

Lexington High School

Permanent Building Committee Meeting

03/13/2025



smma **dw** **Turner**
DORE + WHITTIER

Introduction (20 minutes)

- Exterior Design
- Feature Space Design
- Floor, Wall and Ceiling Material Type Categories
- LCCA for HVAC Options

Discussion (35 minutes)

- Final Solar PV System & Battery Storage Size
- Assumed Floor to Floor Heights and Typical Ceiling Heights
- Proprietary Items - Low Carbon GWB & Tectum Acoustical Panels

Confirmation (15 minutes)

- Outdoor Classrooms Including Roof Terrace
- Ventilation Basis of Design CO2 Level PPM
- Additional Cx for Demand Response (LEED) Beyond MSBA

Introduction (20 minutes)

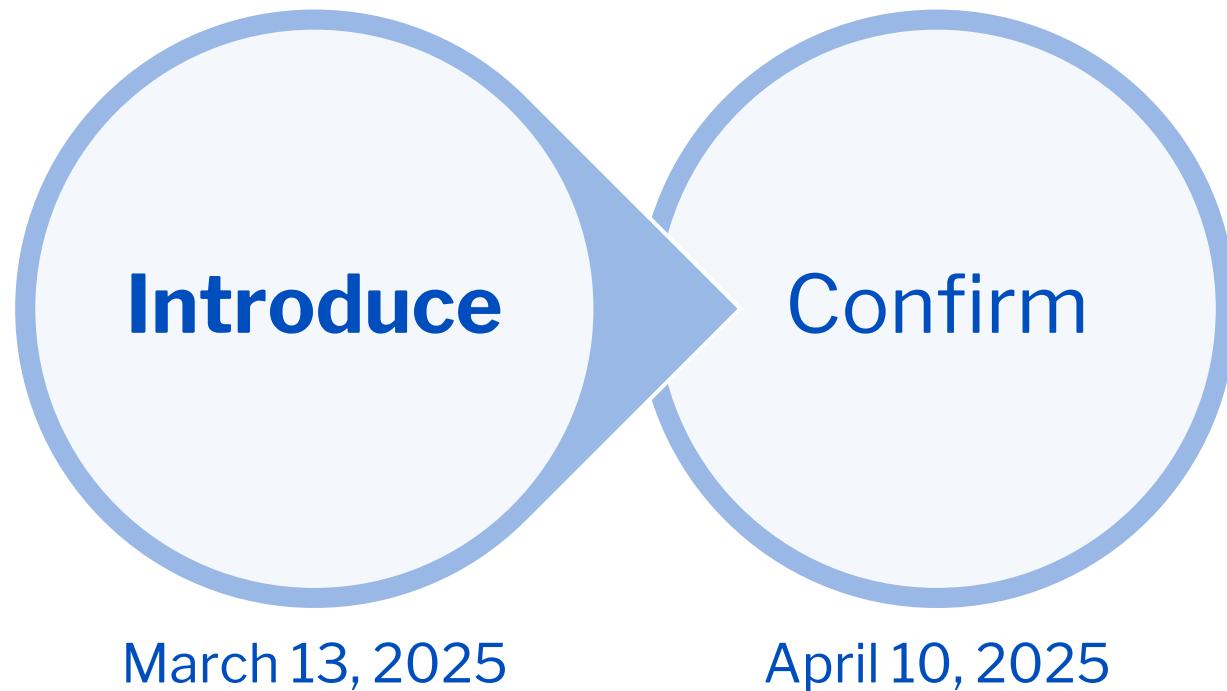
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Exterior Design



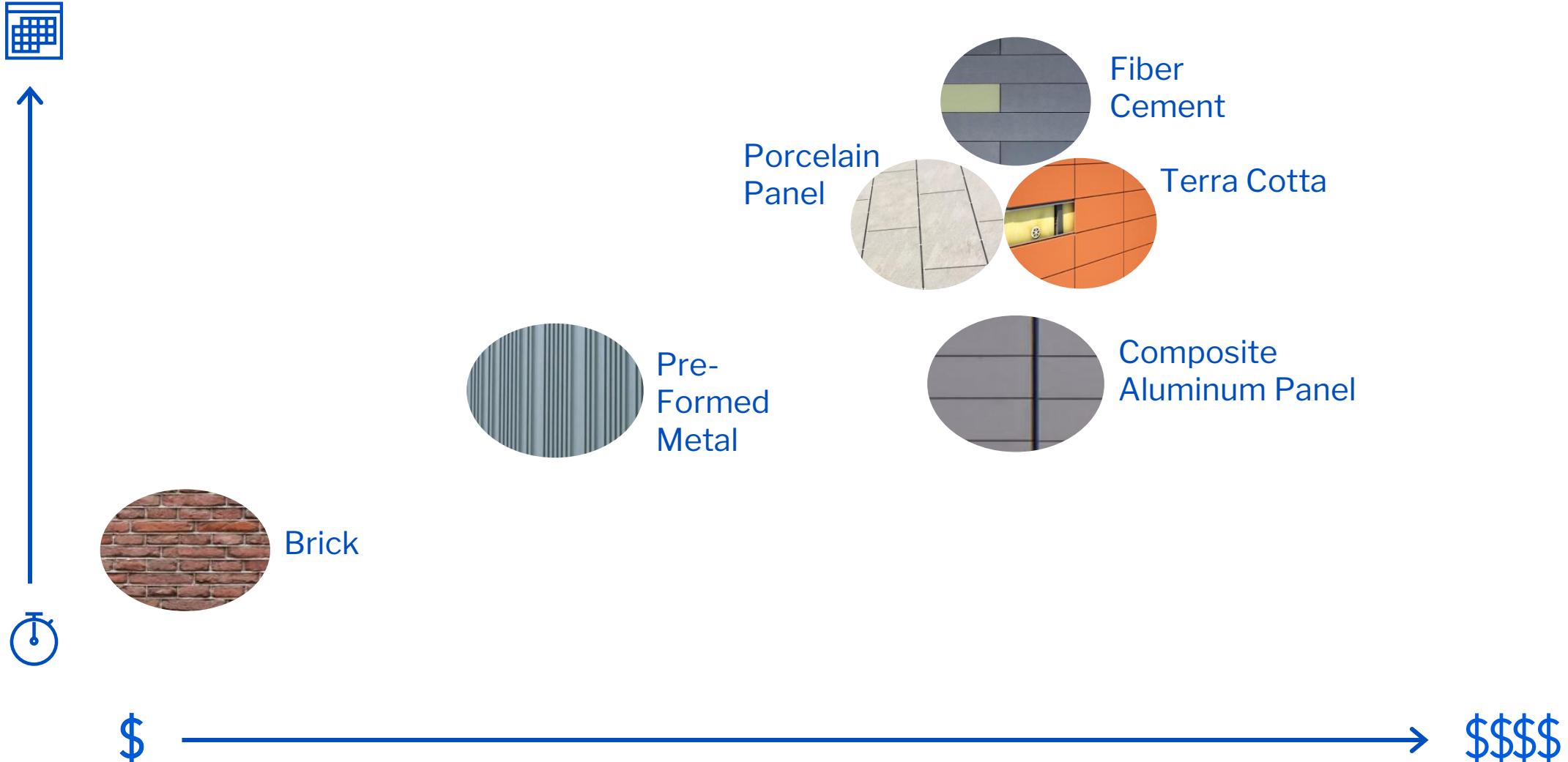
Eye-Level View from Worthen Road Entrance Drive



Potential Materials & Systems

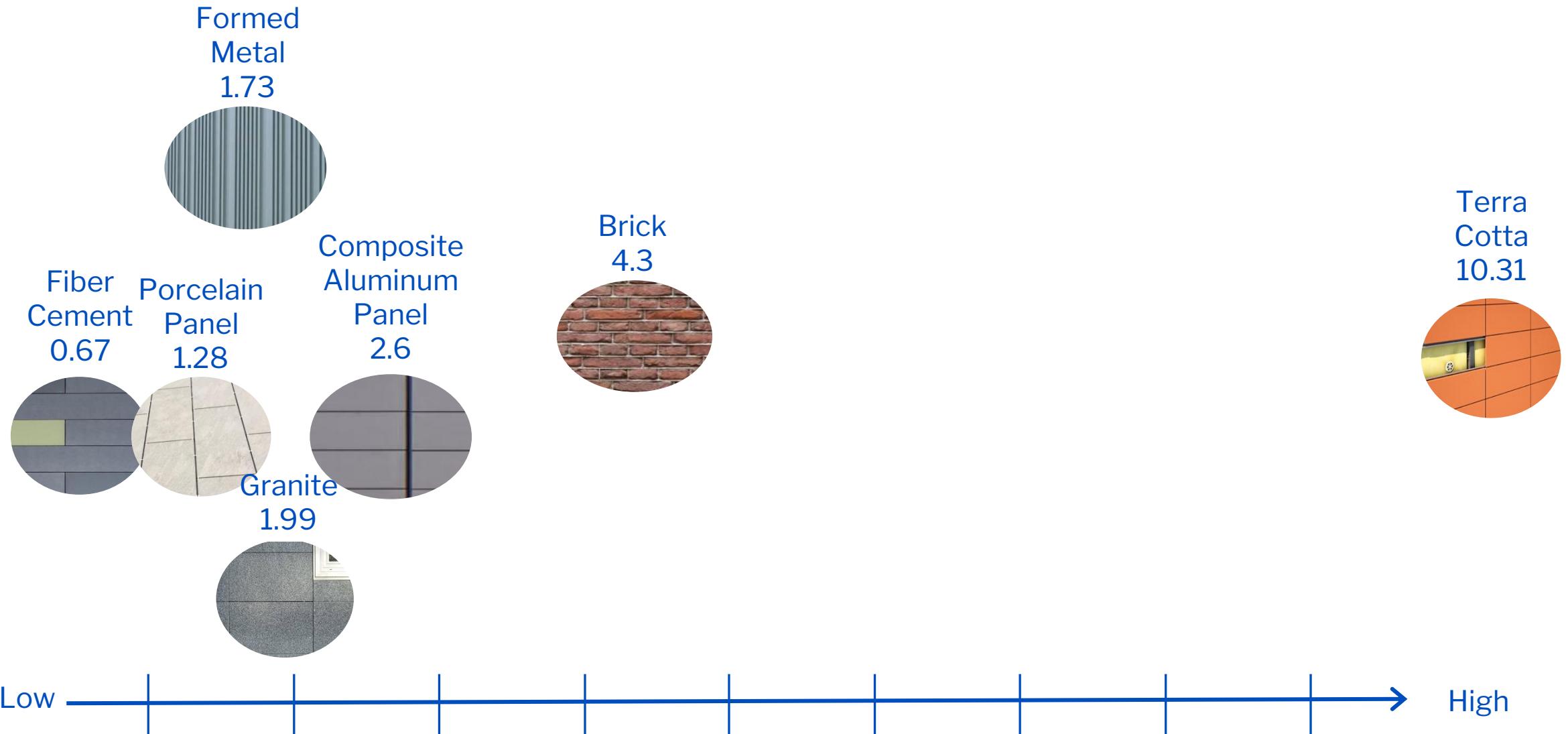
Opaque Masonry Walls	Brick Masonry, Precast Accents, Stone Base	<ul style="list-style-type: none">• Target 75% of Wall Enclosure• High Insulation Value
Rainscreen Accent Walls	Pre-finished Metal Panel Spandrels and Fascias; Accents in Porcelain, Terra Cotta or Fiber Cement	
Windows	Triple Insulated-Glazed, Aluminum Frame	<ul style="list-style-type: none">• Target 25% of Wall Enclosure• Utilizes Low-emissivity glass
Curtain Walls and Storefront	Triple Insulated-Glazed, Aluminum Frame	
Roof Edges & Canopies	Pre-finished Metal	
Soffits	Pre-finished Metal, Phenolic or DEFS (stucco)	
Roof Screens	Pre-finished Metal	
Roofing	PVC Membrane	

Relative Cost and Availability



Exterior Cladding Materials

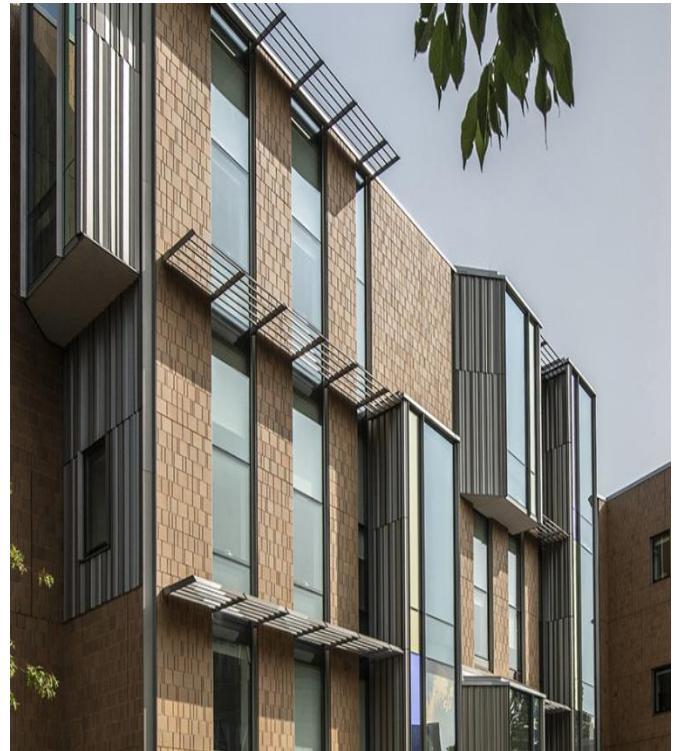
Embodied Carbon Factor (based on Industry-Wide Environmental Product Declarations, in kgCO2e/sf)



