

**MODEL SCHOOL EFFICIENCIES**

**SECTION 3**

**MODEL SCHOOL EFFICIENCIES**

The Permanent Building Committee (PBC) and the School Building Committee (SBC) recognize the benefits of the Model School building program and are committed to incorporating the efficiencies realized by these buildings into the new Wellesley High School.

The Committees requested SMMA to thoroughly review one of the Model School buildings, the Whitman-Hanson Regional High School, and incorporate such realized efficiencies into the Wellesley High School design. The SMMA team reviewed construction drawings, specifications, and toured the facility.

The following chart summarizes the preliminary findings of this review and lists corresponding systems to be included in the new Wellesley High School.

The systems will be further refined throughout the design phase to maximize the efficiencies and cost effectiveness of each system.

Whitman-Hanson Model School	Wellesley High School	Description of Difference
<b>Exterior Architecture</b>		
<p><b>Exterior Envelope</b></p> <ul style="list-style-type: none"> <li>- Brick, Architectural CMU, EIFS</li> <li>- Trim – Pre-Cast Concrete, Pre-Formed EIFS</li> <li>- Punched Aluminum Double Hung Windows</li>   <li>- Limited Curtainwall</li> </ul>	<p><b>Exterior Envelope</b></p> <ul style="list-style-type: none"> <li>- Brick, CSMU</li> <li>- Trim - Pre-Cast Concrete, Metal Panel</li> <li>- Punched Aluminum Fixed and Projected Windows</li>   <li>- Limited Curtainwall</li> </ul>	<p><b>Exterior Envelope</b></p> <ul style="list-style-type: none"> <li>- CSMU comparable to Architectural CMU, EIFS less durable</li> <li>- Metal Panel more durable than Pre-Formed EIFS</li> <li>- Projected Windows comparable to Double Hung, increased seal performance</li> <li>- <i>No difference</i></li> </ul>
<p><b>Roof</b></p> <ul style="list-style-type: none"> <li>- PVC white</li> <li>- R-20</li> </ul>	<p><b>Roof</b></p> <ul style="list-style-type: none"> <li>- TPO or PVC white</li> <li>- R-25</li> </ul>	<p><b>Roof</b></p> <ul style="list-style-type: none"> <li>- <i>No difference</i></li> <li>- R-25 provides increased energy efficiency</li> </ul>
<b>Interior Architecture</b>		
<p><b>Walls</b></p> <ul style="list-style-type: none"> <li>- Corridors - Architectural CMU, Veneer Plaster</li> <li>- Classrooms - Veneer Plaster</li> <li>- Ceilings – 2x4 ACP Typ., 2x2 ACP in Corridors &amp; some Classrooms</li> </ul>	<p><b>Walls</b></p> <ul style="list-style-type: none"> <li>- Corridors - Porcelain Tile, GWB</li> <li>- Classrooms - GWB</li> <li>- Ceilings – 2x2 ACP throughout</li> </ul>	<p><b>Walls</b></p> <ul style="list-style-type: none"> <li>- Porcelain Tile less cost than Architectural CMU, GWB less cost than Plaster</li> <li>- GWB less cost than Veneer Plaster, simpler maintenance</li> <li>- 2x2 ACP easier to access, more durable</li> </ul>
<p><b>Floors</b></p> <ul style="list-style-type: none"> <li>- Lobbies – Porcelain Tile</li> <li>- Corridors - VCT</li> <li>- Classrooms - VCT</li> <li>- Science – Sheet Vinyl</li> </ul>	<p><b>Floors</b></p> <ul style="list-style-type: none"> <li>- Lobbies - Porcelain Tile</li> <li>- Corridors – VCT</li> <li>- Classrooms - VCT</li> <li>- Science – VCT</li> </ul>	<p><b>Floors</b></p> <ul style="list-style-type: none"> <li>- <i>No difference</i></li> <li>- <i>No difference</i></li> <li>- <i>No difference</i></li> <li>- VCT less cost than Sheet Vinyl, appropriate for Science spaces</li> </ul>

