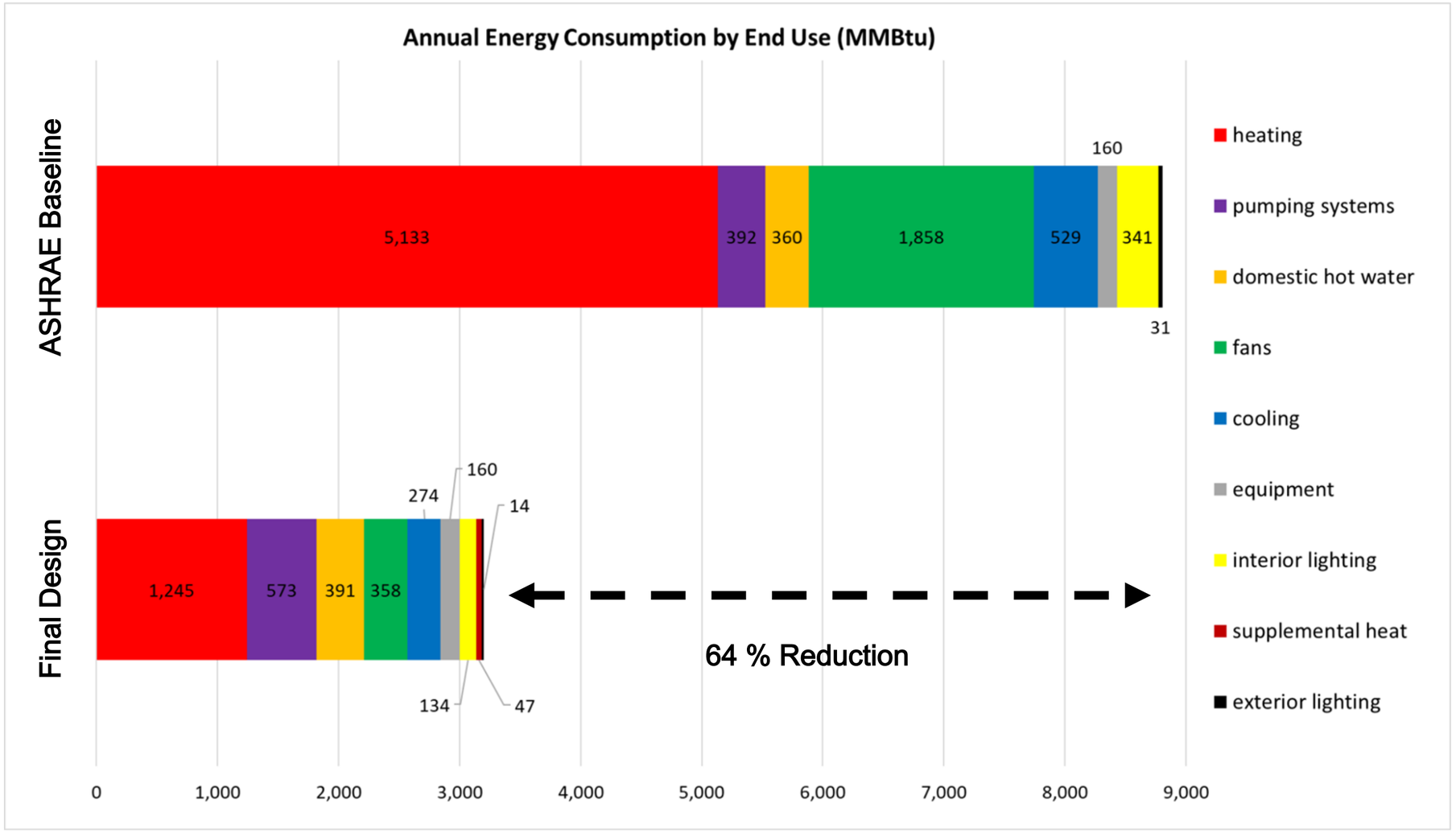
- Non-coincident program use
- Emergency cooling and heating center areas with higher occupant density