Potential Materials & Systems

Brick Masonry

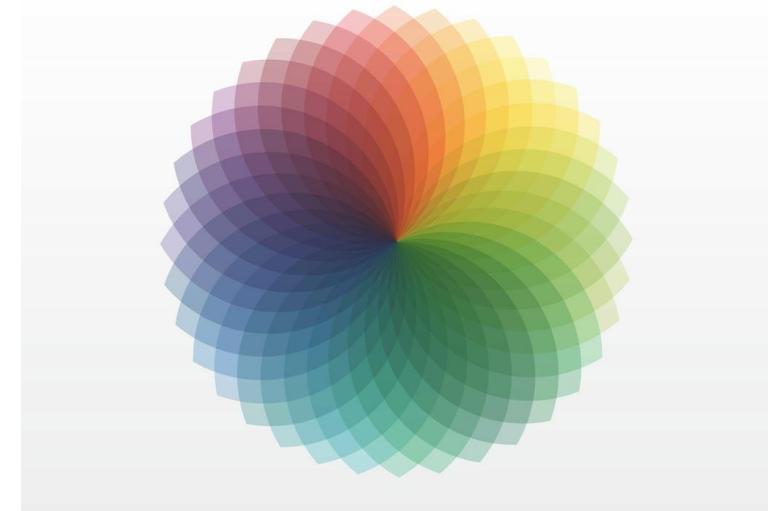
- 60% of Opaque Walls at PSR
- Timeless and reliable
- Wide range of colors and textures available
- Inexpensive
- **Carbon Factor: 4.3**



Potential Materials & Systems

Pre-Finished Metal Panel

- 18% of Opaque Walls at PSR
- Accent Material
- Flat panels, perforations available
- Full spectrum of colors available including metallics
- Similar cost to other rainscreen systems (~2x brick masonry)
- **Carbon Factor: 2.6**



Exterior Elevation “Types”



Long sides of wings

- Primarily Classrooms
- Lots of repetition

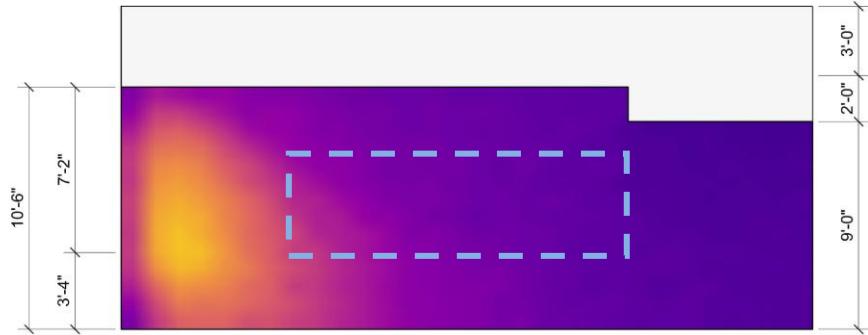
Short ends of wings

- Stairwells and ends of corridor
- Corner room conditions

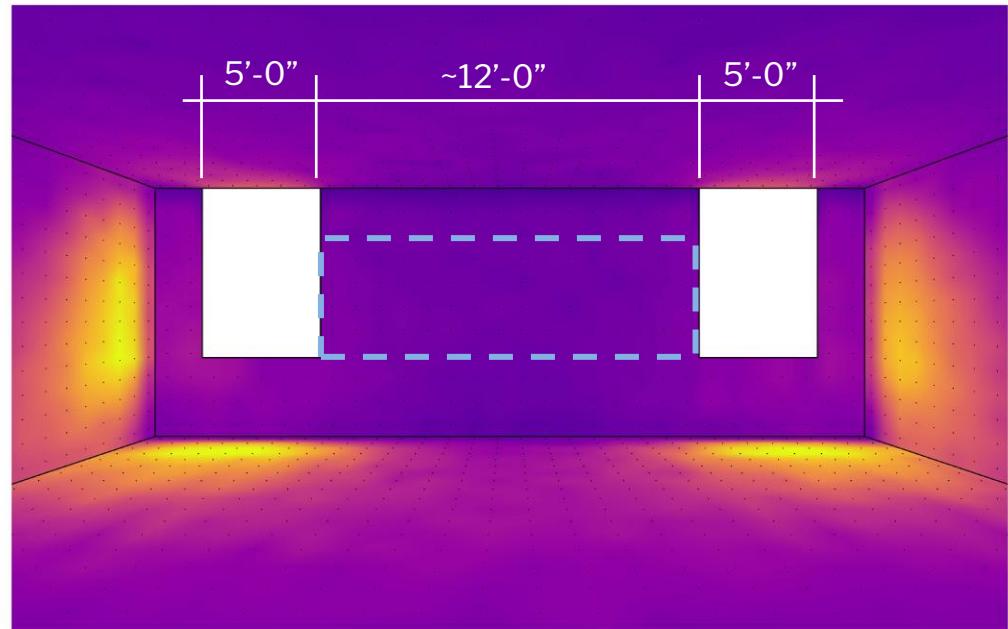
Entrances and “bridges” between wings

Fenestration Approach

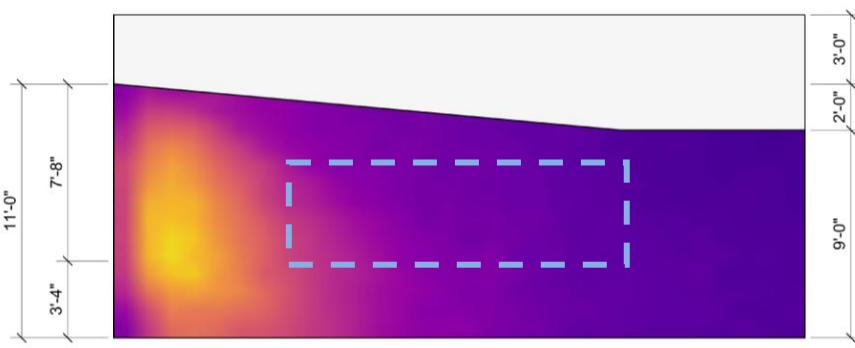
Classroom Window Placement for Optimized Natural Daylighting



RECESSED CEILING
vs.

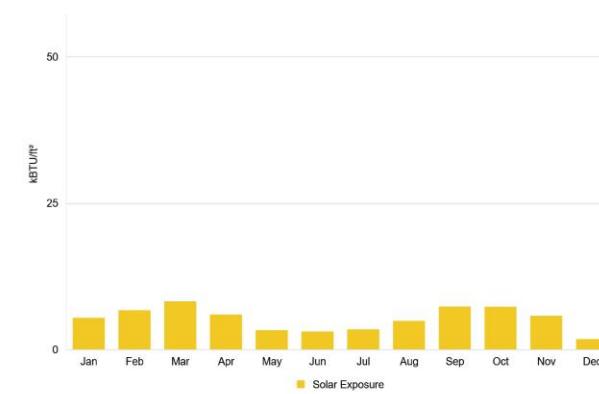


Exterior Wall



SLANTED CEILING

= Teaching Wall



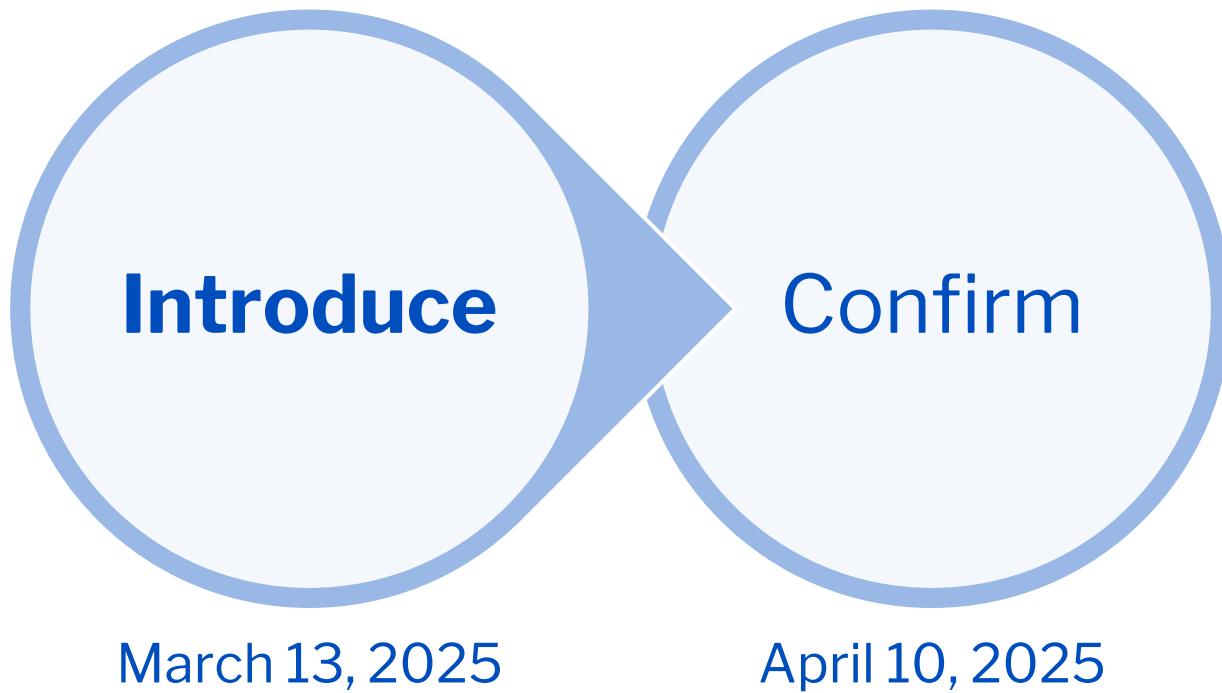
Annual Solar Exposure

Exterior Design – Study 1



Exterior Design – Study 2





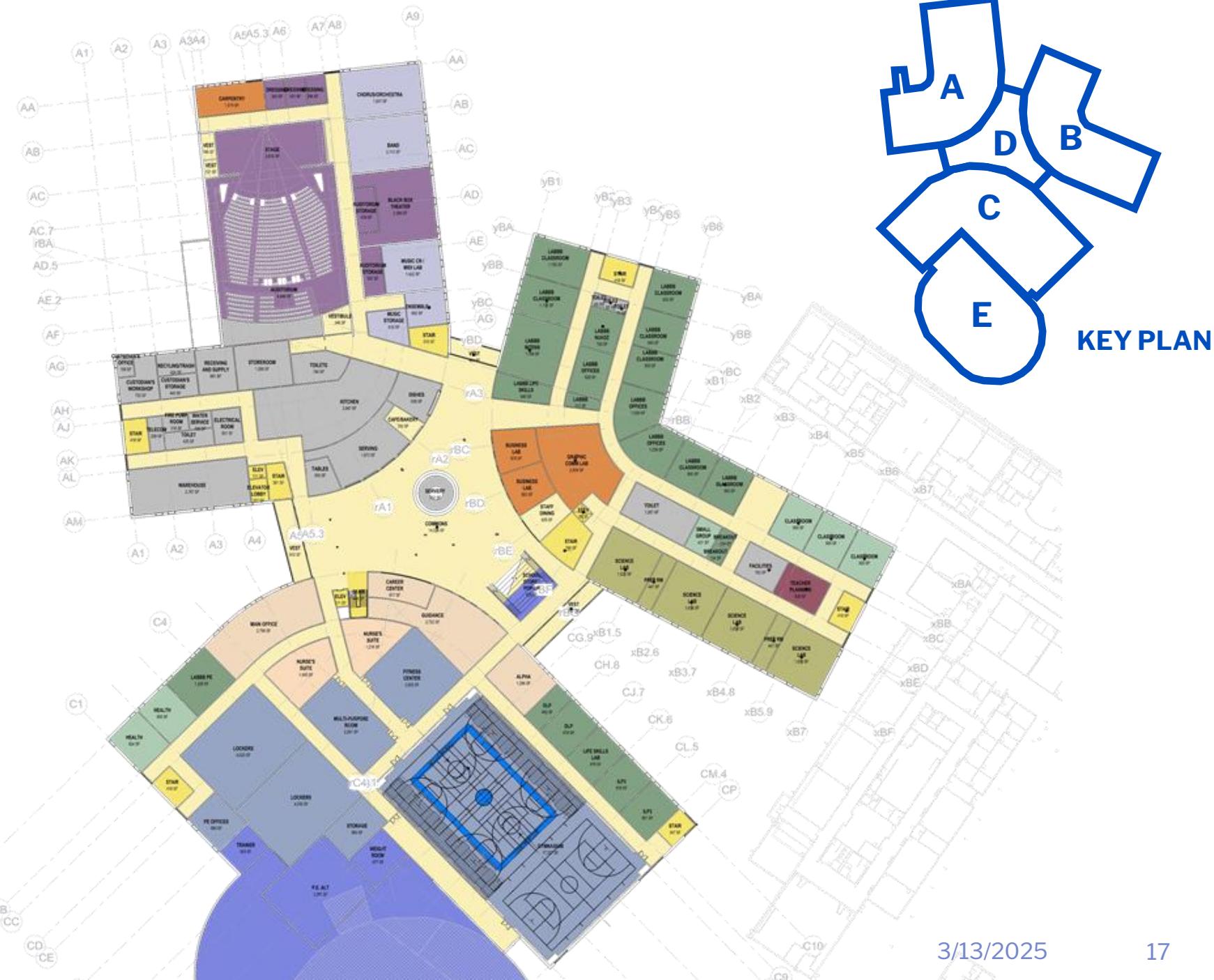
Feature Space Design

Building Floor Plan

- Core Academic
- Science
- Teacher Planning & Small Group
- Admin, Guidance, ALPHA, METCO, Central Offices
- Auditorium / Drama
- Art & Music
- Media Center
- Vocation & Technology
- Physical Education
- Special Education
- Medical
- Kitchen, Restrooms, Custodial
- Commons
- Circulation
- Vertical Circulation
- Rooftop Open Space
- Other
- Expansion