Whitman-Hanson Model School	Wellesley High School	Description of Difference
<b>Site Elements</b>		
<b>Civil Elements</b>	<b>Civil Elements</b>	<b>Civil Elements</b>
<ul style="list-style-type: none"> <li>- Acres of cleared trees=18+acres</li> <li>- Staff Parking: 114</li> <li>- Student Parking @ School: 157</li> <li>- Student Parking @ Stadium: 138</li> <li>- (No clear parent drop-off area)</li> <li>- Increase in impervious area from Pre-to Post= 4.6+ acres</li> <li>- Detention basins for storm water management = 2</li> <li>- 2' high loading dock with no leveler</li> <li>- 18' wide fire lane</li> <li>- Curbing types used – Vertical and Sloped Granite, and Bituminous Concrete</li> <li>- Bituminous pavement thickness: 2-1/2", 3", and 3-1/2"</li> </ul>	<ul style="list-style-type: none"> <li>- Acres of cleared trees= less than 1 acre</li> <li>- Staff Parking: 200</li> <li>- Student Parking: 100</li> <li>- (No stadium)</li> <li>- Clear and separate bus/ parent drop-off</li> <li>- Increase in impervious area from pre to post = 0 acres</li> <li>- No detention basins</li> <li>- 4' high loading dock, no leveler</li> <li>- 12' wide fire lane</li> <li>- Curbing types used – Vertical and Sloped Granite</li> <li>- Bituminous pavement thickness: 3-1/2"</li> </ul>	<ul style="list-style-type: none"> <li>- Consolidated footprint minimized site impact</li> <li>- Larger Staff</li> <li>- Student Parking is controlled</li> <li>- Student parking on site only.</li> <li>- Clear and separate bus/ parent drop-off stated requirement</li> <li>- Consolidated footprint allows for no increase in impervious area</li> <li>- No increase in impervious area allows for no detention basins</li> <li>- 4' high loading dock is preferred</li> <li>- 12' wide fire lane reduces site impact</li> <li>- Vertical and Sloped Granite more durable than Bituminous</li> <li>- 3-1/2" Bituminous pavement thickness, more durable</li> </ul>
<b>Plantings &amp; Lawns</b>	<b>Plantings &amp; Lawns</b>	<b>Plantings &amp; Lawns</b>
<ul style="list-style-type: none"> <li>- No irrigation</li> <li>- Main entrance plaza</li> <li>- Courtyard plaza</li> <li>- Pedestrian circulation system</li> <li>- Roadway &amp; parking lighting</li> <li>- Pedestrian lighting</li> <li>- (No bicycle racks)</li> </ul>	<ul style="list-style-type: none"> <li>- No irrigation</li> <li>- Main entrance plaza</li> <li>- Courtyard plaza</li> <li>- Pedestrian circulation system</li> <li>- Roadway &amp; parking lighting</li> <li>- Pedestrian lighting</li> <li>- Bicycle racks</li> </ul>	<ul style="list-style-type: none"> <li>- <i>No difference</i></li> <li>- <i>No difference</i></li> <li>- <i>No difference</i></li> <li>- <i>No difference</i></li> <li>- <i>No difference</i></li> <li>- <i>No difference</i></li> <li>- Bicycle usage is expected to continue and increase</li> </ul>
<b>Structural Systems</b>		
<ul style="list-style-type: none"> <li>- Spread footing foundations</li> <li>- Ground floor slab-on-grade</li> <li>- Elevated composite floor system with 5-1/2" normal weight concrete, no fire rating</li> <li>- Metal deck on bar joists and beams at roof, no fire rating</li> <li>- Steel braced frames for lateral load-resisting system</li> <li>- Exterior 3 story brick/CMU veneer wall bears on foundation wall</li> </ul>	<ul style="list-style-type: none"> <li>- Spread footing foundations</li> <li>- Ground floor slab-on-grade</li> <li>- Elevated composite floor system with 6-1/4" light weight concrete slab for 2-hour fire rating</li> <li>- Metal deck on bar joists and beams at roof with spray-on fireproofing</li> <li>- Steel braced frames for lateral load-resisting system</li> <li>- Exterior brick veneer wall top 2 of 4 stories supported by suspended steel shelf angle</li> </ul>	<ul style="list-style-type: none"> <li>- <i>No difference</i></li> <li>- <i>No difference</i></li> <li>- 2-Hour rating is achieved with use of light weight concrete, reducing cost of steel</li> <li>- Spray-on fireproofing required for 1 hour rating</li> <li>- <i>No difference</i></li> <li>- 4-Story veneer height requires support by suspended steel shelf angle</li> </ul>