High-Performance Design

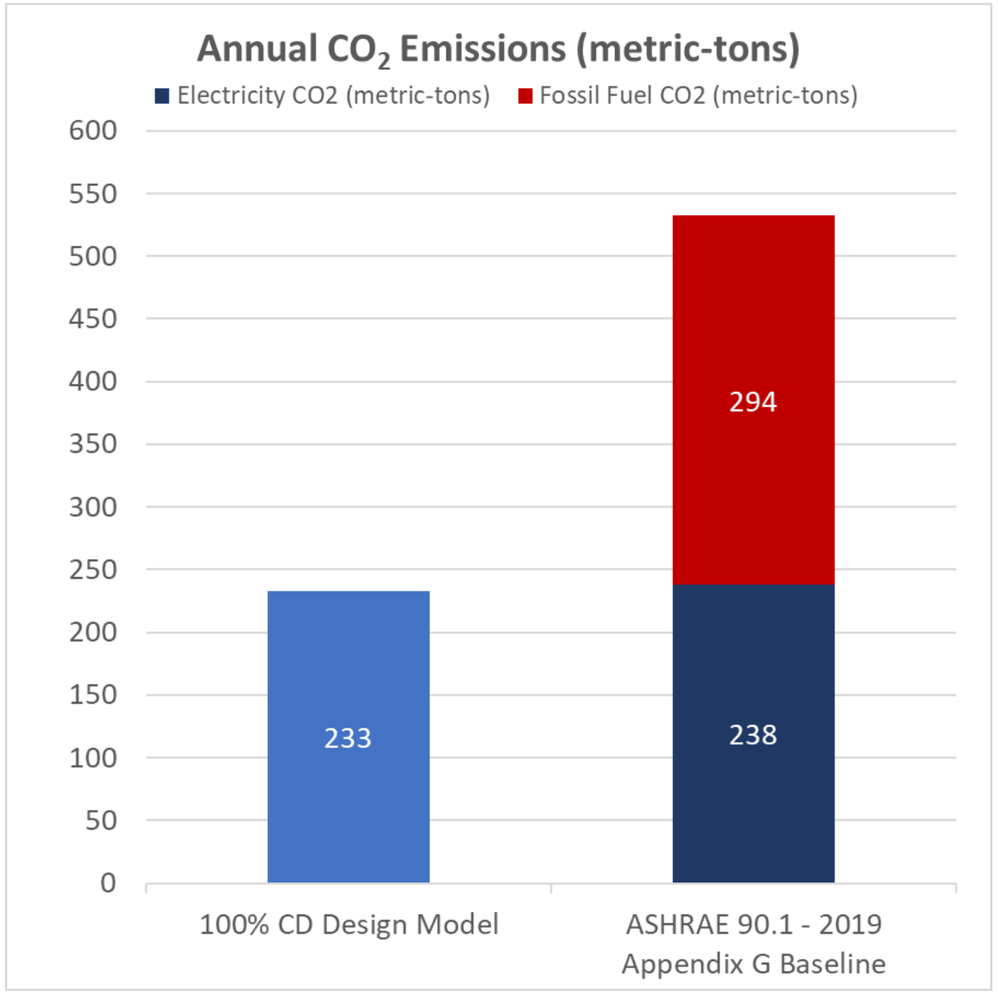
Construction Documents Phase:



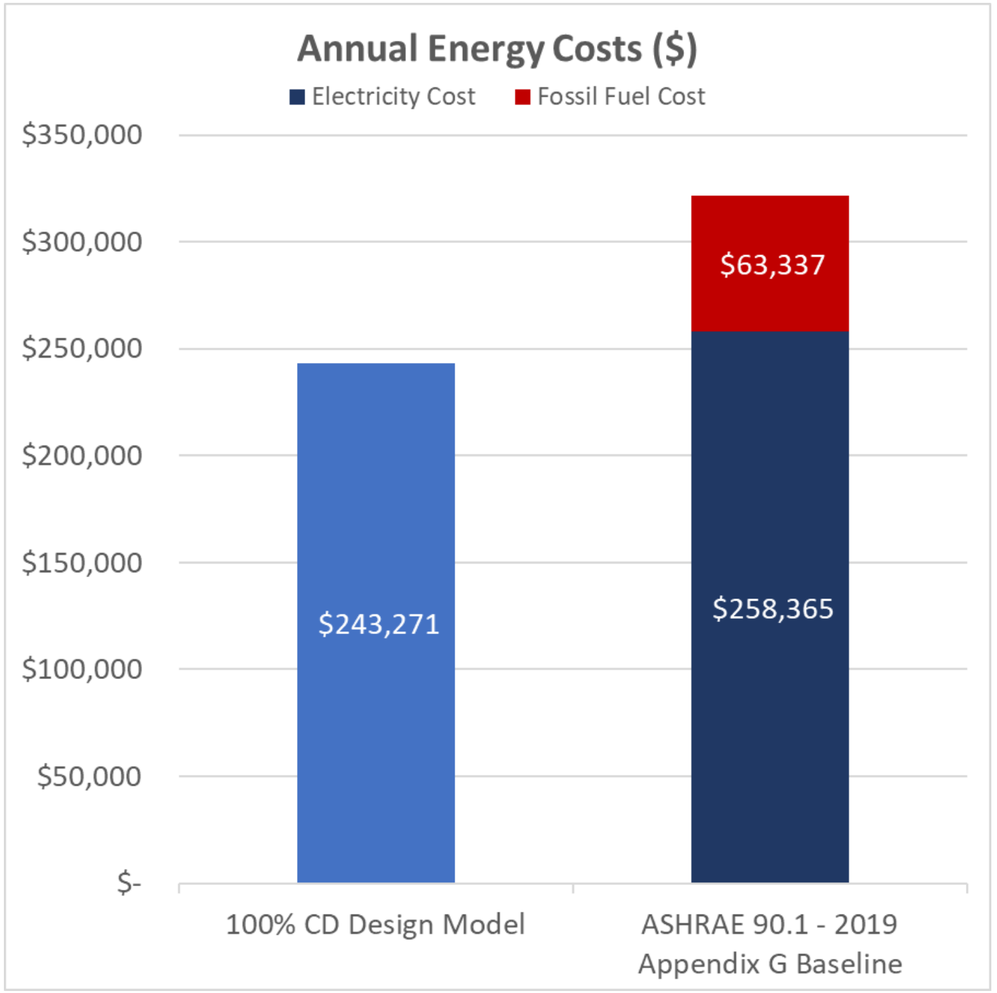
- Optimized envelope design
- Low infiltration design target
- Air source heat recovery chiller
- Ventilation air enthalpy recovery
- Air source heat pumps
- Air economizers with bypass
- Hot gas reheat coils
- Variable air/refrigerant/water flow
- System zoning and occupancy
- 34% reduction in lighting power