LEVEL 1

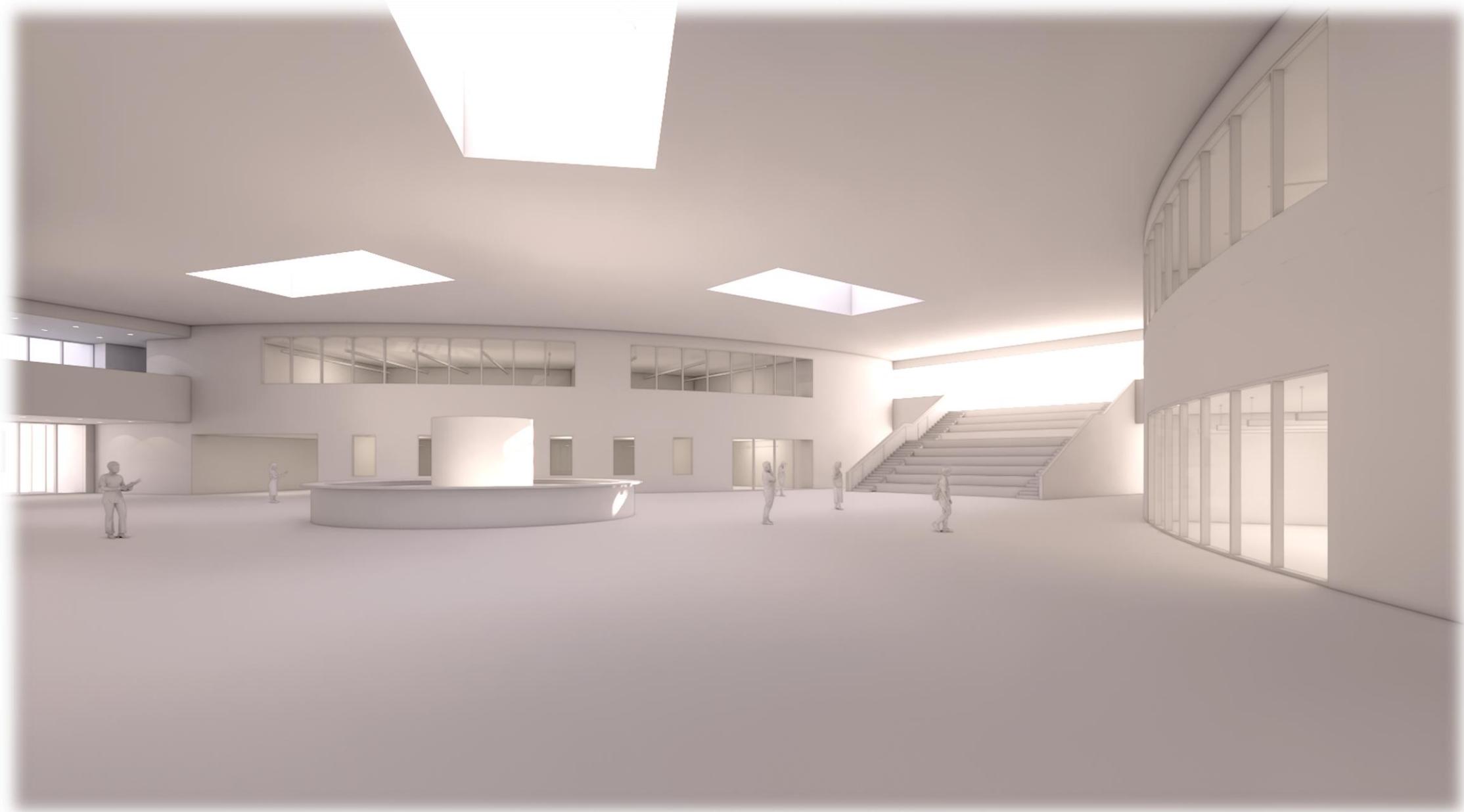


Feature Space Design

Schematic Building Section



Feature Space Model Images/ Dining Commons



Feature Space Model Images/ Dining Commons



Feature Space Precedent Images/ Dining Commons



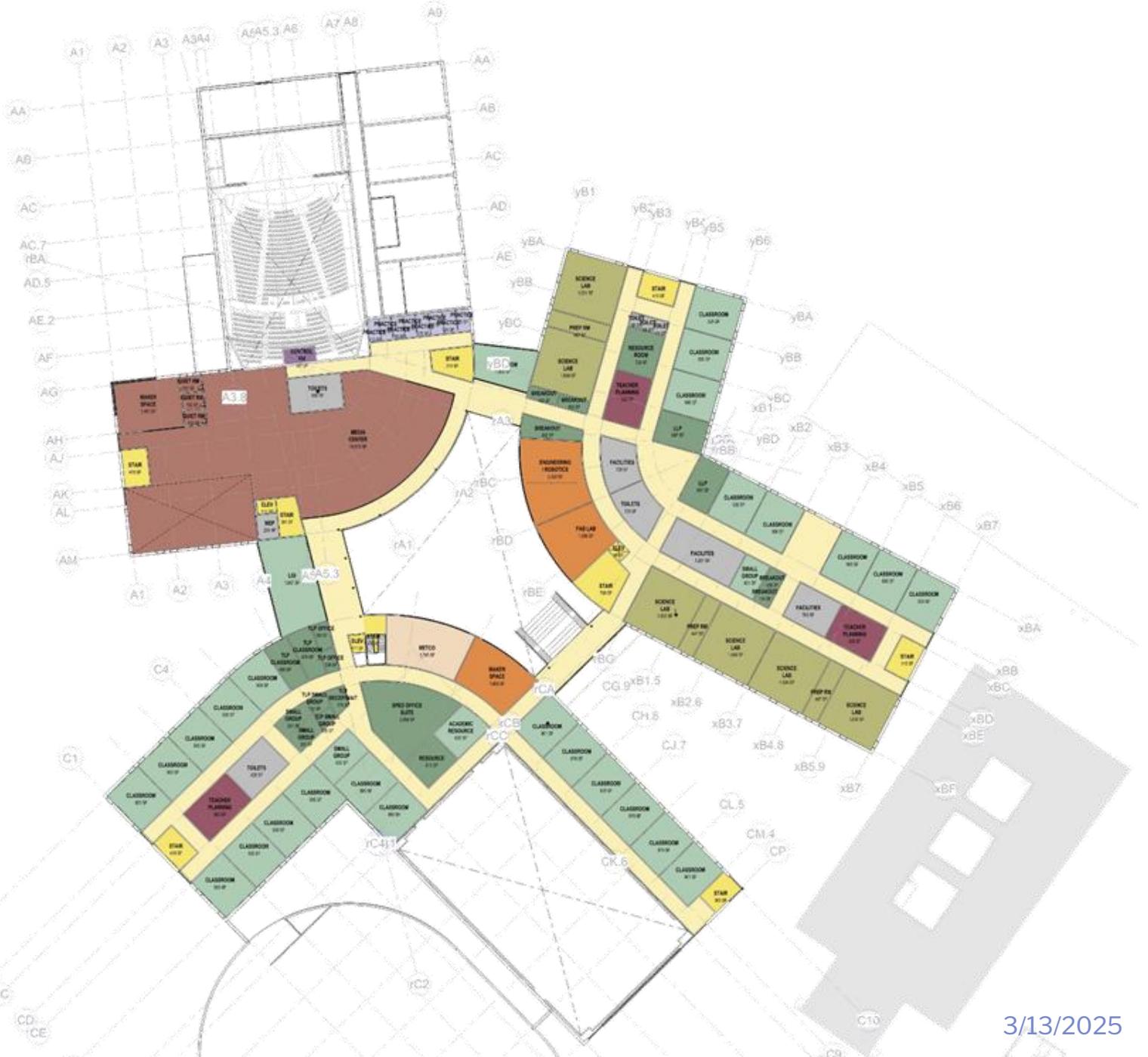
Feature Space Precedent Images/ Auditorium



Feature Space Precedent Images/ Gymnasium



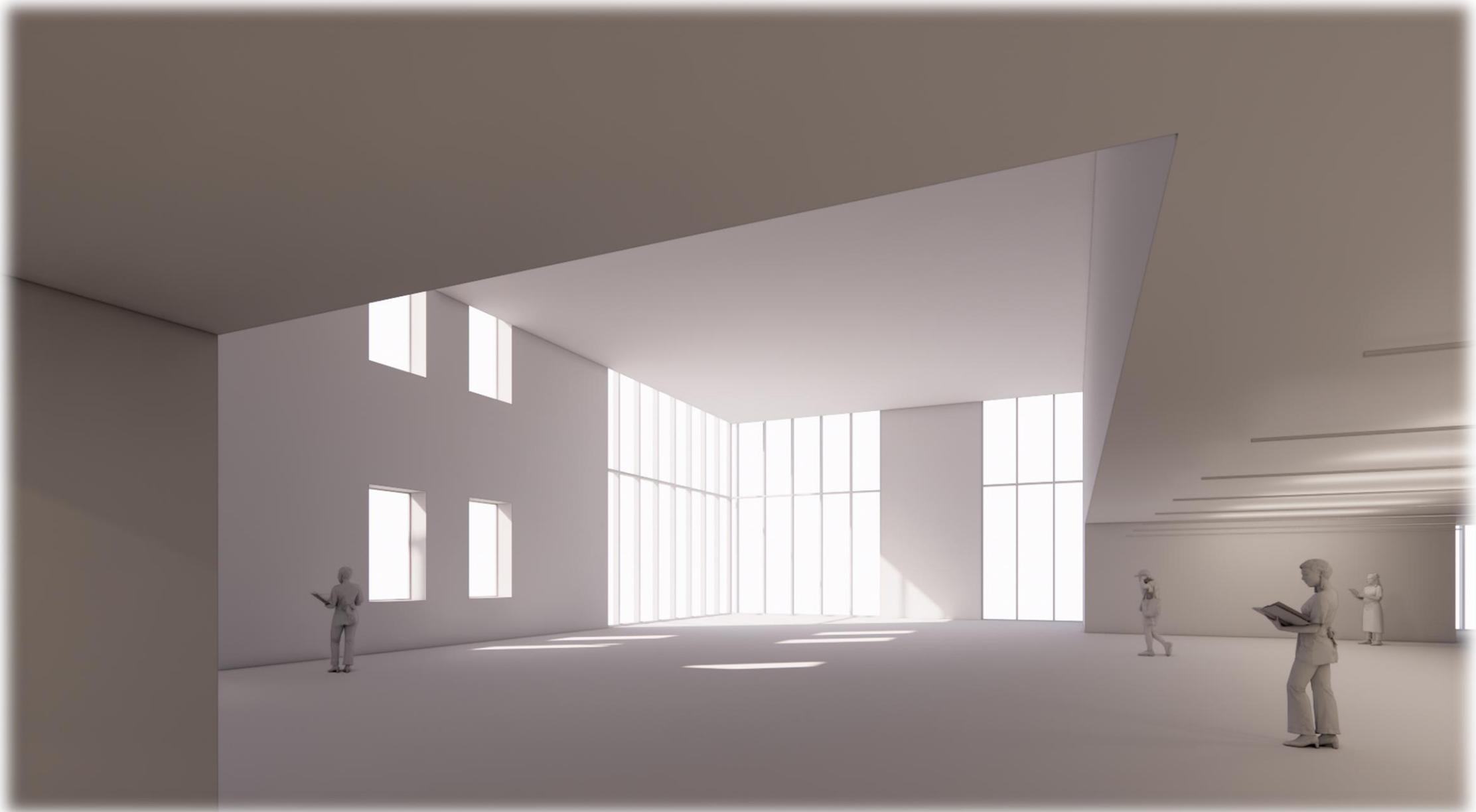
Building Floor Plan



Feature Space Model Images/ Dining Commons & Library/ Media Center



Feature Space Model Images/ Library/ Media Center



Feature Space Precedent Images/ Library/ Media Center

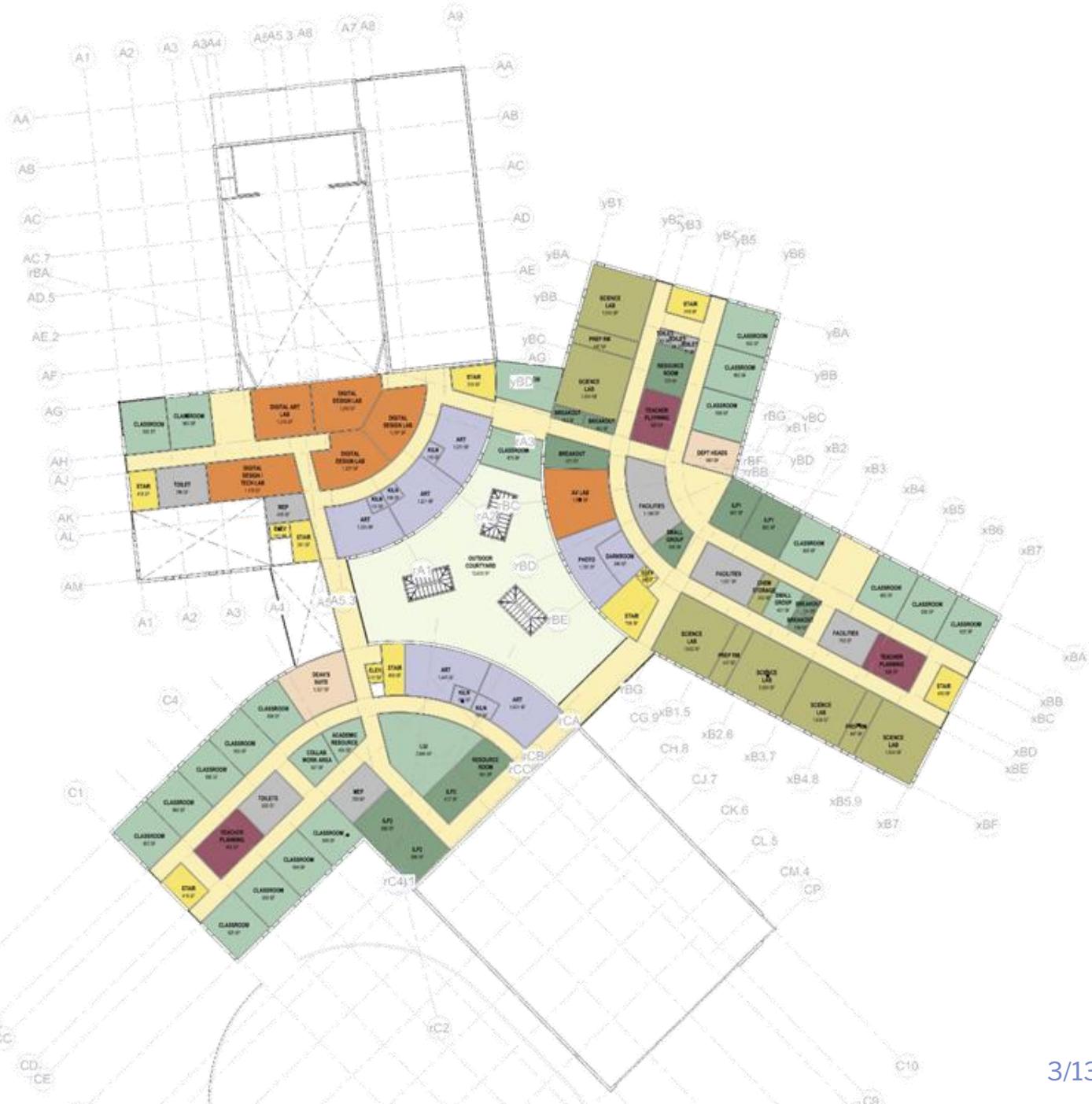


Building Floor Plan

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LEVEL 3



Feature Space Precedent Images/ Large Group Instruction (LGI)