Whitman-Hanson Model School	Wellesley High School	Description of Difference
<b>Plumbing Systems</b>		
<b>Student Fixtures</b>	<b>Student Fixtures</b>	<b>Student Fixtures</b>
<ul style="list-style-type: none"> <li>- Water Closets (boys) – Vitreous China with Battery Operated Sensor Flush Valve (1.6 GPF)</li> <li>- Water Closets (girls) – Vitreous China with Battery Operated Sensor Flush Valve (1.6 GPF)</li> <li>- Urinal – Vitreous China with Battery Operated Sensor Flush Valve (1.0 GPF)</li> <li>- Lavatories – Vitreous China with Battery Operated Sensor Faucet (0.25 gal/cycle)</li> <li>- Showers – 2.5 GPM flow rate</li> </ul>	<ul style="list-style-type: none"> <li>- Water Closets (boys) – Vitreous China with Battery Operated Sensor Flush Valve (1.28 GPF)</li> <li>- Water Closets (girls) – Vitreous China with Dual Flush Valves (1.1 GPF/1.6 GPF)</li> <li>- Urinal – Vitreous China with Battery Operated Sensor Flush Valve (0.50 GPF)</li> <li>- Lavatories – Multi-station Terreon with Battery Operated Sensor Faucet (0.17 gal/cycle*) *10 second run time</li> <li>- Showers – 1.8 GPM flow rate</li> </ul>	<ul style="list-style-type: none"> <li>- 1.28 GPF Flush Valves provides increased conservation</li> <li>- Dual Flush Valves (1.1 GPF/1.6GPF) provides increased water conservation</li> <li>- 0.50 GPF Flush Valves provides increased conservation</li> <li>- Multi-station unit less cost, one connection, easier maintenance, 0.17 gal/cycle provides increased water conservation</li> <li>- 1.8 GPM flow rate provides increased conservation</li> </ul>
<b>Staff Fixtures</b>	<b>Staff Fixtures</b>	<b>Staff Fixtures</b>
<ul style="list-style-type: none"> <li>- Water Closets – Vitreous China with Battery Operated Sensor Flush Valve (1.6 GPF)</li> <li>- Lavatories – Vitreous China with Battery Operated Sensor Faucet (0.25 gal/cycle)</li> </ul>	<ul style="list-style-type: none"> <li>- Water Closets – Vitreous China with Dual Flush Valves (1.1 GPF/1.6 GPF)</li> <li>- Lavatories – Vitreous China with Battery Operated Sensor Faucet (0.17 gal/cycle*) *10 second run time</li> </ul>	<ul style="list-style-type: none"> <li>- Dual Flush Valves (1.1 GPF/1.6GPF) provide increased water conservation</li> <li>- 0.17 Gal/cycle provides increased conservation</li> </ul>
<b>Science</b>	<b>Science</b>	<b>Science</b>
