

Workgroup on the Assessment and Funding of School Facilities

Dr. Karen B. Salmon, Chair

Monday October 7, 2019

9:00 a.m. to 1:00 p.m.

**3 West Miller Senate Office Building
Senate Budget and Taxation Committee**

Agenda

- I. Welcome and Opening Remarks
- II. Summary of September 25th Meeting – Michael Rubenstein
- III. Discussion Matrix Item 4 – Total Cost of Ownership Savings Incentive
- IV. Discussion Matrix Items 5 through 9 – Recommendations of the Ed Specs Workgroup
- V. Discussion Matrix Items 1 and 2 Discussion
- VI. Closing Remarks and Adjournment

Total Cost of Ownership (TCO) Incentive Program Scenarios

Wiki Definition: *Total cost of ownership (TCO) is a financial estimate intended to help buyers and owners determine the direct and indirect costs of a product or system. It is a management accounting concept that can be used in full cost accounting or even ecological economics where it includes social costs.*

Function

The draft incentive compares the **Baseline TCO** of a project against the **Projected TCO** and awards a portion of the TCO savings to the Local Education Agency (LEA) in the form of percentage points added to the State Share Percentage. This bonus will increase the State Share Percentage for the construction cost of a project—thereby reducing the LEA share—but, overall, both the State and LEA will have lower TCO. The TCO incentive would apply to new, replacement, or renewal projects. A renewal project follows the definition of the National Council of School Facilities that defines a renewed school facility as one with a Facility Condition Index (FCI) (=cost of repair divided by cost of replacement) of 15% or lower.

Purpose

The eight incentive scenarios described in this explainer are intended to provide a general understanding of calculation variables. Scenarios A–D do not allow the State share on a given project to exceed 100%, thereby reserving all potential savings above a certain point to the State and eliminating the incentive for LEAs to reach for potentially greater TCO savings in some situations. Those scenarios benefit high-wealth LEAs more than they benefit low-wealth LEAs. Scenarios E–H maintain the incentive for TCO savings even when those savings would earn a State share greater than 100% and result in the LEA receiving credits usable on other projects). These scenarios equalize the benefits potentially available to all LEAs regardless of the LEA’s wealth level.

Definitions

The **Baseline TCO** of a school facility is based upon the IAC's annual allowed project cost per square foot (including site work) times the total square feet allowed by the IAC for the project PLUS the estimated 30-year cost to operate and maintain the project calculated at 4% per year of the IAC project cost (including site work but excluding land and soft costs such as design, surveys, and relocatable furniture, fixtures, and equipment).

The **Projected TCO** shall be the same calculation except that the project cost shall be the contracted project cost (verified at project completion) PLUS the calculated 30-year cost to operate and maintain. Calculated cost to operate and maintain shall be based upon standardized building-system life-cycle costs. The IAC would develop these baseline cost data based upon industry standards, manufacturer recommendations, IFMA’s Asset Lifecycle Model for Total Cost of Ownership Management, and other similar information. These cost data would be challengeable by LEAs.

Two possible examples of TCO savings for a project:

Savings

- 1) A project is made up of many building systems. Sometimes, long-life low-maintenance building systems costing more to install—such as a standing seam metal roof—can yield a 30-year TCO that is lower than the Baseline TCO.
- 2) A reduction in GSF will generally result in a lower TCO. A 10% smaller footprint would likely yield a 10% or lower Projected TCO.

Total Cost of Ownership (TCO) Incentive Program Scenarios

Spreadsheets of all eight scenarios have been provided to the members. Only Scenarios C, G and H will be handouts at the meeting, as they generally demonstrate total savings to the State as well as features of fair balance for State distributions. It should be noted that the total State and Local combined TCO savings are uniform for all eight scenarios.

Scenarios A – D:

State Share Percentage cannot exceed 100% of IAC-eligible project costs.