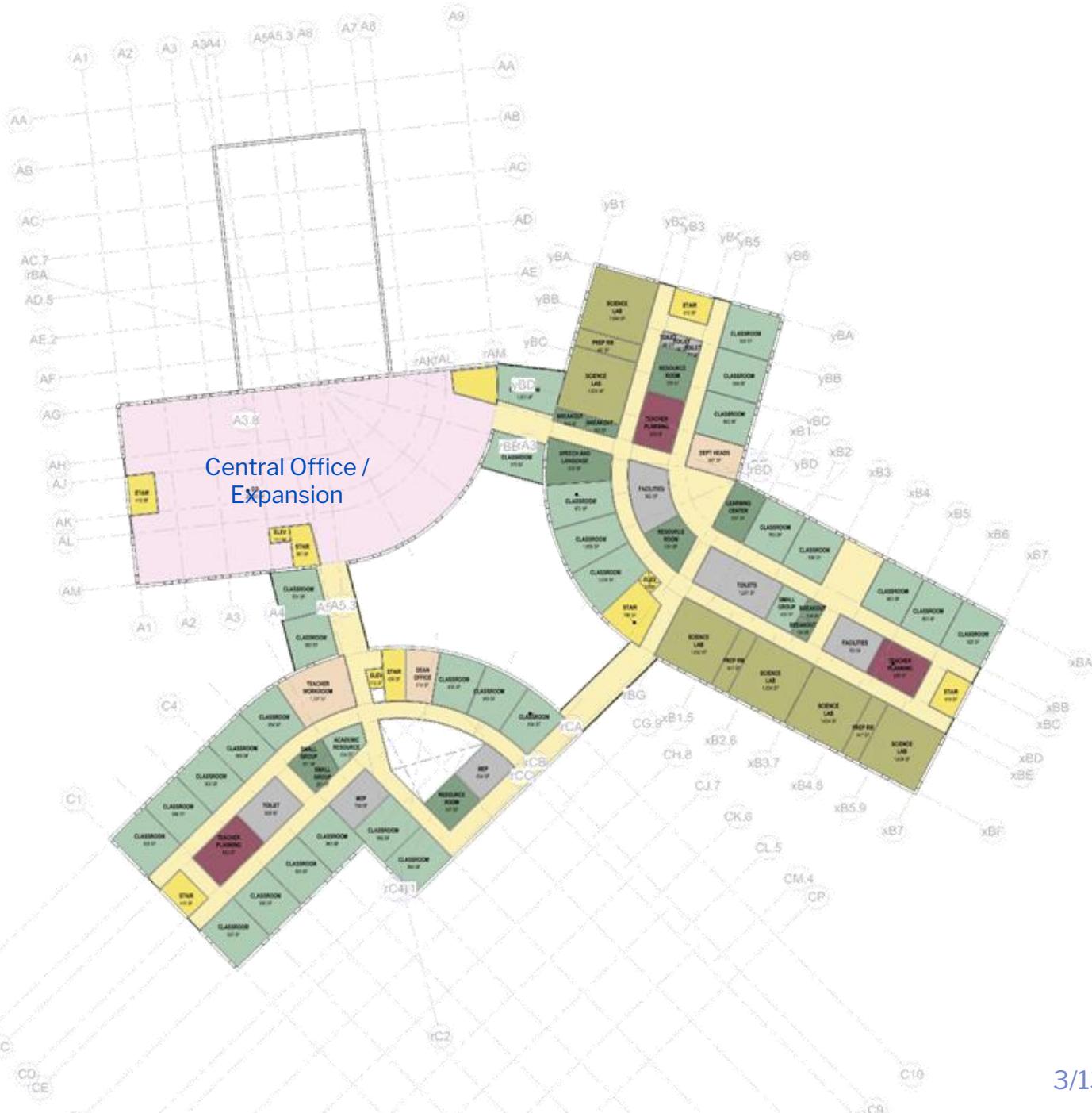


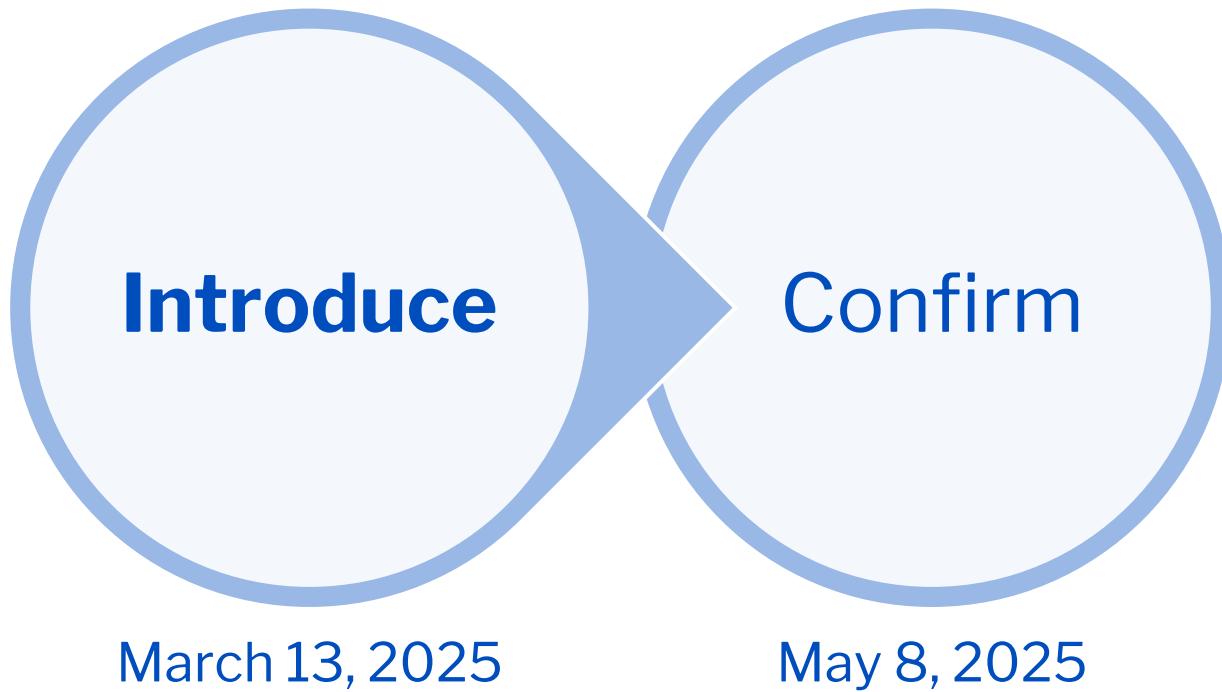
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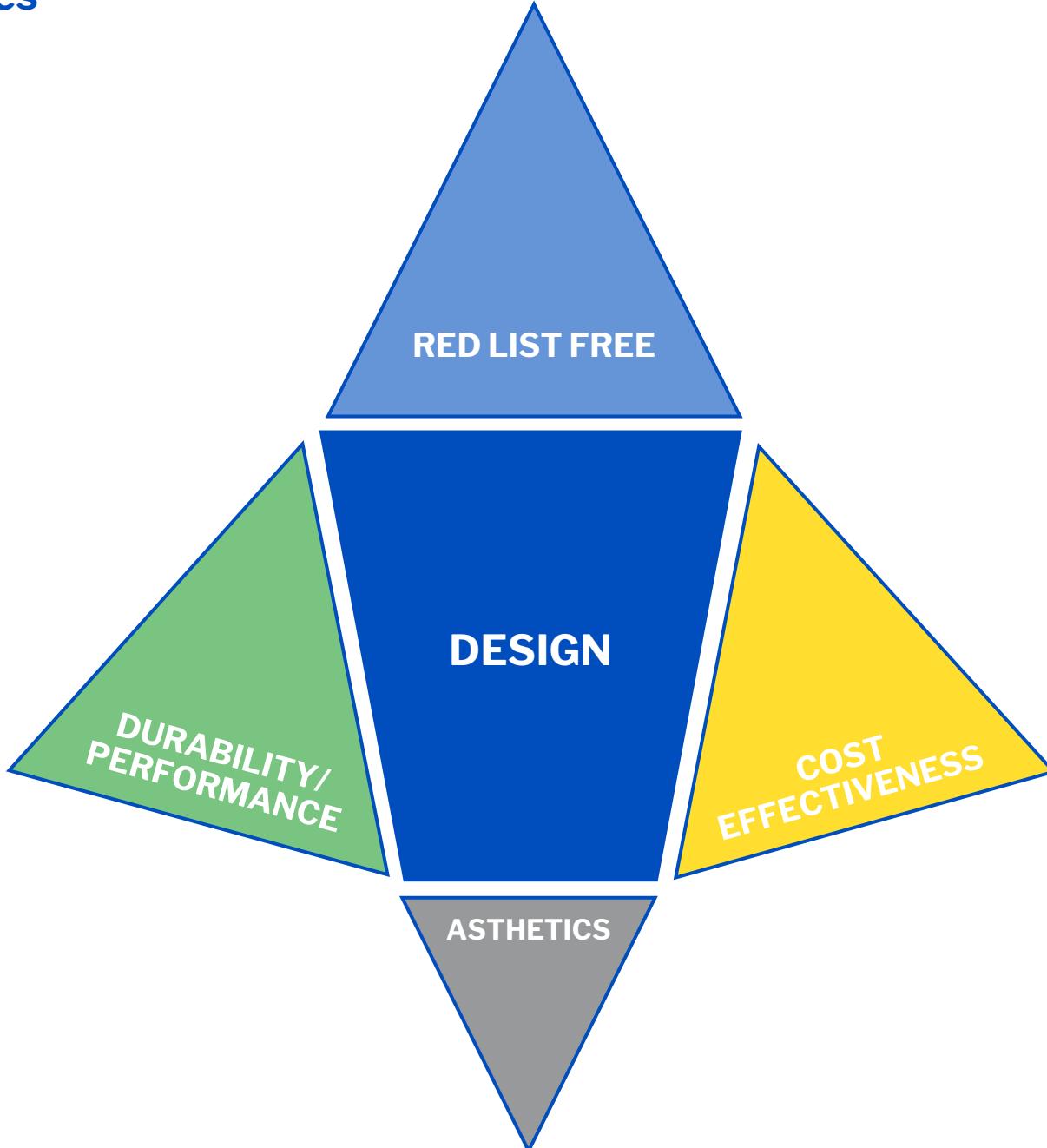


LEVEL 4





Healthy Material Priorities



Red List Materials Category Selection & Prioritization

Flooring and Base Materials

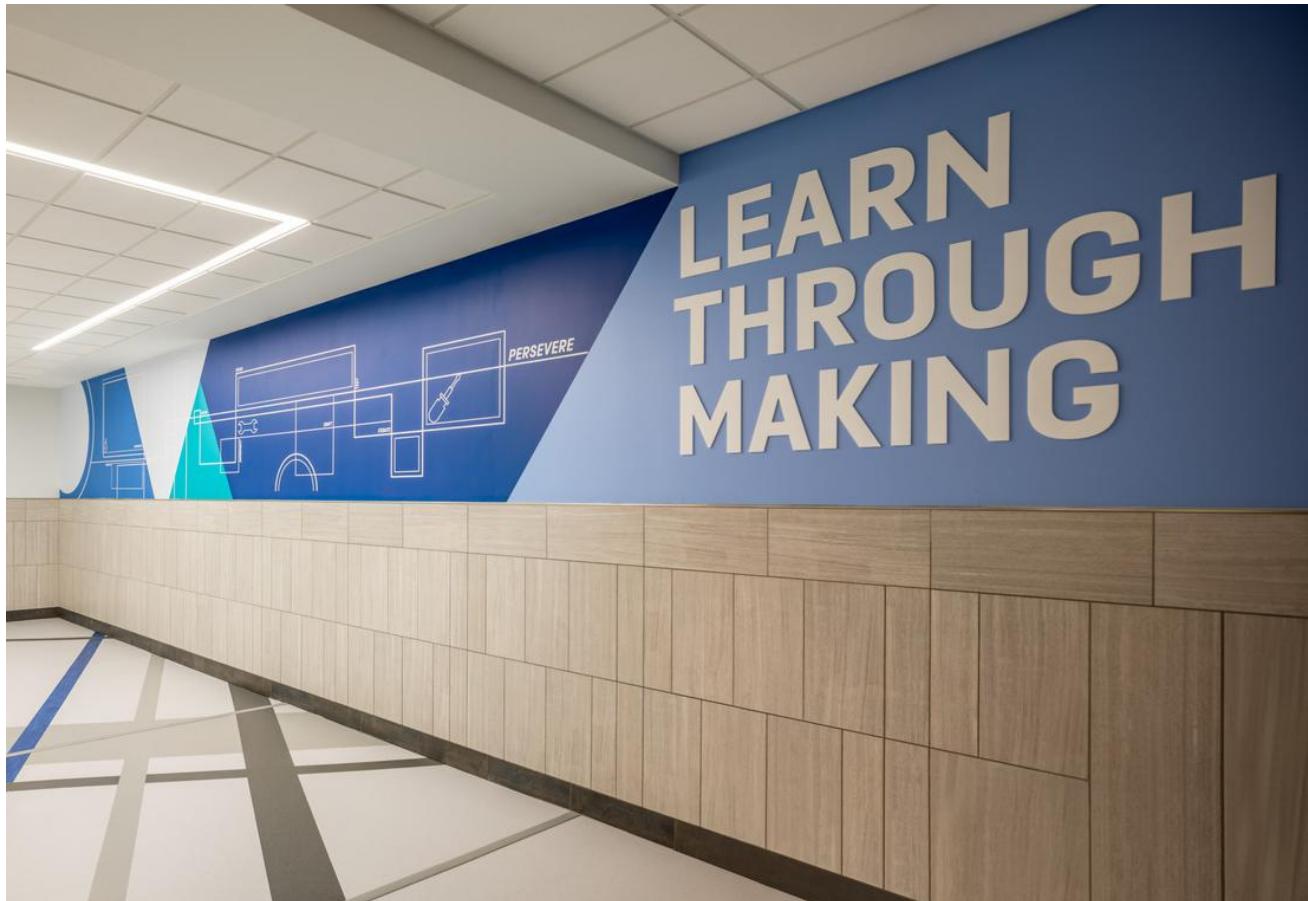
smma

Material Selection Priorities
(Durability and Cost will be reviewed in DD phase)