<ul style="list-style-type: none"> <li>- 6 Student sinks with 1 accessible</li> <li>- 1 Instructor Sink (Teaching Sink)</li> <li>- Master Gas Valve Cabinet</li> <li>- Emergency Shower/Eyewash</li> <li>- Epoxy sinks</li> </ul>	<ul style="list-style-type: none"> <li>- 4 Student sinks with 1 accessible</li> <li>- (No Instructor Sink)</li> <li>- Master Gas Valve Cabinet</li> <li>- Emergency Shower/Eyewash</li> <li>- Epoxy sinks</li> </ul>	<ul style="list-style-type: none"> <li>- 4 Student sinks meet Educational Curriculum</li> <li>- No Instructor Sink meets Educational Curriculum</li> <li>- <i>No difference</i></li> <li>- <i>No difference</i></li> <li>- <i>No difference</i></li> </ul>
<b>Systems</b>	<b>Systems</b>	<b>Systems</b>
<ul style="list-style-type: none"> <li>- Gas Fired Water Heating</li> <li>- Chemically Injected Active Acid Waste Neutralization System</li> <li>- Storm, Sanitary and Vent Systems Cast Iron</li> <li>- Domestic/Protected Cold, Hot and Hot Water Return Systems – copper</li> <li>- Tempered Water System – copper</li> <li>- Thermostatic Mixing Valves for Hot Water Temperature Control</li> <li>- Circulation Pumps for Hot Water Return</li> </ul>	<ul style="list-style-type: none"> <li>- Gas Fired Water Heating</li> <li>- Chemically Injected Active Acid Waste Neutralization System</li> <li>- Storm, Sanitary and Vent Systems Cast Iron</li> <li>- Domestic/Protected Cold, Hot and Hot Water Return – copper</li> <li>- Tempered Water System – copper</li> <li>- Thermostatic Mixing Valves for Hot Water Temperature Control</li> <li>- Circulation Pumps for Hot Water Return</li> </ul>	<ul style="list-style-type: none"> <li>- <i>No difference</i></li> <li>- <i>No difference</i></li> <li>- <i>No difference</i></li> <li>- <i>No difference</i></li> <li>- <i>No difference</i></li> <li>- <i>No difference</i></li> <li>- <i>No difference</i></li> </ul>
<b>Fire Protection Systems</b>		
<ul style="list-style-type: none"> <li>- Wet pipe fire sprinkler system</li> <li>- Standpipes at stairwells with FDVs</li> <li>- No fire pump</li> </ul>	<ul style="list-style-type: none"> <li>- Wet pipe fire sprinkler system</li> <li>- Standpipes at stairwells with FDVs</li> <li>- No fire pump</li> </ul>	<ul style="list-style-type: none"> <li>- <i>No difference</i></li> <li>- <i>No difference</i></li> <li>- <i>No difference</i></li> </ul>

