Medford High School

Sustainability and MEP Systems Advisory Team Meeting #8

11/10/2026



Agenda

- Introductions
- Preliminary Pool LCCA [Life Cycle Cost Analysis] (30 mins)
- Red List Free Materials (15 mins)
- Embodied Carbon & Mass Timber (15 mins)
- Water Efficiency & Stewardship (10 mins)
- Next Steps (10 mins)

Preliminary Pool LCCA

[Life Cycle Cost Analysis]

Sustainability and MEP Systems – 50-year Life Cycle Cost Analysis (LCCA)- Incremental Costs/Payback

Pool Water Heating System Type	Estimated Installation Costs	Estimated Annual Energy Cost	Estimated EUI	Estimated Annual Carbon [GHG] Emissions Savings	
	($)	($)	(kBtu/SF/yr.)	2026 (%)	2045 (%)
Option 1 – Natural Gas Boilers [Code Baseline]	$819,000*	$83,000	239		
Option 2 – Air to Water Heat Pump [AtWHP] with Back Up Electric Boiler	$692,000	$100,000	109	37.3%	56.5%
Option 2 Incremental Costs/Savings ($)	($127,000)	+$17,000			

Notes:

1. *Option 1 Installation Costs include:*
   - *The estimated installation costs for the electrification readiness per the requirements of the Massachusetts Specialized Stretch Energy Code, a Solar PV PPA (no installation/maintenance/replacement costs), and the natural gas service upgrade.*
   - *Electrification readiness space allocation: the mechanical room space is somewhat equivalent (Opt. vs. Opt. 2), while the pool roof must undergo structure upgrades to accommodate the future air to water heat pump (AtWHP). Costs of roof upgrades not included.*
   - *Estimated Payback of fossil fuel option: 7.5 yrs.*
2. *Utility Incentives very limited on pool equipment, pending on Mass Save review and final incentives approval – no natural gas incentives.*
3. *HVAC Systems' costs based on recent estimates. Energy costs based on a PPA fixed electrical rate ($0.18/kWh). [PPA fixed rate estimated at $0.07 (supply), for a blended utility rate of $0.18/kWh vs. current $0.25/kWh.]*
4. *Additional State Incentives may apply at the time of occupancy.*

Pool Standard LCCA - Option 1 Natural gas system replacement at 25 yr.

Pool Water Heating System Type	Estimated Installation Costs ($)	Estimated Replacement Costs ($)	Estimated Maintenance Costs ($)	Estimated Energy Costs ($)	Estimated 50-yr LCCA Cost ($)	Estimated EUI (kBtu/SF/Yr)
Option 1 – Natural Gas Boilers [Code Baseline]	$819,000	$249,000	$146,000	$2,134,000	**$3,348,000**	239
Option 2 – Air to Water Heat Pump [AtWHP] with Back Up Electric Boiler	$692,000	$449,000	$170,000	$2,571,000	**$3,882,000**	109
Option 2 Incremental Costs/Savings ($)	($127,000)	+$200,000	+$24,000	+$437,000	**+$534,000**	

Notes:

1. Energy Costs based on Medford's utility costs (2025-26), PPA fixed rate estimated at $0.07 (supply), for a blended utility rate of $0.18/kWh (vs. current $0.25/kWh).

2. 3% cost escalation compounded over 50 yrs for replacement, maintenance and estimated energy costs (Net Present Value).

3. Utility Incentives

- *The Option 1-Natural Gas (fossil fuel) pool water heating option does not qualify for incentives.*
- *The Option 2- AtWHP all-electric pool water heating system option may qualify for custom incentives to be determined as part of the utility incentives process [currently no incentives are offered for water heating heat pump systems].*
- The pool facility HVAC and lighting systems may qualify for Mass Save incentives, estimated to be limited per the small size of facility/equipment, pending Mass Save final review and approval.

Pool LCCA Alternative 1: Option 1 all-electric system replacement at 25 yr.