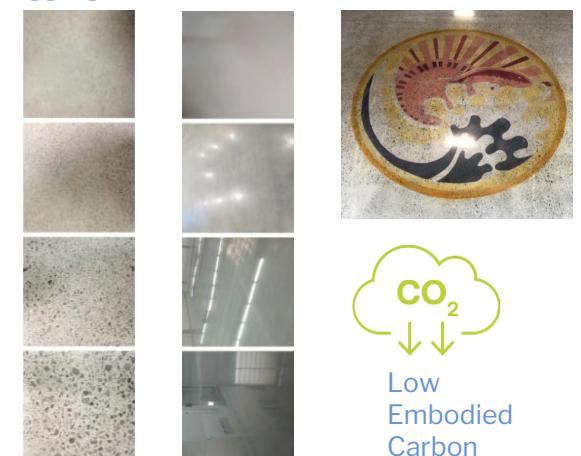
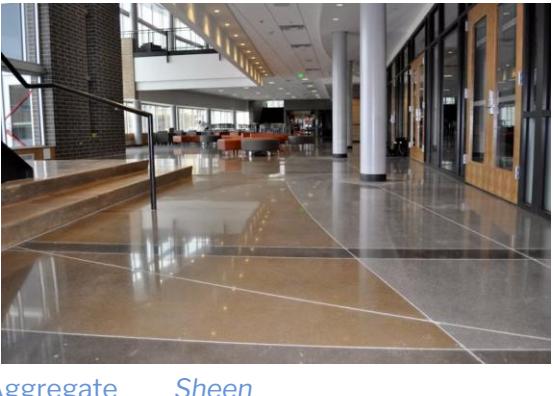
Specification Section Number	Specification Name	Product Type	Manufacturer	Product Name	Red List Status	Declare Label Expiration Date	Poor, Good, Best		Low, Medium, High		Dropdown	Y/N	Y/N	Low, Med, High	Y/N					
							Priority 1		Priority 2		Priority 3									
							Cost	Sustainability	HPD	EPD	Embodied Carbon Content									
096566		Athletic Flooring (Rubber)	Zandur	Vulcanized Rubber Sports Flooring - Sustain, Fitness Flooring - Sustain, Sophros & Flex	Red List Free	2/1/2025			Other	N	N			N		https://zandur.com/products/sophros-solid-rubber/				
096566		Athletic Flooring (Rubber)	Ecore	Ultratile	Product Research Required				FloorScore	Y	Y	Medium		N		https://ecoreathletic.com/products/rubber/performance-ultratile				
096566		Athletic Flooring (Rubber)	Flexco	Tuflex Force Rubber Flooring	Red List Free	Self Declared Red List Free			FloorScore	Y	Y	Medium		N		https://flexcofloors.com/product-category/rubber-tile-samples/tuflex-force-recycled-rubber-tile-samples/				
096566		Athletic Flooring (Rubber)	Capri Collections	Fitness & Rec EPDM Rubber Flooring	Red List Free	10/1/2025			FloorScore	N	N			N		https://declare.living-future.org/products/fitness-rec				
096566		Athletic Flooring (Rubber)	Ecore International	ECOfit	Product Research Required				SCS Indoor Advantage	Y	Y	High		Y		https://ecosurfaces.com/products/rubber/ecofit				
096466		Athletic Flooring (Wood)	Tarkett	Flexlock Wood Sports Flooring	Product Research Required				None	N	N			N		https://professionals.tarkett.com/en_EU/collection-C001408-flexlock				
096466		Athletic Flooring (Wood)	Acer Flooring	Infinity Wood Floors	Product Research Required				None	N	N			N		https://www.acerflooring.com/				
		Carpet (Broadloom)	Milliken	Broadloom Carpet	Red List Free	5/1/2025			CRI Green Label Plus	N	N	High		N		https://fccatalogblob.milliken.com/fccatalogblob/documents/67/F7/Formwork_Brochure.pdf				
		Carpet (Broadloom)	Mohawk Group	Comercial Nylon Broadloom	Red List Free	8/1/2025			CRI Green Label Plus	Y	Y	High		N		https://www.mohawkgroup.com/products/soft-surface?product_type=Broadloom				
		Carpet (Broadloom)	Godfrey Hirst	100% Wool Broadloom Carpet	Red List Free	9/1/2025			Other	N	N			N		https://www.godfreyhirst.com.au/products?type=CPT&subType=wool_cpt				
		Carpet Tile	Mohawk Group	Nylon Modular Carpet on Edge	Red List Free	1/1/2026			CRI Green Label Plus	Y	Y	High		N		https://www.mohawkgroup.com/products/soft-surface?product_type=Carpet%20Tile&red_list_free=True				
		Carpet Tile	Milliken	First Sight Sandscape - PVC-Free WellBAC Comfort cushion backing	Red List Free	7/1/2025			CRI Green Label Plus	Y	Y	High		N		https://fcproductcatalog.milliken.com/en-us/search/colors?sort=recent&regionName=Americas&marketName=Contract&catalogName=Products&regionId=76&marketId=73&catalogId=17&totalResults=18&collectionId=599&collectionName=First+Sign				
		Carpet Tile	Milliken	First Sight Surface Current PVC-Free WellBAC Comfort cushion backing	Red List Free	7/1/2025			CRI Green Label Plus	Y	Y	High		N		https://fcproductcatalog.milliken.com/en-us/search/colors?sort=recent&regionName=Americas&marketName=Contract&catalogName=Products&regionId=76&marketId=73&catalogId=17&totalResults=18&collectionId=599&collectionName=First+Sign				
		Carpet Tile	Bentley Mills	All Carpet Products (Tile & Broadloom)	Red List Free	2/1/2025			CRI Green Label Plus	Y	Y	Low		N		https://www.bentleymills.com/bentley-publishes-declare-labels-achieves-red-list-free-status-for-all-carpet-products/				
096813		Carpet Tile	Bentley Mills	NexStep Cushion Tile - Burn	Red List Free	2/1/2025			SCS Indoor Advantage	Y	Y	Low		Y		https://declare.living-future.org/products/nexstep-cushion-tile				
096813		Carpet Tile	Bentley Mills	NexStep Cushion Tile - Red	Red List Free	2/1/2025			SCS Indoor Advantage	Y	Y	Low		Y		https://declare.living-future.org/products/nexstep-cushion-tile				

Snip of SMMA's Healthy Material Matrix (material research is ongoing)

Classroom and Corridor/ Material Type - Introduction

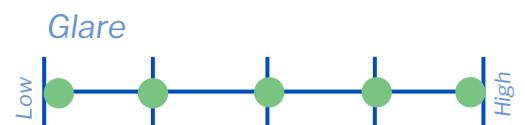
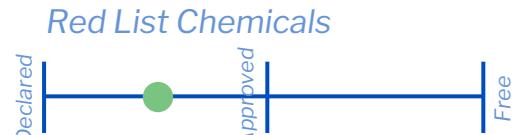


Classroom and Corridor/ Floor Finish



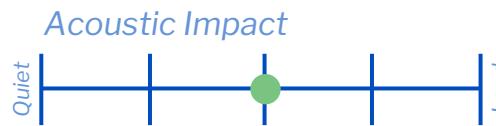
Concrete

(polished, stained, painted)

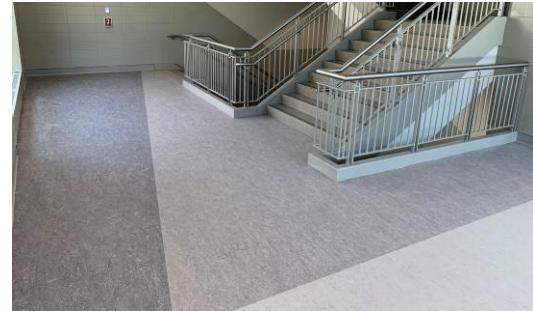


Low Embodied Carbon

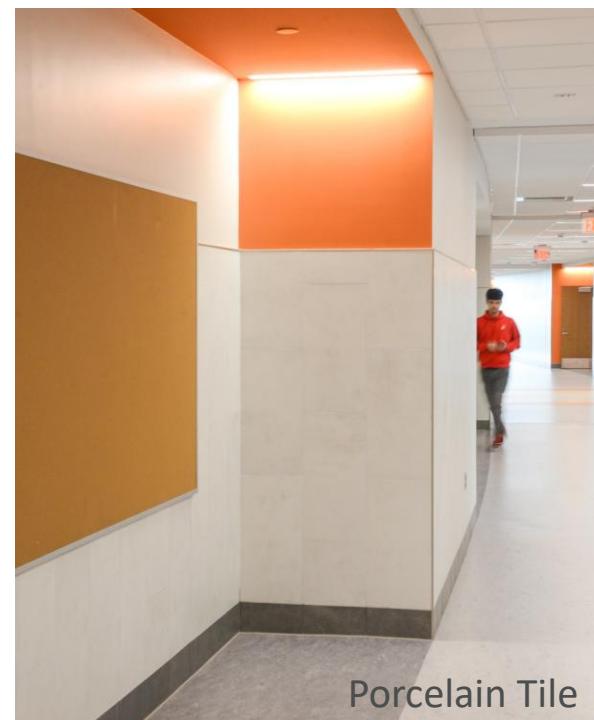
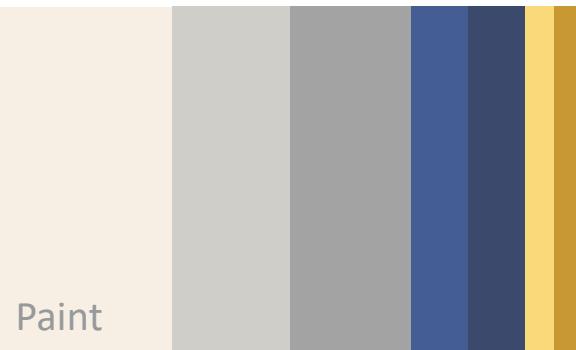
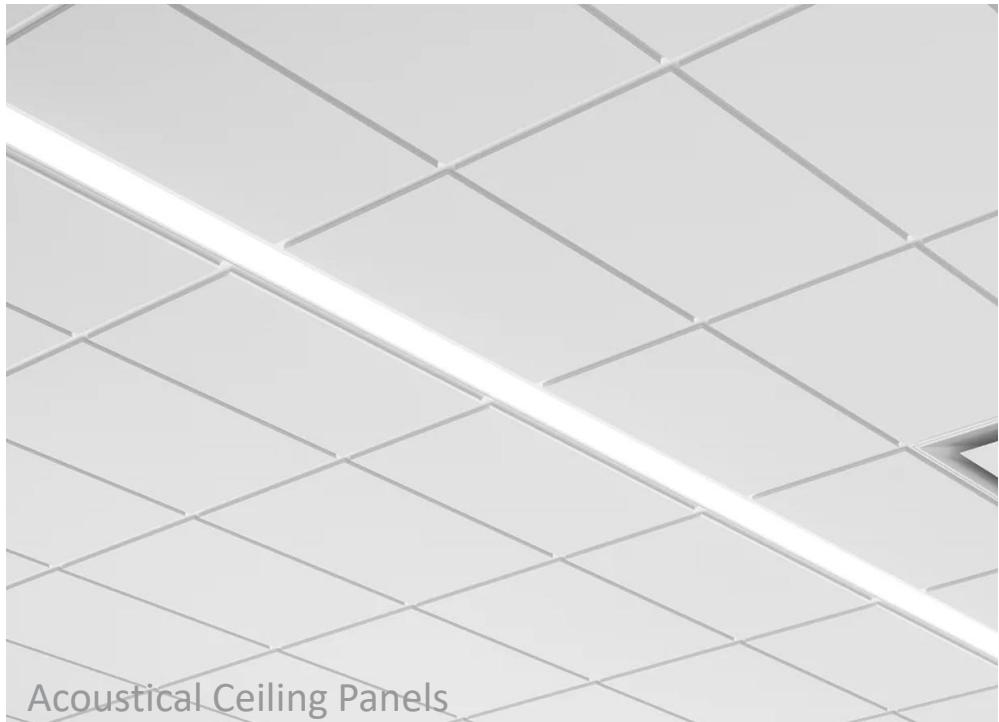
Linoleum