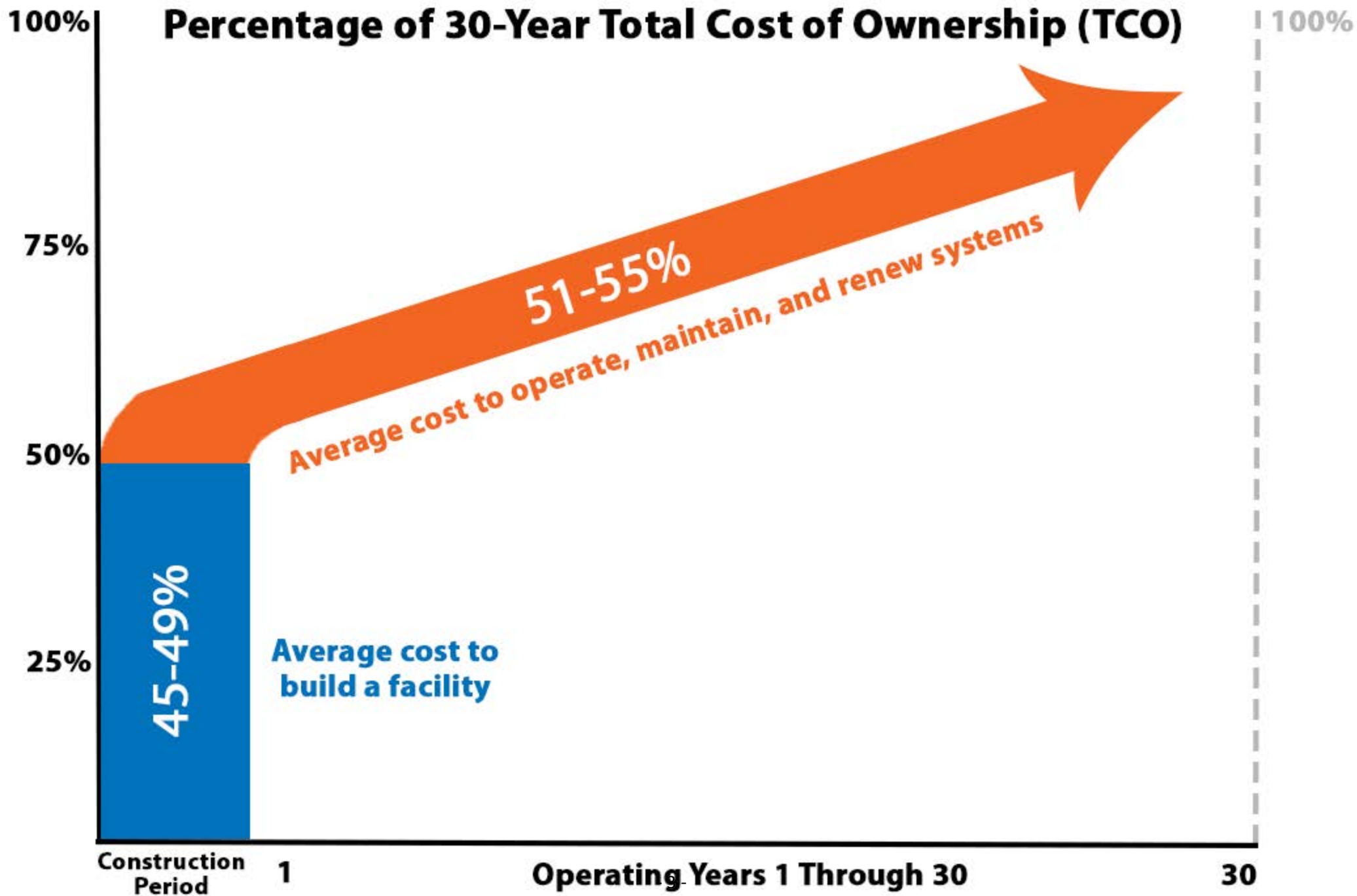
- A. Scenario A: 1% State Share INCENTIVE for each 1% REDUCTION in TCO.
- B. Scenario B: 3/4% State Share INCENTIVE for each 1% REDUCTION in TCO.
- C. Scenario C: 3/4% State Share INCENTIVE for each 1% REDUCTION in TCO (except, for LEAs with state share of 89% or more, a 1% savings incentive up to 100%).
- D. Scenario D: 3/4% State Share INCENTIVE for each 1% REDUCTION (except, for LEAs with state share of 89% or more, a 1% savings incentive up to 100%) PLUS 1/2% ADDITIONAL SAVINGS for reductions of 30% or more.

Scenarios E – H:

State Share Percentage may exceed 100% of IAC-eligible project costs. Under these scenarios, the LEA would receive 75 percent of any state share above 100% of project cost. This bonus above eligible project costs could be utilized for any tax-exempt bond qualified expense for the project such as design and furniture, or may be added to the LEA's Education Article 5-303 reserve account.

- E. Scenario E: 1% State Share INCENTIVE for each 1% REDUCTION in TCO.
 - F. Scenario F: 3/4% State Share INCENTIVE for each 1% REDUCTION in TCO.
 - G. Scenario G: 3/4% State Share INCENTIVE for each 1% REDUCTION in TCO (except, for LEAs with state share of 89% or more, a 1% savings incentive up to 100%).
 - H. Scenario H: 3/4% State Share INCENTIVE for each 1% REDUCTION in TCO (except, for LEAs with state share of 89% or more, a 1% savings incentive up to 100%) PLUS 1/2% ADDITIONAL SAVINGS for reductions of 30% or more.
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Percentage of 30-Year Total Cost of Ownership (TCO)



Scenario G: 3/4% SAVINGS INCENTIVE for each 1% REDUCTION (except, for LEAs with state share of 89% or more, a 1% savings incentive up to 100%) and LEA receives 3/4 of the Adjusted State Percentage above 100% . ~~No State Percentages above 100%~~.