Performance Metrics

Design and ASHRAE Baseline Comparison:



56% reduction



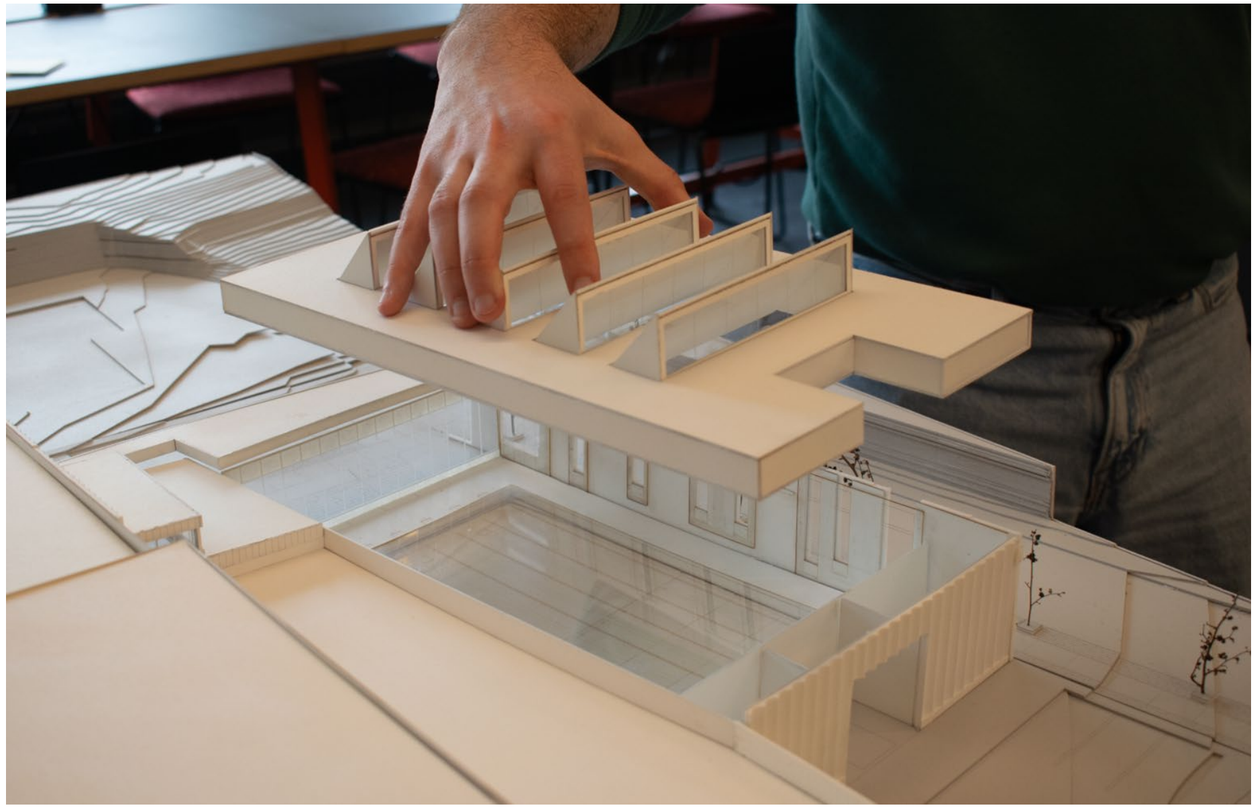
24% reduction

- Site EUI:
  - 76.2 kBtu/sq.ft.
- CO2 Emissions:
  - 233 metric-tons
- Site CEI:
  - 5.56 (kg-CO2/sq.ft)
- Utility Costs:
  - $243,270 annually
  - $5.79 / sq.ft.