Whitman-Hanson Model School	Wellesley High School	Description of Difference
<b>HVAC Systems</b>		
<b>Air Handling System</b>	<b>Air Handling System</b>	<b>Air Handling System</b>
<ul style="list-style-type: none"> <li>- Mainly air handling units</li> <li>- Variable volume</li> <li>- High efficiency motor (95-96%)</li> <li>- 30% efficient filter</li> <li>- Economizer</li> <li>- Demand controlled ventilation</li> <li>- Space motion sensors to reduce airflow</li> </ul>	<ul style="list-style-type: none"> <li>- Mainly air handling units</li> <li>- Variable volume</li> <li>- Premium efficiency motors (97-98%)</li> <li>- MERV 13 (85% efficient)</li> <li>- Comparative enthalpy economizer</li> <li>- Demand controlled ventilation</li> <li>- Space occupancy sensors to reduce airflow</li> </ul>	<ul style="list-style-type: none"> <li>- <i>No difference</i></li> <li>- <i>No difference</i></li> <li>- Premium efficiency motors provide increased energy efficiency</li> <li>- 85% efficient filters provide increased IAQ and equipment performance</li> <li>- Comparative enthalpy optimizes economizer cycle use</li> <li>- <i>No difference</i></li> <li>- <i>No difference</i></li> </ul>
<b>Heating system</b>	<b>Heating System</b>	<b>Heating System</b>
<ul style="list-style-type: none"> <li>- Condensing boilers</li> <li>- Variable speed pumps</li> <li>- Primary-only hot water loop</li> <li>- Outdoor temperature reset</li> <li>- Combustion air dampers</li> <li>- All air space heating and night setback (VAV with reheat)</li> </ul>	<ul style="list-style-type: none"> <li>- Hybrid boiler plant (condensing and non-condensing boilers)</li> <li>- Variable speed pumps</li> <li>- Primary-only hot water loop</li> <li>- Outdoor temperature reset</li> <li>- Direct vent and direct combustion air</li> <li>- All air space heating and night setback (VAV with reheat)</li> </ul>	<ul style="list-style-type: none"> <li>- Hybrid boiler plant less cost, optimizes condensing boiler efficiency</li> <li>- <i>No difference</i></li> <li>- <i>No difference</i></li> <li>- <i>No difference</i></li> <li>- Direct vent and direct combustion air provides increased energy efficiency</li> <li>- <i>No difference</i></li> </ul>
<b>Cooling System</b>	<b>Cooling System</b>	<b>Cooling System</b>
<ul style="list-style-type: none"> <li>- Chilled water (full cooling minus gym and locker areas)</li> <li>- Evaporative chiller</li> <li>- Variable speed pumping</li> <li>- Primary-only chilled water loop</li> </ul>	<ul style="list-style-type: none"> <li>- Chilled water (full cooling minus gym, locker and kitchen areas)</li> <li>- Evaporative chillers</li> <li>- Variable speed pumping</li> <li>- Primary-only chilled water loop</li> </ul>	<ul style="list-style-type: none"> <li>- <i>No difference</i></li> <li>- <i>No difference</i></li> <li>- <i>No difference</i></li> <li>- <i>No difference</i></li> </ul>
<b>Energy Management System</b>	<b>Energy Management System</b>	<b>Energy Management System</b>
<ul style="list-style-type: none"> <li>- Full building energy management system</li> </ul>	<ul style="list-style-type: none"> <li>- Full building energy management system</li> </ul>	<ul style="list-style-type: none"> <li>- <i>No difference</i></li> </ul>
<b>Electrical Systems</b>		
<ul style="list-style-type: none"> <li>- Utility pad-mounted transformer voltage system – 277/480V 3-phase</li> <li>- Electrical service – 4,000 Amp</li> <li>- Switchboard/panels bus material - copper</li> <li>- Electrical service TVSS surge protection – not provided</li> <li>- Branch circuit wiring with common neutral</li> <li>- Classroom lighting – pendant, indirect, LPD – 1.21W/SF</li> <li>- Lighting control – low voltage relay panels, occupancy and daylight sensors</li> </ul>	<ul style="list-style-type: none"> <li>- Utility pad-mounted transformer voltage system – 277/480V 3-phase</li> <li>- Electrical service – 4,000 Amp</li> <li>- Switchboard/panels bus material - aluminum</li> <li>- Electrical service TVSS surge protection – provided</li> <li>- Branch circuit wiring with dedicated neutral per phase</li> <li>- Classroom lighting – pendant, direct/indirect, LPD - 0.92W/SF</li> <li>- Lighting control – low voltage relay panels, occupancy and daylight sensors</li> </ul>	<ul style="list-style-type: none"> <li>- <i>No difference</i></li> <li>- <i>No difference</i></li> <li>- Aluminum less cost, industry standard</li> <li>- TVSS surge protection required by code</li> <li>- Dedicated neutral per phase eliminates non-linear harmonics</li> <li>- 0.92W/SF provides increased energy efficiency</li> <li>- <i>No difference</i></li> </ul>
<ul style="list-style-type: none"> <li>- Diesel-generator set outdoor type, 750kW</li> <li>- (No lightning protection)</li> </ul>	<ul style="list-style-type: none"> <li>- Diesel-generator set outdoor type, 700kW</li> <li>- Lightning protection</li> </ul>	<ul style="list-style-type: none"> <li>- 700kW sized per local need</li> <li>- Lightning protection protects electrical and mechanical equipment</li> </ul>