Assumptions: **Baseline Project Construction Cost is \$45M** or 45% of TCO Baseline [Middle School, w/915 students, \$49,195/student (IAC Cost w/site is \$379/SF)]. TCO is project cost plus 30 years of M&O including systemics. M&O baseline is project cost times 2% per year for systemics (capital maintenance) plus 2% per year for routine M&O (heat, cool, custodial, routine-emergent-preventive maintenance, grounds maint, etc.)

| Baseline | | | | Proposed With Incentive | | | | | | | | | | | | | S | |
|--|---|---|--|-------------------------------|-------------------------------|---------------------------------|--|-------------------------------|---------------------------------|--|--|--|------------------------------------|-------------------------------|---|---|------------------------------------|--|
| A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S |
| \$45,000,000 Project Construction Cost | | | | For State | | | | | | | | For LEA | | | | | | Combined |
| | | A x .45 x B | A x .45 x (1-B) | | | E(mod)+B | .45F x G unless G>100% then ((G-1)*.75)+1 x .45F | C - H | I/A | (.02 x .45A x 30 x B) - (.02 x .45F x 30 x B) | I+K | (1-G) x .45F unless G>100% then (1-G)*75% x .45F | D-M unless G>100% then (M x-1) + D | N/D | (.02 x .45A x 30 x (1-B)) - (.02 x .45F x 30 x (1-B)) | (.02 x .45A x 30) - (.02 x .45F x 30) | N+P+Q | L+R |
| Total Cost of Ownership (TCO) for the Facility | State Share % of Constr/Syst emics for the County | State Share of Baseline Construction Cost w/ Site | LEA Share of Baseline Construction Cost w/Site | TCO Cost Reduction Percentage | Proposed TCO for the Facility | Adjusted State Share Percentage | Adjusted State Share of Construction | State Savings On Construction | % State Savings On Construction | Est. Reduced State Cost of Systemics over 30 years | Est. Net State TCO Savings over 30 years | Adjusted LEA Share | LEA Savings on Construction | % LEA Savings On Construction | Est. Reduced LEA Cost of Systemics over 30 years | Est. Reduced LEA Cost of Maint & Ops. over 30 years | Est. LEA TCO Savings over 30 years | Est. Net TCO Savings (State+LEA) over 30 years |
| \$ 100,000,000 | 50% | \$ 22,500,000 | \$ 22,500,000 | 1% | \$ 99,000,000 | 50.75% | \$ 22,609,125 | \$ (109,125) | -0.48% | \$ 135,000 | \$ 25,875 | \$ 21,940,875 | \$ 559,125 | 2.49% | \$ 135,000 | \$ 270,000 | \$ 964,125 | \$ 990,000 |
| \$ 100,000,000 | 96% | \$ 43,200,000 | \$ 1,800,000 | 1% | \$ 99,000,000 | 97.00% | \$ 43,213,500 | \$ (13,500) | -0.03% | \$ 259,200 | \$ 245,700 | \$ 1,336,500 | \$ 463,500 | 25.75% | \$ 10,800 | \$ 270,000 | \$ 744,300 | \$ 990,000 |
| \$ 100,000,000 | 45% | \$ 20,453,850 | \$ 24,546,150 | 10% | \$ 90,000,000 | 52.95% | \$ 21,445,965 | \$ (992,115) | -4.85% | \$ 1,227,231 | \$ 235,116 | \$ 19,054,035 | \$ 5,492,115 | 22.37% | \$ 1,472,769 | \$ 2,700,000 | \$ 9,664,884 | \$ 9,900,000 |
| \$ 100,000,000 | 50% | \$ 22,500,000 | \$ 22,500,000 | 20% | \$ 80,000,000 | 65.00% | \$ 23,400,000 | \$ (900,000) | -4.00% | \$ 2,700,000 | \$ 1,800,000 | \$ 12,600,000 | \$ 9,900,000 | 44.00% | \$ 2,700,000 | \$ 5,400,000 | \$ 18,000,000 | \$ 19,800,000 |
| \$ 100,000,000 | 50% | \$ 22,500,000 | \$ 22,500,000 | 30% | \$ 70,000,000 | 72.50% | \$ 22,837,500 | \$ (337,500) | -1.50% | \$ 4,050,000 | \$ 3,712,500 | \$ 8,662,500 | \$ 13,837,500 | 61.50% | \$ 4,050,000 | \$ 8,100,000 | \$ 25,987,500 | \$ 29,700,000 |
| \$ 100,000,000 | 96% | \$ 43,200,000 | \$ 1,800,000 | 10% | \$ 90,000,000 | 106.00% | \$ 42,322,500 | \$ 877,500 | 2.03% | \$ 2,592,000 | \$ 3,469,500 | \$ (1,822,500) | \$ 3,622,500 | 201.25% | \$ 108,000 | \$ 2,700,000 | \$ 6,430,500 | \$ 9,900,000 |
| \$ 100,000,000 | 96% | \$ 43,200,000 | \$ 1,800,000 | 20% | \$ 80,000,000 | 116.00% | \$ 40,320,000 | \$ 2,880,000 | 6.67% | \$ 5,184,000 | \$ 8,064,000 | \$ (4,320,000) | \$ 6,120,000 | 340.00% | \$ 216,000 | \$ 5,400,000 | \$ 11,736,000 | \$ 19,800,000 |
| \$ 100,000,000 | 96% | \$ 43,200,000 | \$ 1,800,000 | 30% | \$ 70,000,000 | 126.00% | \$ 37,642,500 | \$ 5,557,500 | 12.86% | \$ 7,776,000 | \$ 13,333,500 | \$ (6,142,500) | \$ 7,942,500 | 441.25% | \$ 324,000 | \$ 8,100,000 | \$ 16,366,500 | \$ 29,700,000 |
| \$ 100,000,000 | 50% | \$ 22,500,000 | \$ 22,500,000 | 10% | \$ 90,000,000 | 57.50% | \$ 23,287,500 | \$ (787,500) | -3.50% | \$ 1,350,000 | \$ 562,500 | \$ 17,212,500 | \$ 5,287,500 | 23.50% | \$ 1,350,000 | \$ 2,700,000 | \$ 9,337,500 | \$ 9,900,000 |
| \$ 100,000,000 | 60% | \$ 27,000,000 | \$ 18,000,000 | 10% | \$ 90,000,000 | 67.50% | \$ 27,337,500 | \$ (337,500) | -1.25% | \$ 1,620,000 | \$ 1,282,500 | \$ 13,162,500 | \$ 4,837,500 | 26.88% | \$ 1,080,000 | \$ 2,700,000 | \$ 8,617,500 | \$ 9,900,000 |
| \$ 100,000,000 | 70% | \$ 31,500,000 | \$ 13,500,000 | 10% | \$ 90,000,000 | 77.50% | \$ 31,387,500 | \$ 112,500 | 0.36% | \$ 1,890,000 | \$ 2,002,500 | \$ 9,112,500 | \$ 4,387,500 | 32.50% | \$ 810,000 | \$ 2,700,000 | \$ 7,897,500 | \$ 9,900,000 |
| \$ 100,000,000 | 80% | \$ 36,000,000 | \$ 9,000,000 | 10% | \$ 90,000,000 | 87.50% | \$ 35,437,500 | \$ 562,500 | 1.56% | \$ 2,160,000 | \$ 2,722,500 | \$ 5,062,500 | \$ 3,937,500 | 43.75% | \$ 540,000 | \$ 2,700,000 | \$ 7,177,500 | \$ 9,900,000 |
| \$ 100,000,000 | 90% | \$ 40,500,000 | \$ 4,500,000 | 10% | \$ 90,000,000 | 100.00% | \$ 40,500,000 | \$ - | 0.00% | \$ 2,430,000 | \$ 2,430,000 | \$ - | \$ 4,500,000 | 100.00% | \$ 270,000 | \$ 2,700,000 | \$ 7,470,000 | \$ 9,900,000 |