Low Embodied Carbon



Classroom and Corridor/ Wall & Ceiling Finishes



Feature Space/ Material Type Introduction

Commons

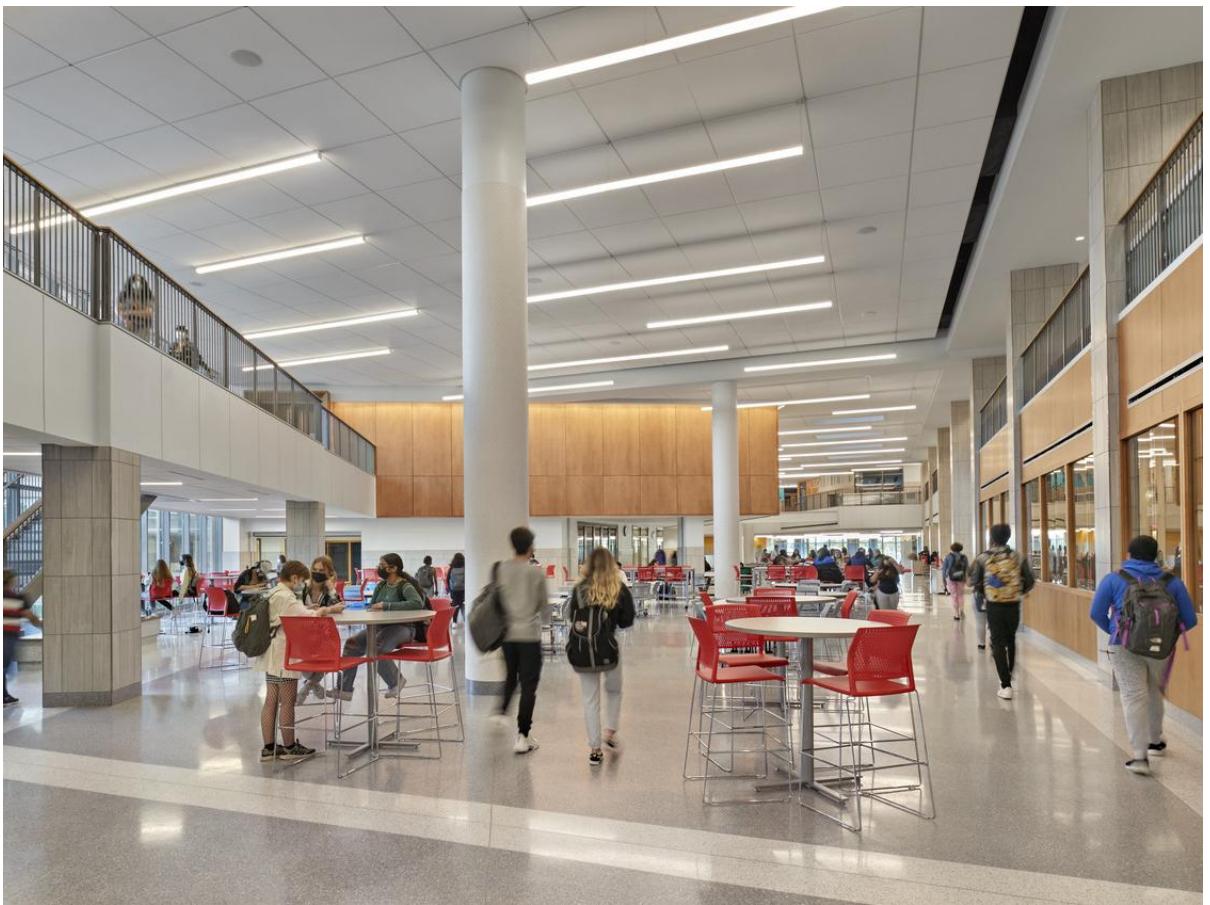
Gymnasium

Library/ Media Center

Art/Maker Space

Auditorium

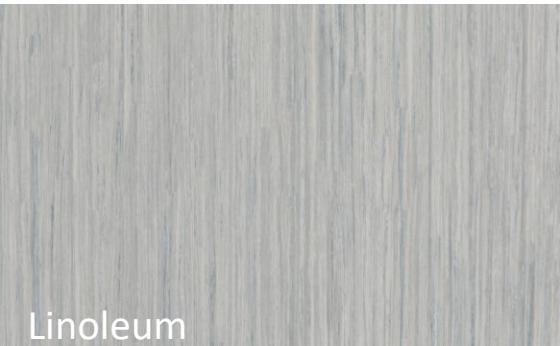
Large Group Instruction



Feature Space/ Floor Finishes



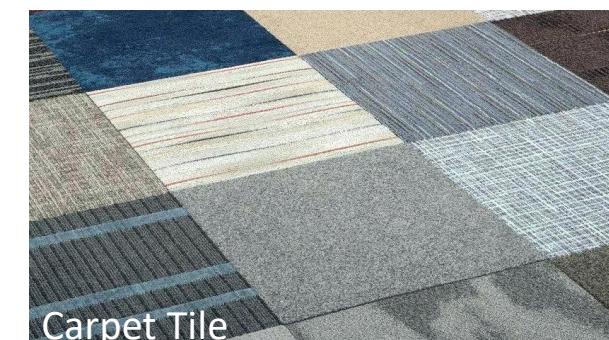
Polished Concrete – Large Aggregate



Terrazzo

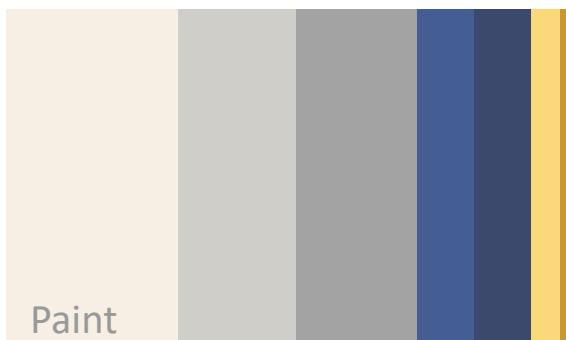


Stained Concrete

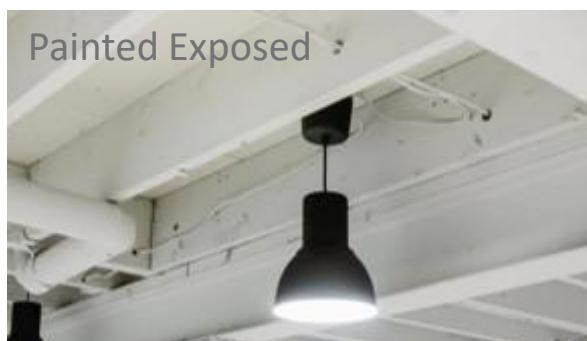
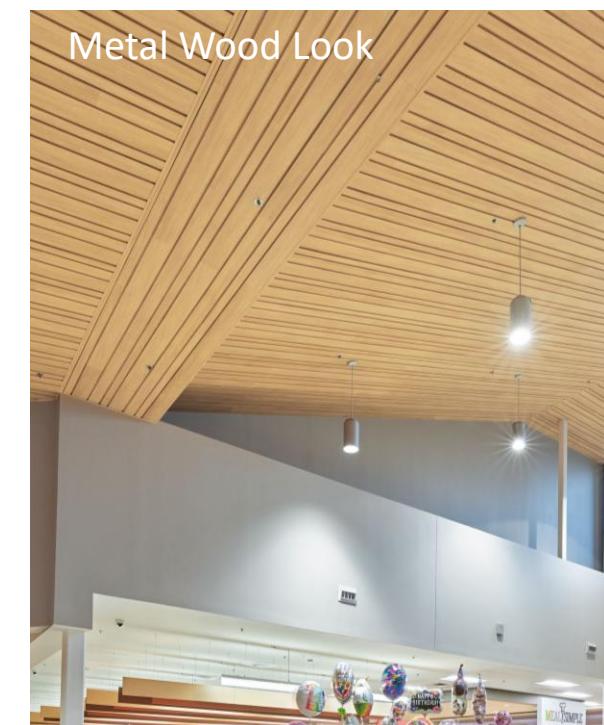
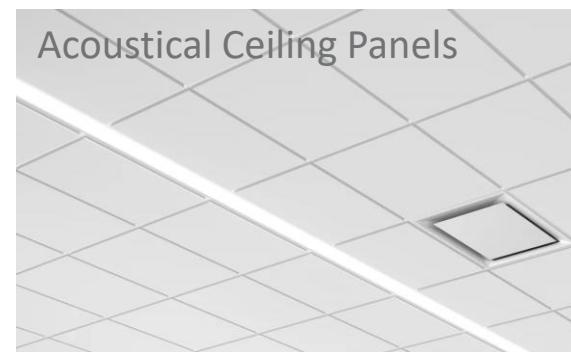
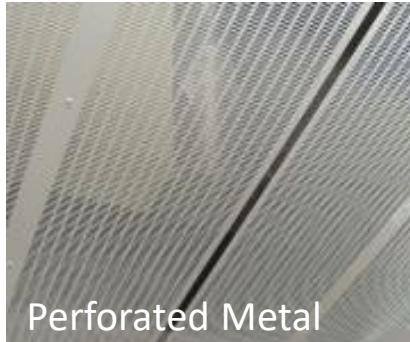
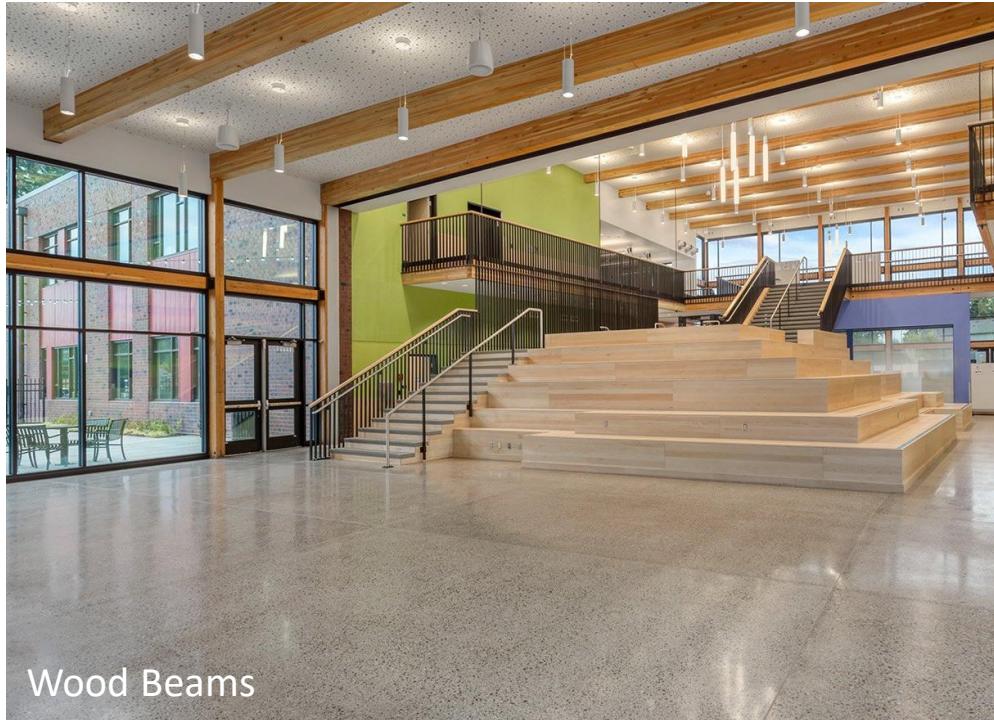


Carpet Tile

Feature Space/ Wall Finishes



Feature Space/ Ceiling Finishes





Schematic Design LCCA in Progress

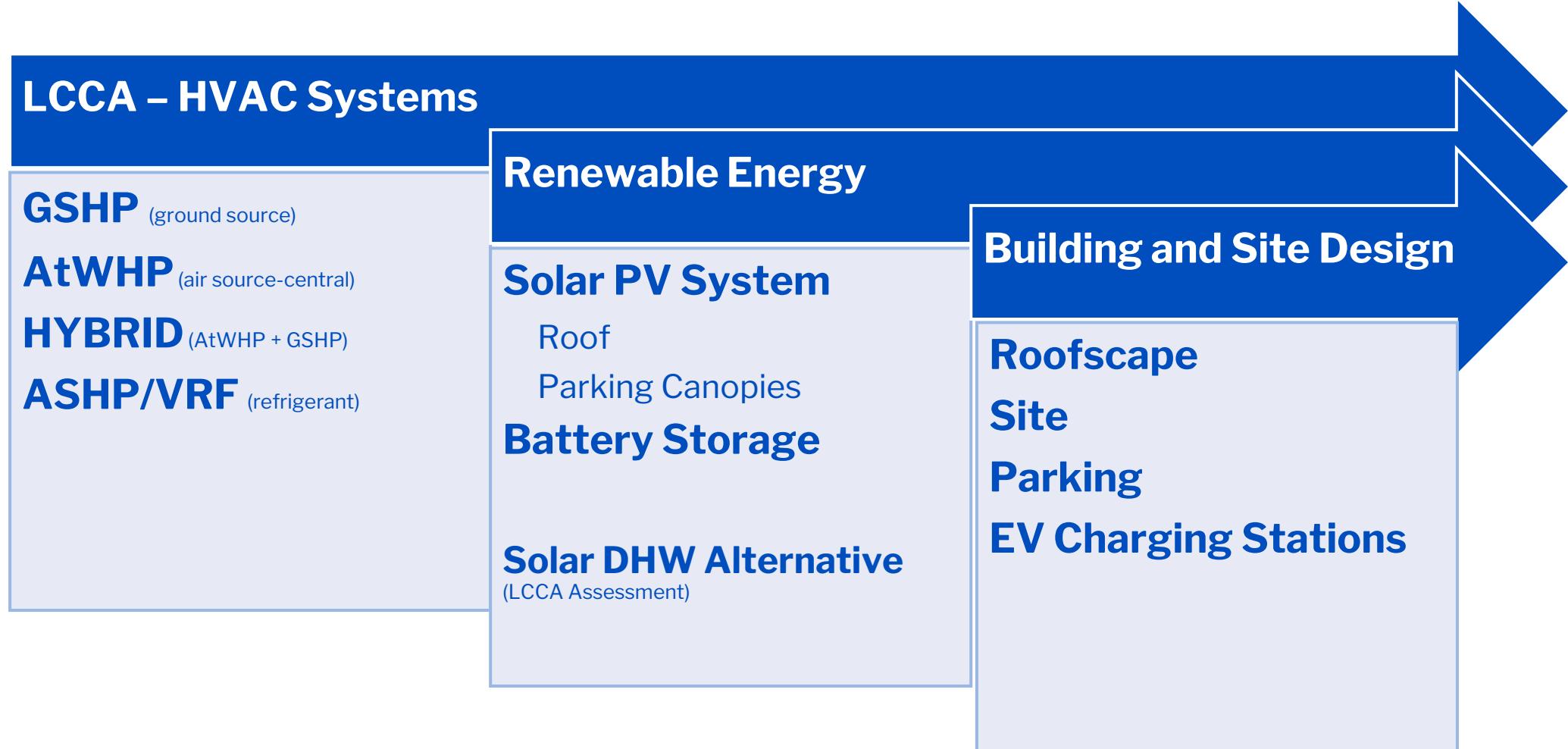
- 75-year LCCA
- MSBA LCCA requirements for whole building LCCA (50-year)
- Massachusetts Stretch Energy Code Baseline (Specialized Code)
- Installation costs, replacement costs and maintenance costs
- Energy savings
- Incentives tracking:
 - Construction:
 - Utility: NZE and Post-Occupancy (EUI)
 - IRA
 - Occupancy:
 - Utility: Battery storage, peak reduction, Demand Response
 - State: Alternative Energy Certification (AEC)