Pool Water Heating System Type	Estimated Installation Costs ($)	Estimated Replacement Costs ($)	Estimated Maintenance Costs ($)	Estimated Energy Costs ($)	Estimated 50-yr LCCA Cost ($)	Estimated EUI (kBtu/SF/Yr)
Option 1 – Natural Gas Boilers [Code Baseline]	$819,000	$523,000	$202,000	$3,184,000	**$4,728,000**	239
Option 2 – Air to Water Heat Pump [AtWHP] with Back Up Electric Boiler	$692,000	$449,000	$170,000	$2,571,000	**$3,882,000**	106
Incremental Costs/Savings ($)	($127,000)	($74,000)	($32,000)	($613,000)	**($846,000)**	

Notes:

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Sustainability and MEP Systems – Schematic Design Preliminary LCCA Analysis Takeaways

Initial Costs

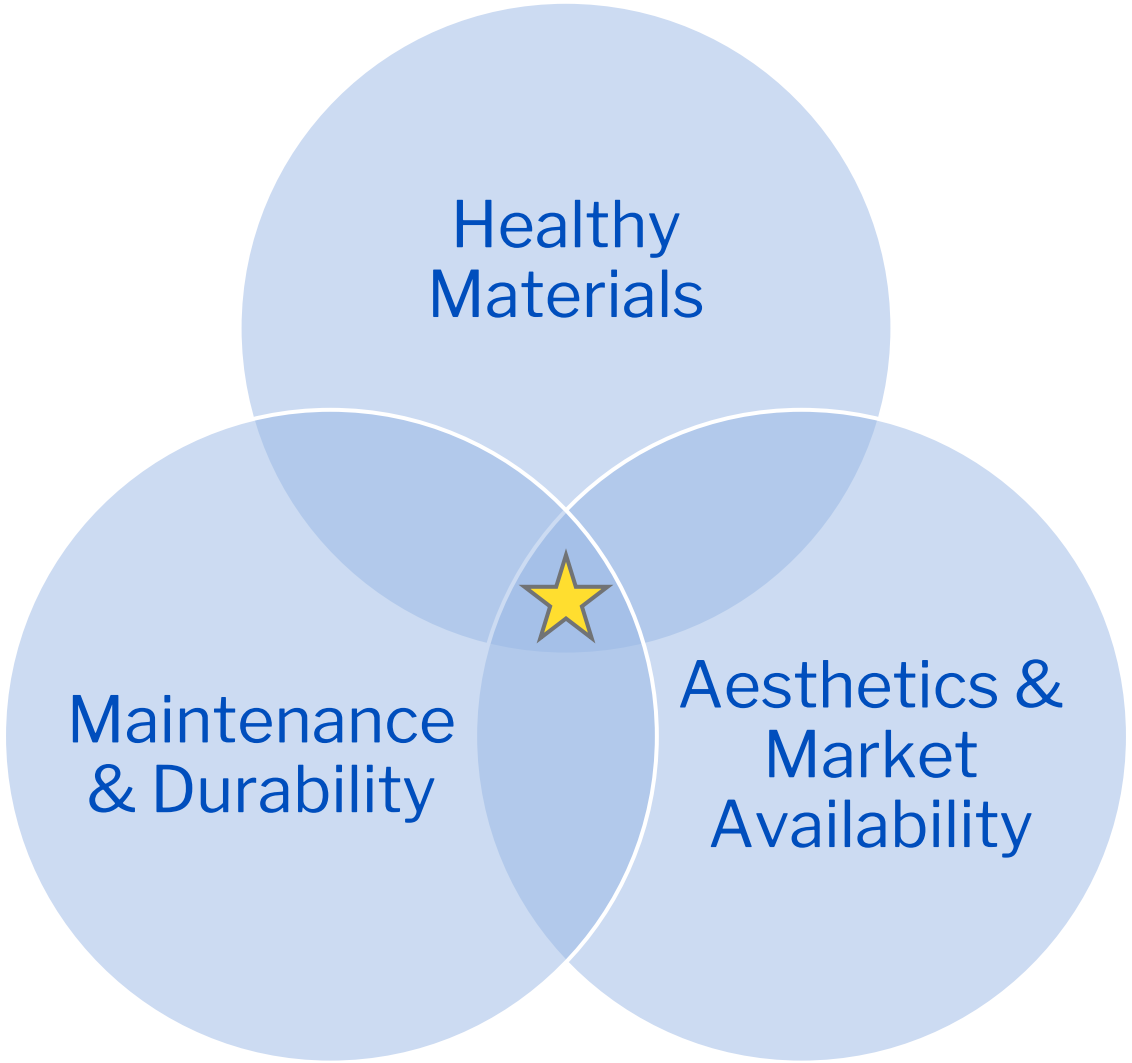
- Fossil Fuel system [Code baseline]:
  - Estimated installation cost, maintenance costs and replacement costs are more expensive, including electrification readiness per Specialized Stretch Energy Code, and natural gas line service upgrade. [Solar PV Code requirement assumed as PPA]
  - Estimated Annual Energy Costs are less expensive than the all-electric system option, by approximately $ 17,000, based on PPA fixed rate.
  - Estimated 7.5 yr payback.