| Scenario G - Estimated 30-year State and Counties savings (cost avoidance) what-if for entire Statewide School Facilities Portfolio | | | | | | | | | | | Notes: 1) Baseline construction is 45% of TCO; 2) State share average is an assumption; 3) All numbers x 1,000; | | | | | | | |
|---|-----|------------|-----------|-----|------------|--------|------------|-------------|--------|--------------|---|--------------|--------------|--------|------------|--------------|--------------|--------------|
| 56,000,000 | 65% | 16,380,000 | 8,820,000 | 1% | 55,440,000 | 65.75% | 16,403,310 | \$ (23,310) | -0.04% | \$ 98,280 | \$ 74,970 | \$ 8,544,690 | \$ 275,310 | 3.12% | \$ 52,920 | \$ 151,200 | \$ 479,430 | \$ 554,400 |
| 56,000,000 | 65% | 16,380,000 | 8,820,000 | 10% | 50,400,000 | 72.50% | 16,443,000 | \$ (63,000) | -0.11% | \$ 982,800 | \$ 919,800 | \$ 6,237,000 | \$ 2,583,000 | 29.29% | \$ 529,200 | \$ 1,512,000 | \$ 4,624,200 | \$ 5,544,000 |
| 56,000,000 | 77% | 19,404,000 | 5,796,000 | 10% | 50,400,000 | 84.50% | 19,164,600 | \$ 239,400 | 0.43% | \$ 1,164,240 | \$ 1,403,640 | \$ 3,515,400 | \$ 2,280,600 | 39.35% | \$ 347,760 | \$ 1,512,000 | \$ 4,140,360 | \$ 5,544,000 |
| 150M GSF x \$379/sf = \$ 56,000,000,000 < --Estimated total Statewide school facilities portfolio replacement value | | | | | | | | | | | | | | | | | | |

| Scenario G - State and Counties estimated 30-year future value of savings (cost avoidance) at 4% per year construction cost escalation and with . | | | | | |
|---|---------------|------------------------------|-------------------------|-------|---------------------------------|
| State Share % | TCO Reduction | Present Value of TCO Savings | Const Cost Escalation % | Years | Future Value w/Const Escalation |
| 65% | 1% | \$554,400,000 | 4% | 30 | \$1,798,139,580 |
| 65% | 10% | \$5,544,000,000 | 4% | 30 | \$17,981,395,796 |
| 77% | 10% | \$5,544,000,000 | 4% | 30 | \$17,981,395,796 |