SD LCCA Summary Relative to HVAC Systems Code Baseline Costs						
HVAC System	Incremental Costs	Estimated Annual Energy Costs Savings	Estimated Incentives	Estimated Payback	Estimated EUI	Operational Carbon Reduction
GSHP (ground source)						
With IRA						
Without IRA						
AtWHP (air source-central)						
HYBRID (AtWP + GSHP)						
With IRA						
Without IRA						
ASHP/VRF (refrigerant)						

In Progress

Notes:

1. Energy Savings: based on total annual kWh savings, using the average 2023-24 \$0.24/kWh (utility bills). Peak demand savings not included (in progress)
2. Incremental Costs will be based on the PSR Cost Estimates and include materials and labors and are based on a per cost comparison to the analysis system baseline (ASHRAE 90.1-2019 App G).



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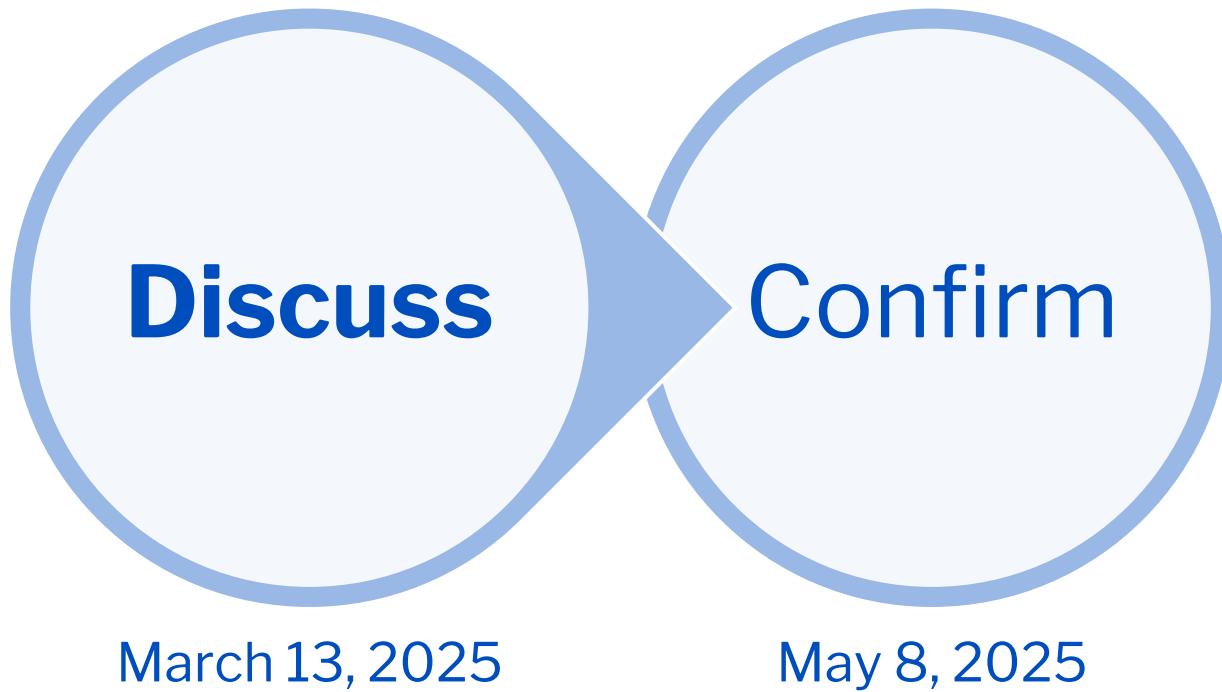
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Confirmation (15 minutes)

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Final Solar PV System & Battery Storage Size



Final Solar PV System & Battery Storage Size

Net Zero Building, including Option B Fieldhouse

Solar System

- 3500 kW-dc PV system
 - Maximize available Roof space
 - Canopy Parking Arrays to supplement

Battery Energy Storage System

- 2000 kW / 8000 kWh
- Energy Savings
 - Load Shedding
 - Peak Demand Reduction
 - Alternate Energy Credits
- Resiliency Solution
 - Level 2 (Fieldhouse & Gym)
 - Level 3 (Remainder of Building)

Assumed Floor to Floor Heights and Typical Ceiling Heights

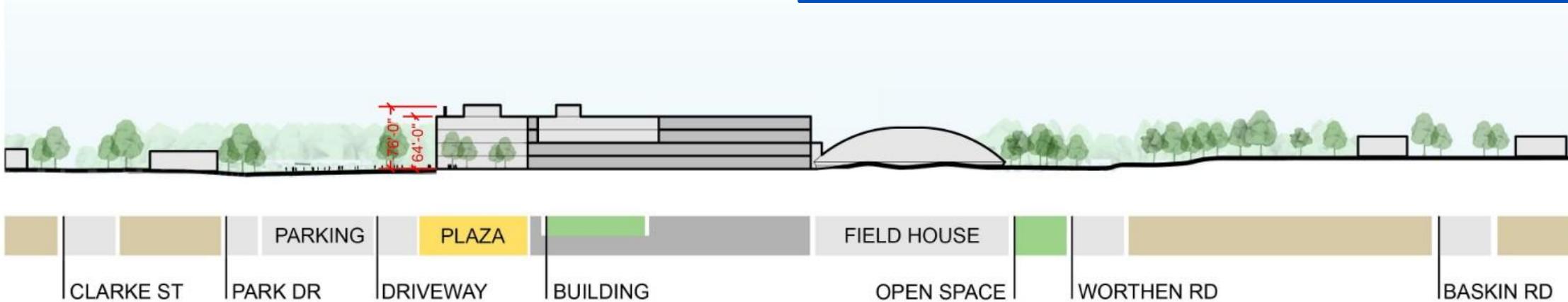
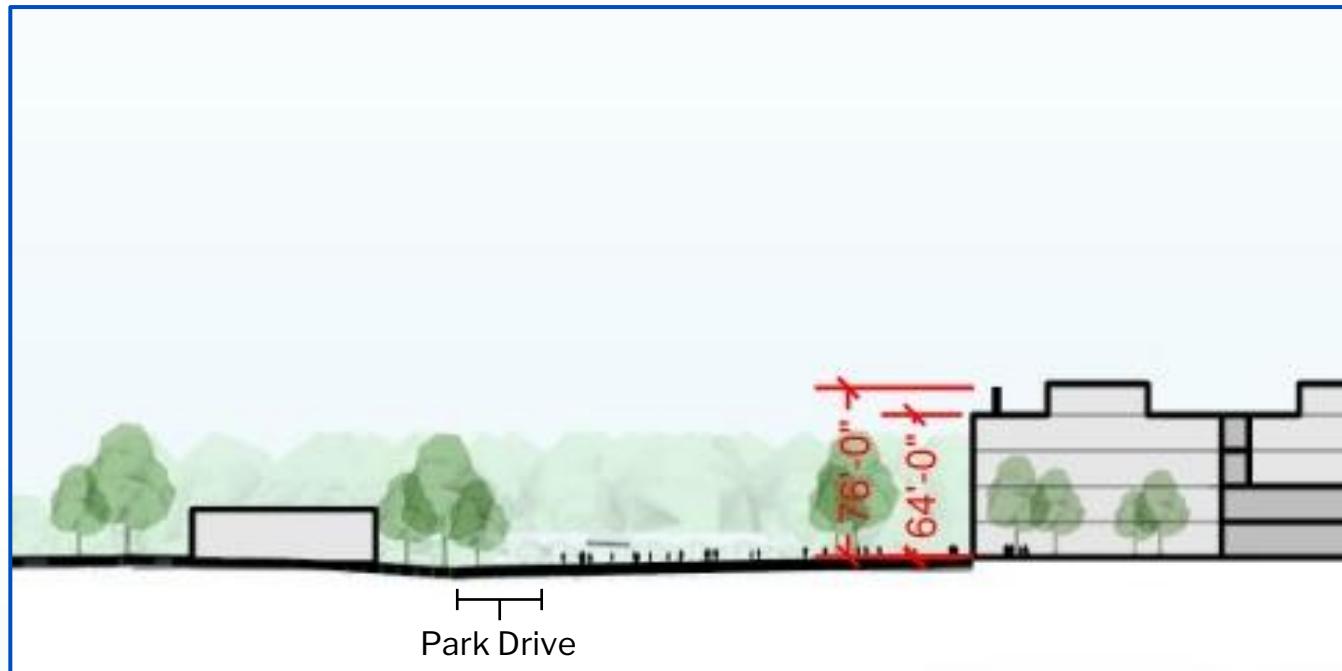


Floor to Floor Heights

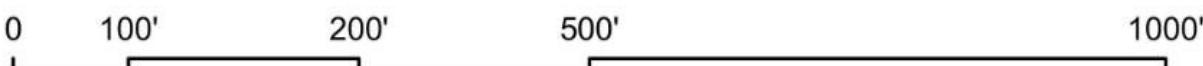
Impact on Total Building Height

16'-0" floor to floor height

$$\begin{aligned} &= 64'-0" \text{ building height to top of roof*} \\ &+ 12'-0" \text{ mechanical roof screen} \\ &= 76'-0" \text{ height to top of screen} \end{aligned}$$



SECTION B



* Zoning building height is defined by the vertical distance between the lower elevation (defined as the natural grade of land at the point of measurement prior to disturbance for construction) and the upper elevation (defined as the highest point of any ridge, gable, other roof surface, or parapet). The lower elevation has yet to be determined.

Eye-Level View from Clarke Street / Park Drive



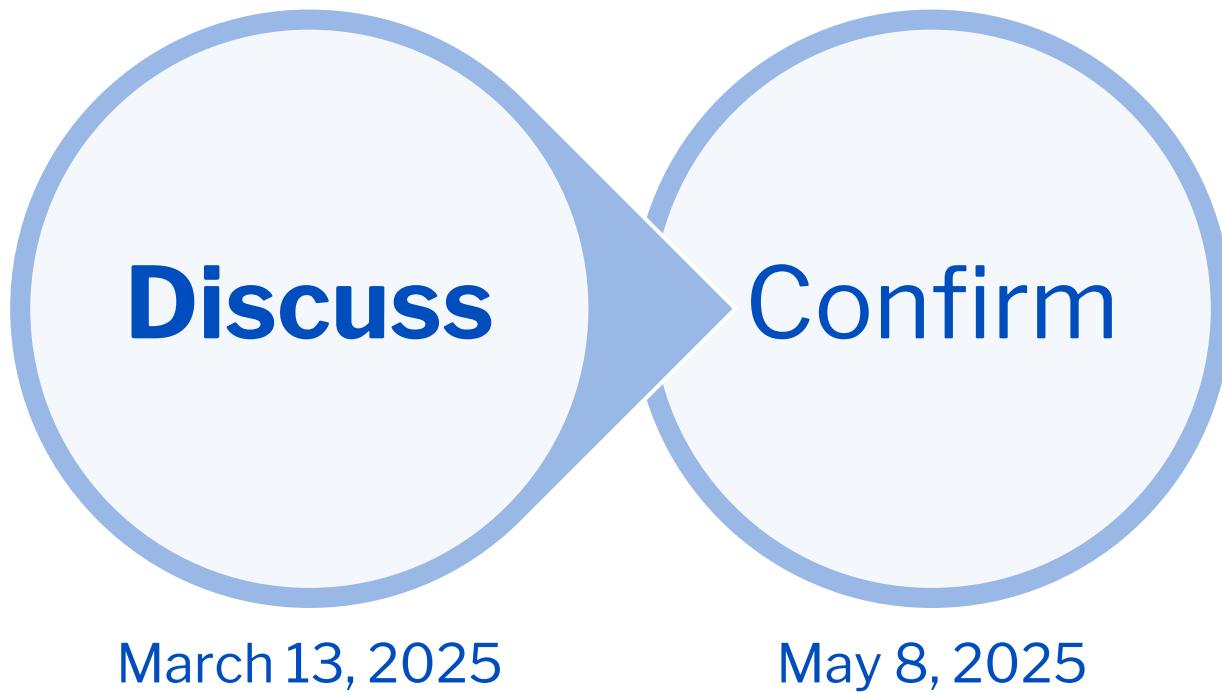
Floor to Floor Heights

Schematic Design Considerations

- Mechanical system has yet to be selected
 - Ductwork size is not impacted by use of either ground source or air source heat pumps
 - Every classroom requires a dedicated fan coil unit
 - VRF cassette systems are effective in smaller plenums, but are noisy and not ideal for instructional spaces and are more often used in office spaces
- The structural beam sizes have yet to be designed
- The Level 1 survey elevation has yet to be finalized
- The optimal finish ceiling heights have yet to be determined
- 2/24/25 DPF/LPS Design Meeting Confirmation: 16'-0" floor to floor should be carried forward as the height while the design team looks for potential opportunities for height reductions as more of the major elements listed above are detailed



Ceiling cassette example



Proprietary Items / Low Embodied Carbon GWB (USG)



Declare.