50 yr. Cost of Ownership

- The fossil fuel system [Code Baseline] brings approximately an estimated $534,000 savings over 50 yrs **if a natural gas system replacement is allowed** in 25 yrs (2051).
- The all-electric AtWHP/back up electric boiler option results in a and estimated $846,000 **with a Code/State requirement** for an all-electric system replacement at 25 yrs (2051) or earlier.

11.10.26 - Advisory Committee to make recommendation to SBC: _____

Red List Free Materials


Healthy Materials
Maintenance & Durability
Aesthetics & Market Availability

Sustainability and MEP Systems – Healthy and Sustainable Materials

- LEEDv4:
  - Low-Emitting Materials
  - Reduced Embodied Carbon Materials
  - Sustainable Materials Attributes: EPDs, HPDs
- Living Building Challenge's Red List Approved/Free

SMMA Precedents/Research

TIER 1: LEED Equivalency	TIER 2: Targeted Products	TIER 3: Division 9 Focus	TIER 4: Division 9 & Beyond
LEEDv4 equivalency for materials credits (HPDs for all identified product categories)	Identify the Top 10-15 products or product categories to vet using the **Red List** or class-based approach.	Vet all finishes in Division 9 using the Red List or a class-based approach	Vet all finishes in Division 3-13, with a focus on interior materials that have exposure/ human interaction



Sustainability and MEP Systems – Healthy and Sustainable Materials

Red List Free Material Selection - Interior Materials Prioritized:

Where most of the human interaction with building materials takes place:

- Floors
- Walls
- Ceilings







Red List Selection Options:

Specifications will require DECLARE red list reporting only when no Red List Free/Approved Available.

	3 Equals	2 Equals	1 Proprietary
Red List Free	No Cost	$$	$$$
Red List Approved	No Cost	$$	$$$
Declare Level Documentation (required)	No Cost	No Cost	No Cost

***Note: Excluding major manufacturers impacts price competition. Cost impact based on availability of Red List equals.*

Considerations:

- Consideration for lower embodied carbon (transportation, location).
- Red List Free availability based on manufacturer documentation and/or LBC Declaration label.