Building Entrance

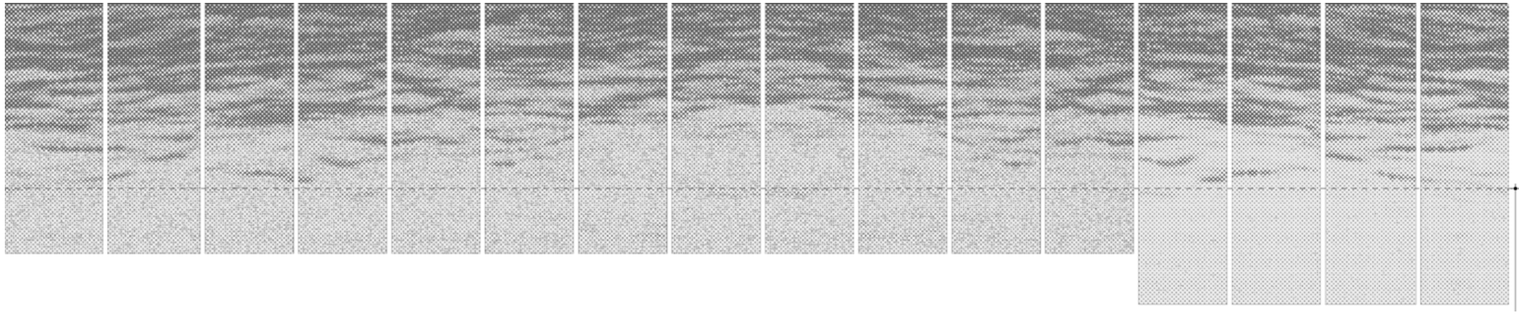
Covered Porch Defines Entrance from Street

Community Input in the Design

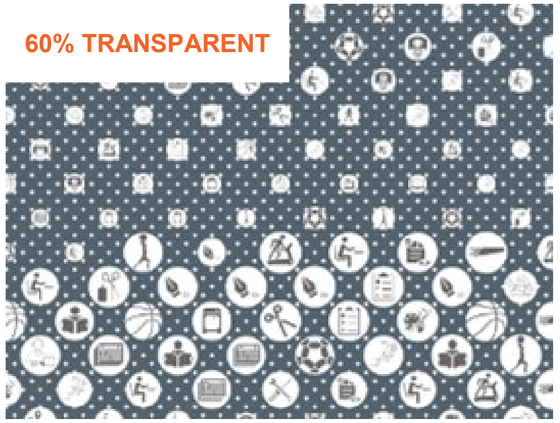


Privacy and Daylight at the Pool

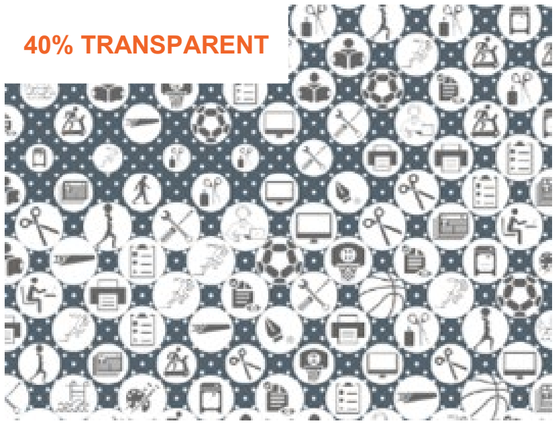
An Opaque Pattern on the Glass Obscures Views