USG Sheetrock® Brand EcoSmart Panels
Firecode® X
United States Gypsum Company

Final Assembly: Multiple Locations in USA
Life Expectancy: 60+ Year(s)
End of Life Options: Salvageable/Reusable in its Entirety, Recyclable

Ingredients:

Core: Gypsum, Paper Facing and Backing: Cellulose; Fire Endurance: Vermiculite; Binder: Starch; Core Strengthener: Metaphosphoric acid (MSP309), trisodium salt; Reinforcing: Mineral wool; Drying Additive: Dextrose; Dispersant: Polycarboxylate Polymer; Accelerator: Aluminum sulfate; Polyvinyl Alcohol: Adhesive

Living Building Challenge Criteria: Compliant

I-13 Red List:
 LBC Red List Free % Disclosed: 100% at 100ppm
 LBC Red List Approved VOC Content: Not Applicable
 Declared

I-10 Interior Performance: CDPH Standard Method v1.2-2017
I-14 Responsible Sourcing: Not Applicable

USG-0001
EXP. 01 MAR 2025
Original Issue Date: 2017

MADE WITH RESPONSIBILITY FOR LABEL ACCURACY
INTERNATIONAL LIVING FUTURE INSTITUTE™ living-future.org/declare

- *Red List Free*
- *Contain 100% USDA certified biobased content*
- *Up to 94.6% recycled content*
- *GREENGUARD Gold Certified*
- *HPD & EPD*

Proprietary Items / Tectum Acoustical Panels (Armstrong)

Wall Panels in Gymnasium



Wall panels

Declare.

Tectum® Ceiling & Wall Panels
Armstrong World Industries

Final Assembly: Newark, Ohio, USA
Life Expectancy: 30 Year(s)
Embodied Carbon: 1.33kg CO₂ eq
Declared Unit: 1ft²
End of Life Options: Salvageable/Reusable in its Entirety

Ingredients:

Aspen Wood Fibers; Magnesium Oxide; Silicic Salt; Magnesium Sulfate; Calcium carbonate; Calcium Carbonate; Water; Polyvinyl acetate; Quartz; White Tint; Limestone; Undisclosed (< 0.9%); Cellulose Acetate; Cellulose Acetate Butyrate; Cellulose pulp; Propanol; Glass Fiber; Calcium Oxide; Titanium dioxide; 2-Oxopropanoic polymer with 2,2'-oxybisethanol; Glycol acrylate; Cristobalite (SiO₂); Diatomaceous Earth; Ethanol; Glycol Ether; Talc; Urea; Yellow Pigment; Iron oxide; Polyethylene Wax; Propylene glycol; Silicon oxide; Caprolactum; Amorphous Silica; 2-Propenoic acid, 2-phenoxyethyl ester; 2-Propenoic acid, 1,7,7-trimethylbicyclo[2.2.1]hept-2-yl ester; exo-Propenoic Copolymer C.I. Pigment Black 1; Distillates (petroleum), hydrotreated heavy paraffinic; Tetra Hydro Furan; Barium sulfate; Iron Oxide; Aluminum Oxide; Phosphine oxide; Sodium Salt; Propanoic acid, 2-methyl-, monoester with 2,4-trimethyl-1,3-pentanediol; Black Tint; Brown pigment; Paraffins; 2-Propenoic acid, 1,6-hexanediyl ester; 2-Propenoic acid, 2-(2-ethoxyethoxyethyl) ester; Poly ether salts; Butanamide, 2-[(4-chloro-2-nitrophenyl) azo]-N-(2-methoxyphenyl)-3-oxo-

¹LBC Temp Exception RL-004b - Proprietary Ingredients in Declare

Living Building Challenge Criteria: Compliant

I-13 Red List:

LBC Red List Free % Disclosed: 99.1% at 100ppm
 LBC Red List Approved VOC Content: Not Applicable
 Declared

I-10 Interior Performance: CDPH Standard Method v1.2-2017

I-14 Responsible Sourcing: Low Risk Wood

ARM-0069
EXP. 01 NOV 2025
Original Issue Date: 2021

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Introduction (20 minutes)

- Exterior Design
- Feature Space Design
- Floor, Wall and Ceiling Material Type Categories
- LCCA for HVAC Options

Discussion (35 minutes)

- Final Solar PV System & Battery Storage Size
- Assumed Floor to Floor Heights and Typical Ceiling Heights
- Proprietary Items - Low Carbon GWB & Tectum Acoustical Panels

Confirmation (15 minutes)

- Outdoor Classrooms Including Roof Terrace
- Ventilation Basis of Design CO2 Level PPM
- Additional Cx for Demand Response (LEED) Beyond MSBA

Outdoor Learning Environments & Roof Terrace/ Program & Materials



Roof Terrace – Ground Plane Treatment



Roof Terrace – Shade Structure Inspiration



Outdoor Learning Environment – Ground Plane Treatment & Materials



Roof Terrace – Ground Plane Treatment & Furnishing Options



Outdoor Learning Environment – Ground Plane Treatment & Materials

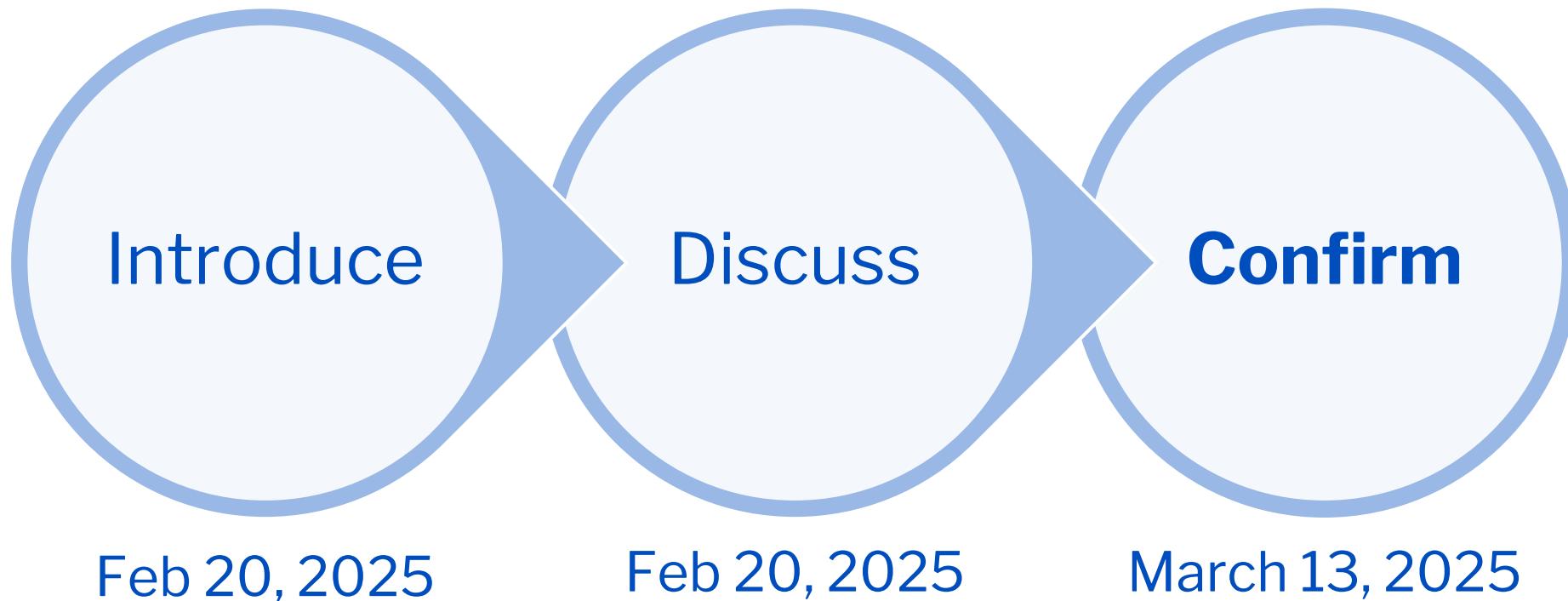


Outdoor Learning Environment – Wetland Boardwalk

Outdoor Learning Environments & Roof Terrace

Schematic Building Section

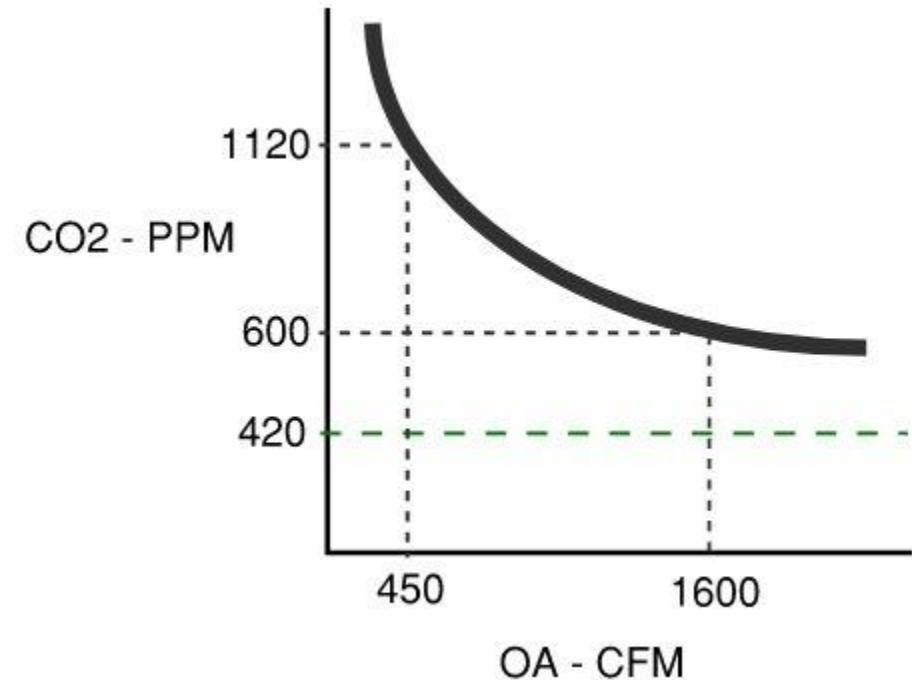




Acceptable Indoor CO2 Levels

- Massachusetts Department of Public Health
 - 800 PPM
- ASHRAE Standard 62.1
 - Ambient ~400 PPM
 - Indoor Limit = Ambient + 600 PPM = 1,000 PPM ¹

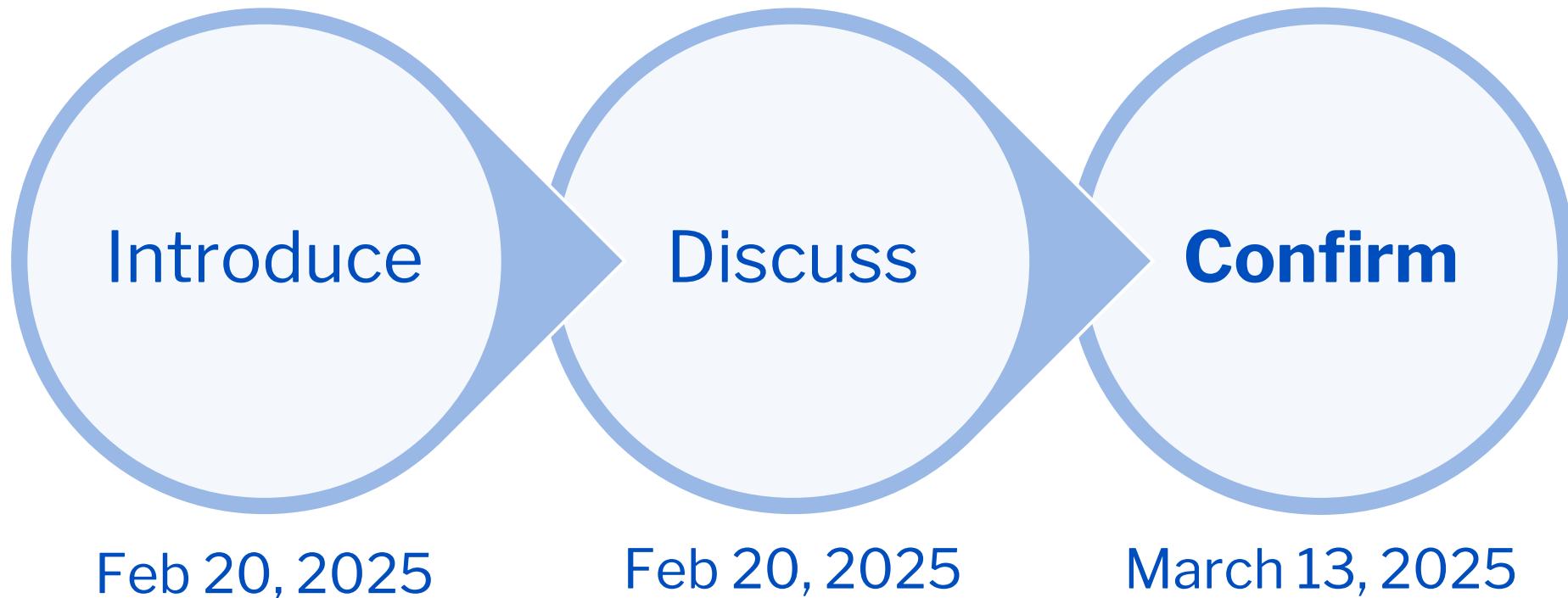
Recommended Target: 800 PPM



¹ Reference: ASHRAE Standard 62.1, Addendum ab, Table 6-1



Additional Commissioning (Cx) for Demand Response / LEED credit



LEED Demand Response (DR) credit:

- Requires a test of the DR plan be observed and documented by Cx Agent
- MSBA Enhanced Cx LEEDv4 scope does not cover the DR requirement
- Additional Cx scope estimated fee: \$10,000-\$15,000
- Estimated DR Utility savings: >\$25,000/year (to be confirmed)

Thank You!