Red List Materials Included - Products with 3 equals

Spec. Div.	Material Type	Manufacturer #1 (BOD)	Manufacturer #2	Manufacturer #3	Proximity/Exposure to Occupant	Scale of Material (SF)
06 – Woods, Plastics, Composites	**Plastic Laminate** Millwork, Casework	Wilsonart	Formica	Pionite	✓	Medium
	Flush Wood Paneling (Auditorium)	Armstrong	Linea	ASI	✓	Small
07-Thermal & Moisture Protection	**Insulation - Exterior Wall** (Mineral Wool)	Knauf	Rockwool	Owens Corning		Large
	Insulation - Roof (Poly-iso)	Carlisle	GAF	Hunter		Large
	Sheet Applied Air Barrier – Permeable	Henry	Va[illegible]shield	WR Meadows		Large
09-Finishes	**Tiling** (Porcelain)	Creative Materials Corp.	Cr[illegible]svi	Daltile	✓	Large
	Tiling (Ceramic)	Fireclay Tile	Daltile	[illegible]merican Olean	✓	Medium
	Carpet Tile & Broadloom	Mohawk Group	Bentley Mills	Miliken	✓	Medium
	Felt Acoustic Panel	CSI Creative	Fsorb	Acoufelt	✓	Medium
	Paint (Topcoat)	Benjamin Moore	Behr	Sherwin Williams*	✓	Large
12 - Furnishings	**Countertops** (Solid Surface)	Wilsonart	Corian	LX Hausys	✓	Medium

SAMPLE

Note: The aesthetics are not equal between manufacturers within the same material type.

Red List Free	Red List Approved	Declared	No Practical Alternative Available

*Self Declared Products (not third party verified and do not contain an official Living Future Institute label)
**Excluding major manufacturers may impact price competition.
Products are only defined as an equal based on red list status.

Red List Materials Update - Spec Division 09-Finishes

Spec. Div.	Material Type	Manufacturer #1 (BOD)	Manufacturer #2	Manufacturer #3	Proximity/ Exposure to Occupant	Scale of Material (SF)	Cost Premium	Additional Sustainability Attributes
09 – Finishes	**Gypsum Board**	USG	Nation Gypsum	CertainTeed	✓	Large	$249,000	EPD HPD VOC UF
	Gypsum Board (High impact and Abuse Resistant)	USG	National Gypsum	CertainTeed	✓	Medium	$6,000	EPD HPD VOC UF
	Acoustical Ceiling Panels	Armstrong	CertainTeed	USG	✓	Large	$49,000	EPD HPD VOC UF
	Acoustical Metal Pan Ceilings	Armstrong	Rockfon	USG	✓	Medium	$72,000	EPD HPD VOC UF
	Resilient Stair Treads & Risers - Rubber	Roppe*	Tarkett	Mannington Mills	✓	Medium	$2,000	EPD HPD VOC UF
	Resilient Base	Roppe*	Nora*	Tarkett	✓	Large	$4,000	EPD HPD VOC UF
	Resilient Sheet Flooring (Rubber Stair Landings)	Roppe*	Tarkett	Mannington Mills	✓	Small	$5,000	EPD HPD VOC UF
	Linoleum Flooring	Forbo	Tarkett	GerFloor	✓	Large	$24,000	EPD HPD VOC UF
	Resilient Athletic Flooring (Rubber)	Ecore International*	Flexco*	Mondo	✓	Medium	$51,000	EPD HPD VOC UF
	Resinous Matrix Terrazzo Flooring	Key Resin ESR Terrazzo	Terrazzo & Marble Supply	Sherwin Williams	✓	Medium	$30,000	VOC UF
	Resilient Carpet Tile Flooring	J&J	Forbo	LS Greenflor	✓	Large	$6,000	EPD C2C HPD VOC UF
	Sprayed Acoustic Insulation – K13	International Cellulose Corp*	ThermoCon	Monoglass Inc.	✓	Medium	$9,000	EPD C2C HPD VOC UF
	Wood Ceilings (Sound Reflective Panels) – Auditorium)	Armstrong	Linea	9wood	✓	Small	$21,000	EPD HPD VOC UF FSC

SAMPLE

Sustainability and MEP Systems – Healthy and Sustainable Materials Recommendation

Original School Committee resolution language:

- ***Prioritize LEED healthy materials points to obtain the additional 1% MSBA reimbursement.***

School Committee current resolution language:

- ***Specify red list-free, healthy materials*** *for all materials except MEP/FP and prioritize LEED healthy materials credits necessary to obtain the maximum IAQ MSBA reimbursement to ensure superior indoor air quality for students and staff*

Proposed Recommended language adjustments (11.10.26 Advisory Committee to confirm):

- **Specify red list-free, healthy materials** for interior finishes/materials
  - Prioritizing materials with 3 equals
  - Prioritizing materials with high exposure risk to occupants (materials in the “touch zone”)
  - Excluding MEP/FP and no-exposure materials categories.

Embodied Carbon & Mass Timber

Sustainability and MEP Systems – Mass Timber

Wood & Mass Timber Feasibility Considerations

- Cost
- Code regulation impacts
- Early coordination with manufacturer needed
- Fire resistance
- Acoustics
- Tighter column spacing and/or deeper beams



SMMA Project: Smith Vocational and Agricultural High School



Innoventum Solar Carport Project

Sustainability and MEP Systems – Embodied Carbon & Mass Timber

Healthy Materials & Embodied Carbon Reduction Strategies:

- Low-Carbon Materials Procurement
- High-Recycled Content in new building materials
  - Concrete
  - Steel
  - Windows
  - Insulation
- Optimization of materials reuse
- Low-Emitting Materials
- Recycled Content, FSC Wood
- Local/Regional Materials (as feasible)

Design Scenario Analyzed	Embodied Carbon Reduction from Baseline Scenario (%)
Proposed Design with Steel/Concrete Construction	**-20.2%**
Proposed Design with 10% Mass Timber Construction ILO Steel/Concrete	-21.1%
Proposed Design with 50% Mass Timber Construction & 50% Steel/Concrete - TIMB1	**-25.9%**
Proposed Design with 100% Mass Timber Construction - TIMB2	**-31.9%**

Notes:

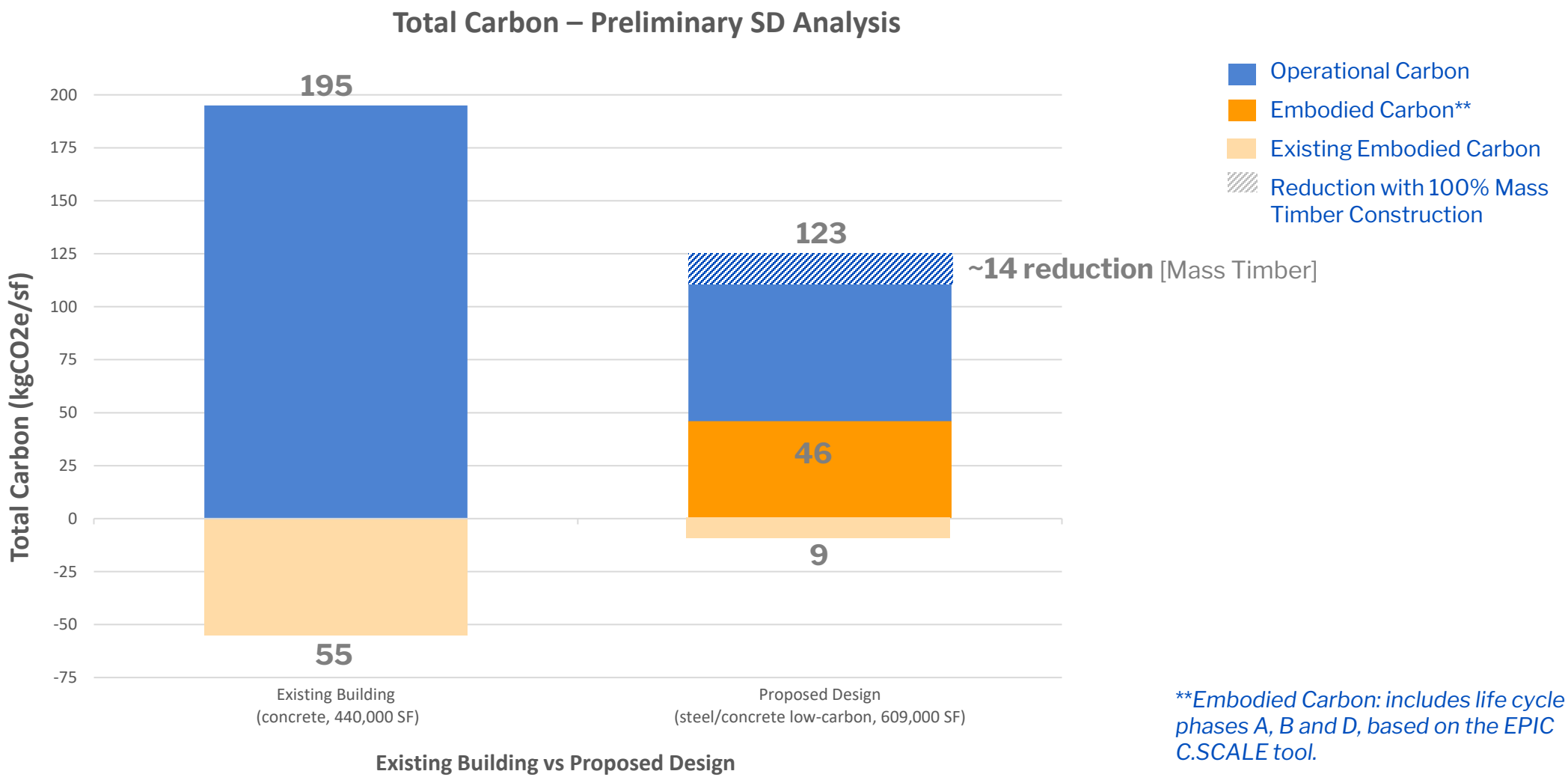
1. *The Proposed design scenarios for the purpose of the Mass Timber impacts are compared to a LEED Baseline Building scenario (materials with baseline values reflecting the industry-wide EPD data.)*
2. *Early Embodied Carbon analysis conducted using the EPIC C.Scale tool.*
   - *PSR based on 609,000 SF.*

Sustainability and MEP Systems – Total Carbon

Total Carbon = Operational Carbon (Energy) + Embodied Carbon (Materials)

Operational Carbon is the greenhouse gas (GHG) emissions associated with the annual energy consumption of the building.

Embodied Carbon is the greenhouse gas emissions associated with the life cycle of the building materials, including manufacturing, transportation, installation, maintenance, and disposal.