Whitman-Hanson Model School	Wellesley High School	Description of Difference
<b>Technology Systems</b>		
<ul style="list-style-type: none"> <li>- Category 6 for students and fiber option for teacher's station in labs</li> <li>- Wireless access for student and fiber optic for teacher's station in classrooms</li> <li>- Ubiquitous wireless access</li> <li>- Ceiling mounted projectors and smart boards in classrooms</li> <li>- Permanently mounted facilitator stations at classrooms</li> <li>- Telephone/Intercom PA</li> <li>- CATV Distribution</li> </ul>	<ul style="list-style-type: none"> <li>- Category 6 for students and teacher's station in labs</li> <li>- Category 6 for students and teacher's station in classrooms</li> <li>- Ubiquitous wireless access</li> <li>- Ceiling mounted projectors and smart boards in classrooms</li> <li>- Mobile facilitator stations at classrooms</li> <li>- Telephone/Intercom PA</li> <li>- CATV Distribution</li> </ul>	<ul style="list-style-type: none"> <li>- Category 6 provides 1 GB/second to labs, sufficient for all uses</li> <li>- Category 6 provides 1 GB/second to classrooms, sufficient for all uses</li> <li>- <i>No difference</i></li> <li>- <i>No difference</i></li> <li>- Mobile facilitator stations provides increased flexibility</li> <li>- <i>No difference</i></li> <li>- <i>No difference</i></li> </ul>
<b>Security Systems</b>		
<ul style="list-style-type: none"> <li>- Extensive video surveillance</li> <li>- Motion detection devices</li> <li>- Door access control system</li> </ul>	<ul style="list-style-type: none"> <li>- Limited video surveillance</li> <li>- Motion detection devices</li> <li>- Door access control system</li> </ul>	<ul style="list-style-type: none"> <li>- Limited video surveillance is preferred by School Department</li> <li>- <i>No difference</i></li> <li>- <i>No difference</i></li> </ul>
<b>Sustainable Design Elements</b>		
<b>Energy Efficiency</b>	<b>Energy Efficiency</b>	<b>Energy Efficiency</b>
<ul style="list-style-type: none"> <li>- High efficiency HVAC systems</li> <li>- (No displacement ventilation)</li> <li>- (No geothermal wells)</li> <li>- Light Power Density: 1.2W/SF</li> <li>- Occupancy and daylight sensors</li> <li>- Daylight modeling</li> <li>- Commissioning</li> <li>- Code compliant building envelope</li> <li>- Cool roof</li> <li>- No green roof</li> </ul>	<ul style="list-style-type: none"> <li>- High efficiency HVAC systems</li> <li>- Displacement ventilation</li> <li>- Geothermal wells to serve administration area</li> <li>- Light Power Density 0.9 W/SF or less</li> <li>- Occupancy and daylight sensors</li> <li>- Daylight modeling</li> <li>- Commissioning</li> <li>- High performance building envelope</li> <li>- Cool roof</li> <li>- Green roof 9,500 SF</li> </ul>	<ul style="list-style-type: none"> <li>- <i>No difference</i></li> <li>- Displacement ventilation provides increased IAQ and energy efficiency</li> <li>- Geothermal system provides increased energy efficiency</li> <li>- 0.9W/SF provides increased energy efficiency</li> <li>- <i>No difference</i></li> <li>- <i>No difference</i></li> <li>- <i>No difference</i></li> <li>- High performance building envelope provides increased energy efficiency</li> <li>- <i>No difference</i></li> <li>- Green roof provides increased energy efficiency, protects roof membrane</li> </ul>
<b>Utility incentives</b>	<b>Utility Incentives</b>	<b>Utility Incentives</b>
<ul style="list-style-type: none"> <li>- \$1.1 Million</li> </ul>	<ul style="list-style-type: none"> <li>- WLP contribution - \$42,500</li> </ul>	<ul style="list-style-type: none"> <li>- Wellesley is served by a municipal light and power plant</li> </ul>
<b>Renewable Energy</b>	<b>Renewable Energy</b>	<b>Renewable Energy</b>
<ul style="list-style-type: none"> <li>- 51kW Photovoltaic system</li> <li>- MTC grant funded - \$475,000</li> </ul>	<ul style="list-style-type: none"> <li>- 40kW Photovoltaic system</li> <li>- (No grant)</li> </ul>	<ul style="list-style-type: none"> <li>- 40kW Photovoltaic sized within overall Town commitment</li> <li>- Wellesley is served by a municipal light and power plant</li> </ul>
<b>Water Efficiency</b>	<b>Water Efficiency</b>	<b>Water Efficiency</b>
<ul style="list-style-type: none"> <li>- Code compliant fixtures</li> <li>- Rainwater harvesting system – 20,000 gallons</li> </ul>	<ul style="list-style-type: none"> <li>- Water efficient fixtures – dual flush</li> <li>- Rainwater harvesting system – 100,000 gallons</li> </ul>	<ul style="list-style-type: none"> <li>- Dual Flush Valves provide increased water conservation</li> <li>- Rainwater harvesting system sized for toilets and urinals</li> </ul>