Examples of HVAC System Life Cycle Cost Analyses (LCCAs) for Total Cost of Ownership Savings

School #1 – New Elementary School (S.F. = 145,000):

| Type | First Costs | Energy Costs (per year) | Service Costs (per year) | Maintenance Costs (per year) | Total Annual Cost (\$) | PRESENT VALUE OF TOTAL ANNUAL COST = TOTAL ANNUAL COST X PW FACTOR | TOTAL LIFE CYCLE COST = PRESENT VALUE OF ANNUAL COST + TOTAL INITIAL COST | TOTAL LIFE CYCLE COST SAVINGS PERCENTAGE (%) |
|-------------------------------|--------------|----------------------------|-----------------------------|---------------------------------|------------------------|--|---|--|
| Option A: 4-Pipe Conventional | \$10,650,250 | \$384,860 | \$14,400 | \$16,200 | \$415,460 | \$14,506,297 | \$25,156,547 | |
| Option B: Geothermal VRF | \$10,266,000 | \$286,353 | \$13,900 | \$12,200 | \$312,453 | \$10,909,681 | \$21,175,681 | 15.80% |

School #2 – Tech High School (S.F. = 99,000):

| Type | First Costs | Energy Costs (per year) | Service Costs (per year) | Maintenance Costs (per year) | Total Annual Cost (\$) | PRESENT VALUE OF TOTAL ANNUAL COST = TOTAL ANNUAL COST X PW FACTOR | TOTAL LIFE CYCLE COST = PRESENT VALUE OF ANNUAL COST + TOTAL INITIAL COST | TOTAL LIFE CYCLE COST SAVINGS PERCENTAGE (%) |
|---|-------------|----------------------------|-----------------------------|---------------------------------|------------------------|--|---|--|
| Option A: Air Side VRF and Dual Temp O.A. | \$7,710,880 | \$166,571 | \$20,900 | \$19,700 | \$207,171 | \$7,233,630 | \$14,944,510 | |
| Option B: Geothermal | \$8,618,950 | \$121,531 | \$14,900 | \$13,200 | \$149,631 | \$5,224,550 | \$13,843,500 | 7.30% |

School #3 – Renovation/Addition Elementary School (S.F. = 103,000):

| Type | First Costs | Energy Costs (per year) | Service Costs (per year) | Maintenance Costs (per year) | Total Annual Cost (\$) | PRESENT VALUE OF TOTAL ANNUAL COST = TOTAL ANNUAL COST X PW FACTOR | TOTAL LIFE CYCLE COST = PRESENT VALUE OF ANNUAL COST + TOTAL INITIAL COST | TOTAL LIFE CYCLE COST SAVINGS PERCENTAGE (%) |
|-------------------------------|-------------|----------------------------|-----------------------------|---------------------------------|------------------------|--|---|--|
| Option A: 4-Pipe Fan Coil ERV | \$8,025,850 | \$187,883 | \$15,400 | \$17,200 | \$220,483 | \$7,698,435 | \$15,724,285 | |
| Option B: Geothermal VRF | \$7,792,600 | \$108,636 | \$13,900 | \$12,200 | \$134,736 | \$4,704,473 | \$12,497,073 | 20.50% |