***Embodied Carbon: includes life cycle phases A, B and D, based on the EPIC C.SCALE tool.*

smma

Sustainability and MEP Systems – Mass Timber Recommendation

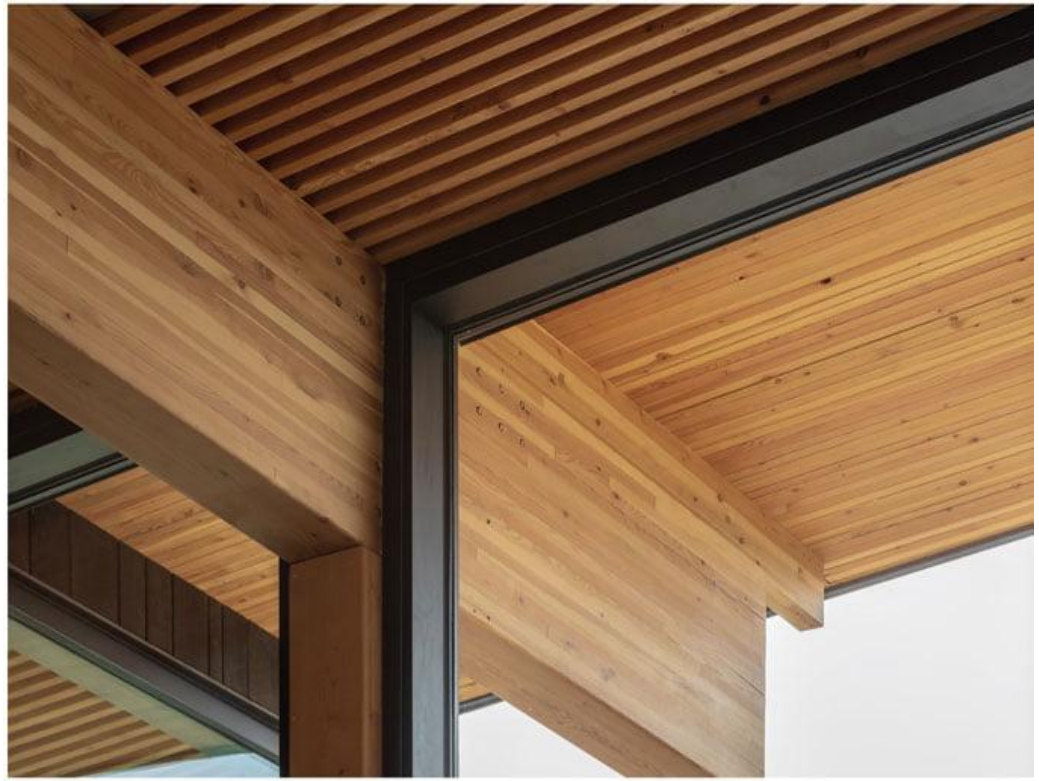
The PSR Mass Timber Cost Alternates:

- TIMB1 (Replace 50% of the New Addition Structural Steel Frame with Mass Timber):
  Estimated $17,830,714
- TIMB2 (Replace 100% of the New Addition Structural Steel Frame with Mass Timber):
  Estimated $35,661,427

Proposed Recommendations (Advisory Team to confirm):

- Due to the high cost of Mass Timber, using Mass Timber for a large percentage of the New Addition Structural Frame is not recommended.
- Obtain Schematic Design Cost Estimate options for the following Mass Timber options, for acceptance/rejection by the SBC prior to finalizing the SD budget:
  - TIMB3 – Use Mass Timber (Dowel Laminated Timber – DLT) decking for the replacement gymnasium roof
  - TIMB4 – Use a composite Mass Timber / Structural Steel frame for the ECC Wing. SMMA to develop finish adjustments in the ECC Wing to offset first cost of Mass Timber structural frame components and expose Mass Timber structural elements.

Sustainability and MEP Systems – Mass Timber Recommendation



Fluted stacked DLT and flat stacked DLT roof panels.

TIMB3



TIMB4

Water Stewardship

Sustainability and MEP Systems – Water Stewardship

- Project has a goal of 30% indoor water use reduction (contributing to 3 points in LEEDv4)
  - Water efficient toilet, faucets, showers fixtures.
  - Water efficient appliances (cafeteria, home economics, CTE programs)

- Reduced outdoor water use or no irrigation options (minimum 1 point in LEEDv4)
  - Majority of native plantings
  - Limited irrigated areas

- Additional Strategies for Consideration (not previously included in cost modeling)
  - Large scale rainwater harvesting system
  - Demo system for educational purposes for consideration: STEM and CTE programs use



Rainwater Harvesting at Somerville High School

Next Steps



Sustainability and MEP Systems – Next Steps

Next Steps

- Advisory Team will provide recommendations to the SBC to consider and adopt the recommendations including:
  - Pool Water Heating Approach
  - Mass Timber Approach to Structural Frames for Additions
  - Healthy Materials / Red List language adjustment

Next Meetings:

School Building Committee (SBC) Meetings

- Monday October 16th, 6:30pm

Thank you.