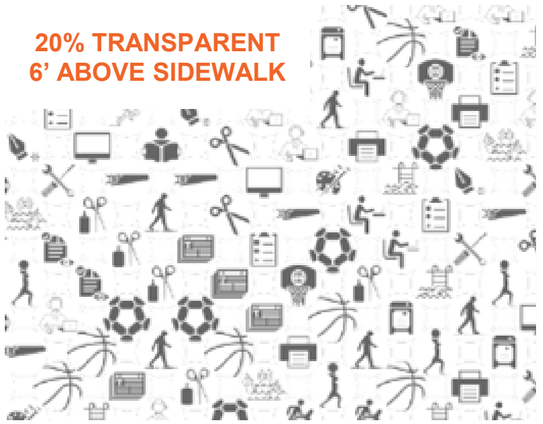
60% TRANSPARENT



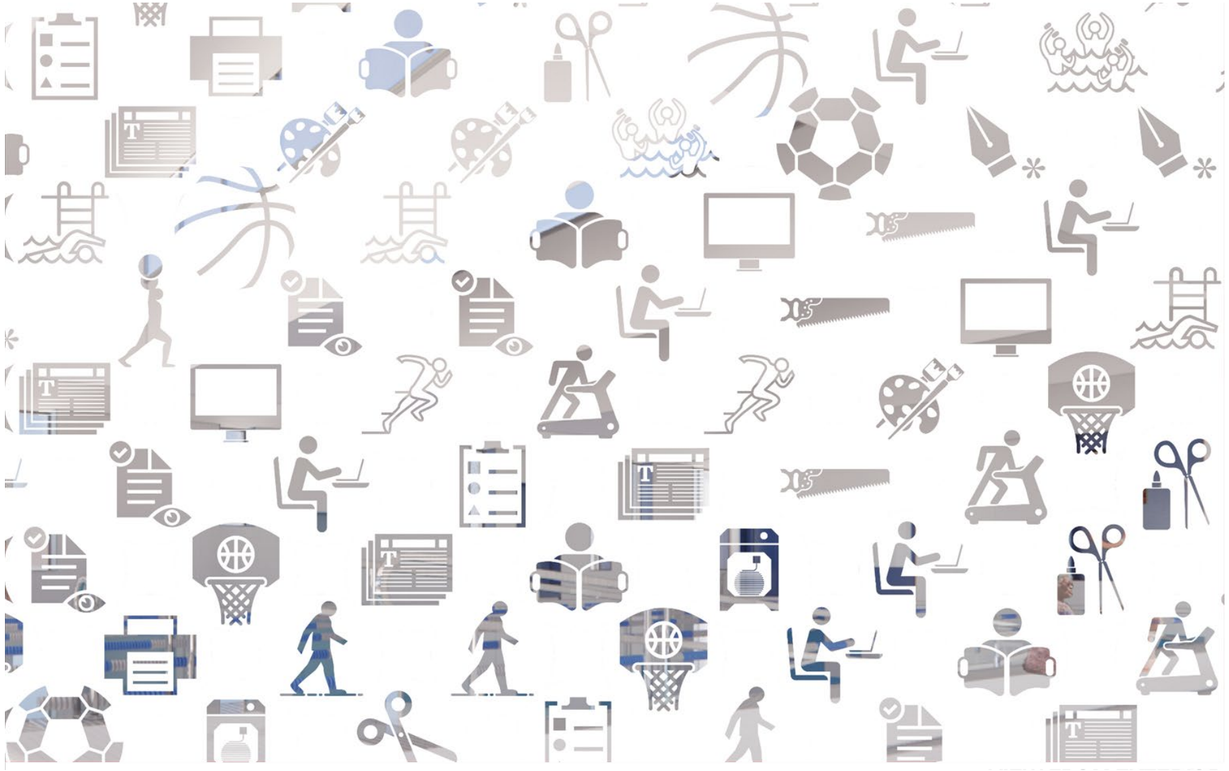
40% TRANSPARENT



20% TRANSPARENT
6' ABOVE SIDEWALK



Glass Pattern Reflects What's Happening Inside



Low Transparency at Sidewalk to Block Views

High Transparency at Ceiling for Daylight

Key Takeaways

- Learn from community members - value lived experience alongside professional expertise
- Plan early to balance community needs, daylight, and envelope durability when designing a natatorium enclosure
- Identify control layers (e.g. air, vapor, thermal) on drawings and ensure continuity at transitions
- Evaluate systems options early to arrive at the most optimal and cost-effective solution
- Energy savings comes from many small interventions: building envelope, controls, variable flows
- Don’t let the technical solutions overwhelm designing beauty and joy in all of the details

Thank You!

BUILDINGENERGY BOSTON

Please fill out an evaluation for this session

or: *nesea.org/eval*

Northeast Sustainable Energy Association (NESEA)