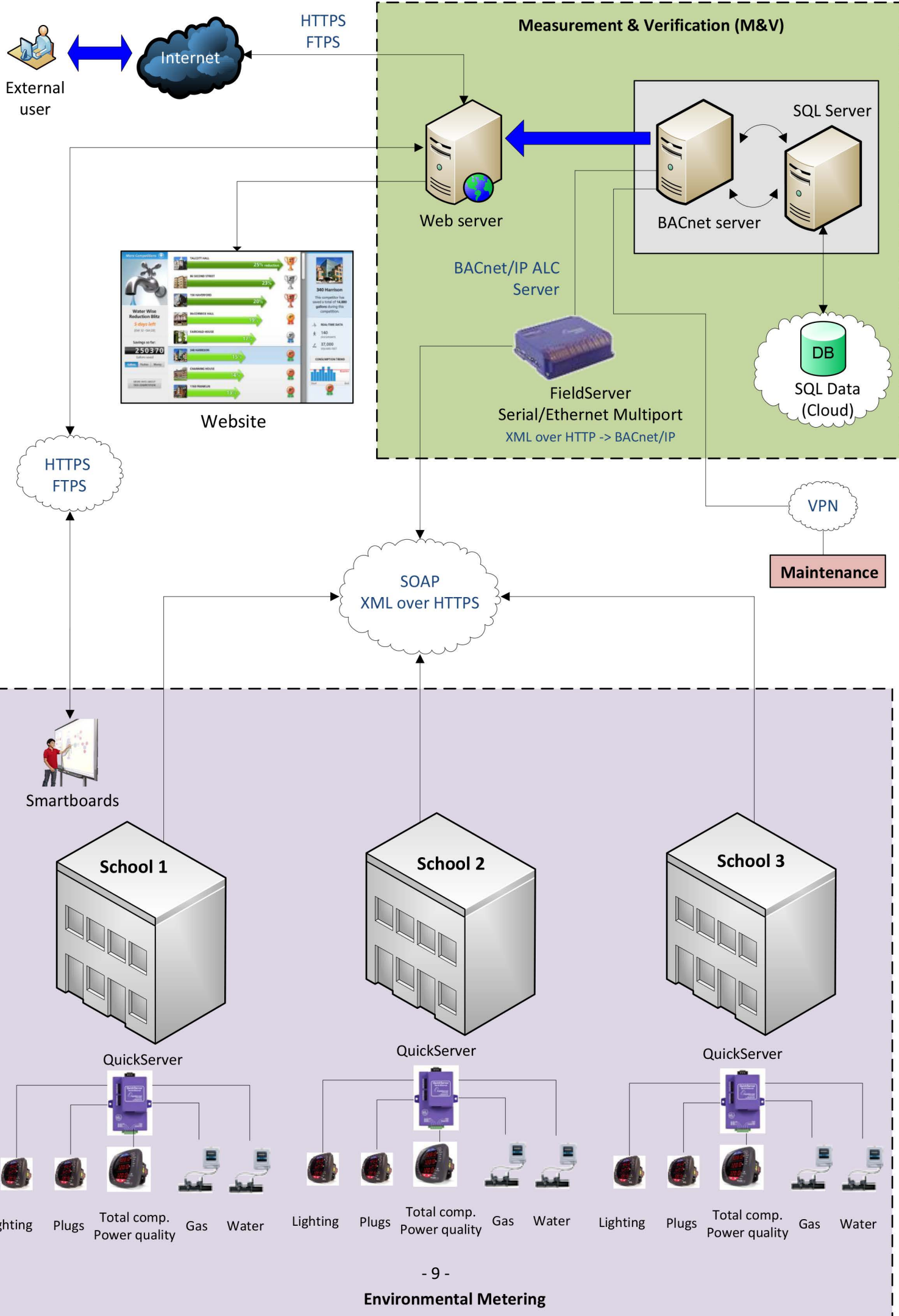
Definitions of Key Facilities Data Elements

For the purposes of classifying expenditures and budgeting, facilities-related activities should fall into one of the six following categories regardless of funding source.

| PLANNING—Determining What Is Needed | |
|---|---|
| <i>The identification and maintenance of the next steps—including funding sources and planning coordination with 'outside' entities—that are required to most efficiently and effectively provide the facilities necessary to adequately support the institution's intended outcomes.</i> | |
| Long-term capital planning | The creation of comprehensive plans, often looking out further than five years, for the funding, establishment, acquisition, maintenance, and disposal of school facilities deployed to meet a district's needs. |
| Short- or near-term capital planning | The creation of detailed plans to meet a district's needs during the upcoming five years. Such plans include preliminary or pre-design project information such as educational specifications, potential sites, facility/building(s), budgets, and timelines. |
| ACQUISITION—Obtaining the School Facility | |
| <i>Activities that result in a facility or asset becoming available in a like-new condition to a school district.</i> | |
| Acquisition of Land | Obtaining the use of land through purchase in fee simple or through lease-purchase (lease duration must be longer than one year), including environmental, legal, and other activities required to make the land usable for its intended purposes. |
| Acquisition of Facilities | Obtaining a preexisting facility through purchase in fee simple or lease-purchase (lease duration must be longer than one year). Includes costs associated with eminent domain (including purchase of rights-of-way); and tax or special assessment foreclosure. |
| Construction of New or Replacement Facility | Construction of a new or replacement campus, including support infrastructure—both on-site and off-site—such as water, sewer, drainage, gas, power, access roads, etc. Includes all steps from planning to occupancy that are necessary to achieve a facility that has an initial lifespan of 30 or more years before comprehensive renewal would be required to gain back the learning and operational advantages of a new facility. |
| Renewal of Existing Facility (Full Modernization) | Renovation of an entire campus to like-new condition (equal to an Facility Condition Index* of 15% or lower) during a period of time not to exceed four years, including its support infrastructure both on-site and off-site. * The Facility Condition Index figure is derived by dividing the estimated cost to repair a complete facility to a like-new condition by the estimated current replacement (new) cost of a facility of the same class and type. |

| | |
|---|---|
| ALTERATION—Permanent Facility Modification | |
| <i>Building addition, renovation, modernization, or other major modification to a school campus that may add or reduce capacity and otherwise supports the facility’s function but is insufficient to renew the facility (see Acquisition).</i> | |
| NONPERMANENT ADDITION—Adding Temporary Capacity | |
| <i>Augmentation of the capacity of a facility through the installation of portable classrooms or similar assets—along with associated support systems—that are not permanent. (When deinstalled, any recovered value remaining in the portable assets should be deducted from this account code).</i> | |
| MAINTENANCE—Tending the School Facility | |
| <i>The work required to keep a facility (plant, building, structure, ground facility, utility system, or other real property) in such condition that it may be fully functional and continuously utilized for its expected lifespan, for its intended purpose, and at its maximum energy efficiency. Includes both routine and capital maintenance.</i> | |
| Routine Maintenance | Routine, preventive, predictive, and emergent unscheduled tasks and repairs required to ensure that a facility functions according to its design and for its expected lifespan. Includes scheduled inspections, record keeping, equipment servicing, replacement of lamps and filters, replacement of failed equipment components such as motors, pumps and switches, responding to calls for emergency repairs, patching holes, and repairing furniture and fixtures. |
| Facility System(s) & Component(s) Renewal (Capital Maintenance) | Major repair, alteration, and replacement of building systems, equipment, finishes and components, including their removal and disposal. These system and component renewals occur more often at the end of a building system’s or equipment’s useful life. They will sustain or extend the useful life of the entire facility but are insufficient to result in the facility becoming “like new.” Includes improvement of roadways and drainage; replacement of playing fields, roofs, HVAC systems, windows, and doors; structural repairs; and installation or replacement of long-life assets in a facility such furniture, fixtures, and equipment. |
| OPERATIONS—Supporting Occupancy Needs | |
| <i>The services required to keep a facility clean, sanitary, and tidy such that its occupants are comfortable, healthy, and productive. Includes the provision of utilities such as fuel, electricity, water, and sewerage; support services to assist occupants; and disposal and recycling of unnecessary structures, equipment, and trash.</i> | |
| Short-Term Lease | A lease for 1 year or less. |
| Utilities | The energy, water, communications, and waste disposal services purchased to enable the operation of a school facility. Includes but is not limited to electricity, natural gas, liquid propane, oil, water, sewerage, telephone, Internet access, recycling, and trash disposal services. |

| | |
|---|---|
| <p>Custodial Services</p> | <p>The day-to-day janitorial and grounds tasks necessary to keep a facility sanitary, polished, and tidy. Includes trash removal, cleaning, waxing, weed removal, trimming, mowing, irrigating, snow and ice removal, and otherwise caring for school facilities and grounds. Also includes non-cleaning tasks such as opening the school, checking for vandalism, and identifying safety and maintenance needs.</p> |
| <p>Support Services</p> | <p>Routine and non-routine work tasks to support occupant functions. Includes responding to teachers' and principals' requests; setting up spaces for special activities and events; ordering and delivering supplies; raising and lowering the flag; and management of equipment for physical-education and athletic activities.</p> |
| <p>Demolition and Disposal of Facilities</p> | <p>End-of-life removal of assets including furniture, equipment, and buildings. Includes spot removal of any unsafe product such as lead or asbestos as well as cleanup of spills, mold, and other contaminants. Does not include demolition, disposal, or environmental cleanups as part of facility acquisition (construction or replacement of a new facility, or renewal of an existing facility) or capital maintenance.</p> |



What is the Measurement and Verification Program?

School facilities are important. If educational spaces are not comfortable, education suffers. If educational spaces are too expensive to operate, funding is diverted from education and it suffers. As the saying goes, “If you can’t measure it, you can’t manage it”. Measurement and Verification (M&V) provides performance transparency and allows process improvement. M&V allows comparative measurement of both new and potentially existing facilities energy and water usage. Just having utility billing information doesn’t help because there are so many different sources, systems, and rate plans across the state. The M&V for a one-time cost of installation, provides this information. If M&V is expanded to all schools, they can be compared one to another and there is a potential for competition of savings between schools and even LEAs. More importantly, the real-time measurement information will be a valuable opportunity to STEM programs. The IAC will use the accurate and detailed information for continuous improvement of building system installed in new or renovated facilities. The real-time M&V data will also allow LEAs and the IAC to see and diagnose problems, and to assess needs where applicable, remedies, either by contract enforcement or other, before schools are surprised by too large utility bills or uncomfortable learning environments.

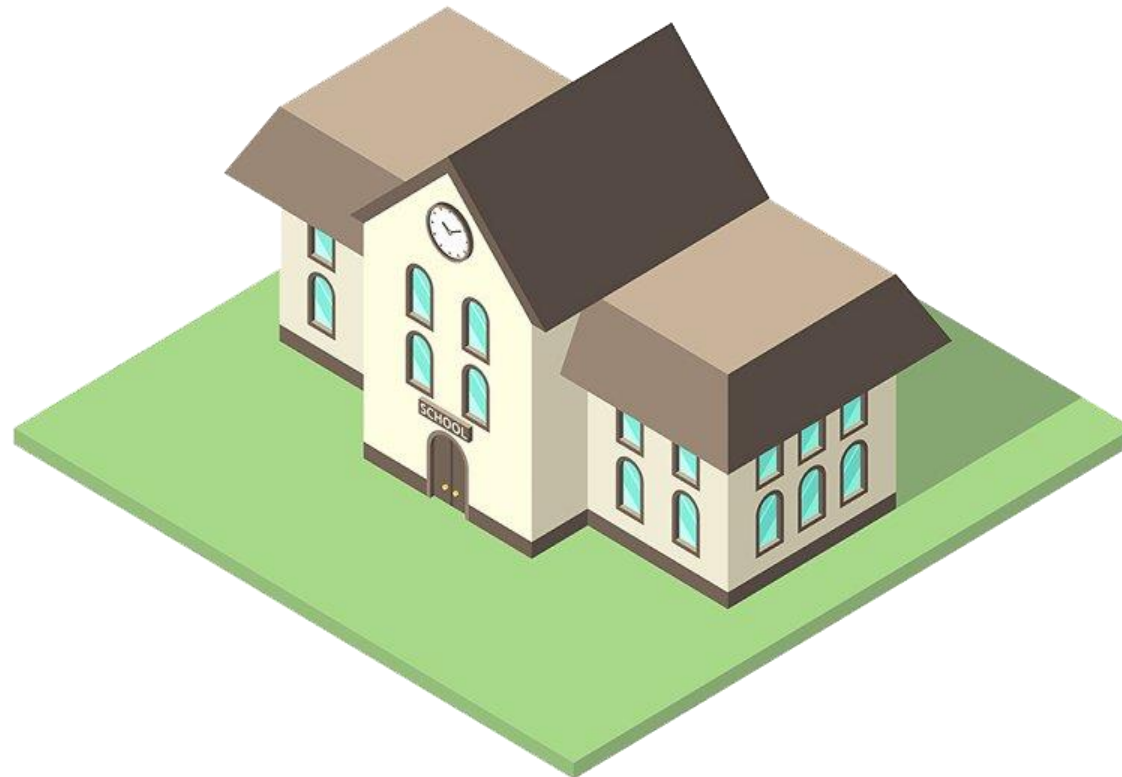
Understanding the Impacts of Weighting Major Systems:

The HVAC Example



This 40 year old facility is made up of only three components: a roof, exterior walls, and a HVAC system.

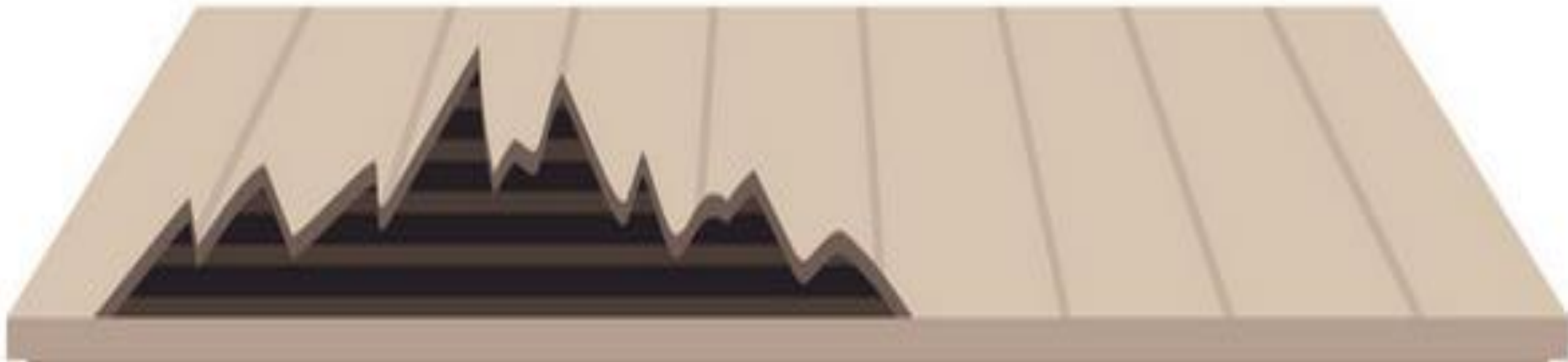
It has a total replacement value of \$600



Component 1

*The roof makes up roughly $\frac{1}{4}$ the cost of the facility, with a **replacement value** of **\$150** and is **50% degraded**. Therefore, its **repair value is \$75**.*

*The roof is within its expected life cycle, so it is assigned to **Category 9**, with a **weight of .25**.*



Component 2

*The exterior walls make up roughly $\frac{1}{4}$ the cost of the facility, with a **replacement value of \$150** and is **33% degraded**. Therefore, its **repair value is \$50**.*

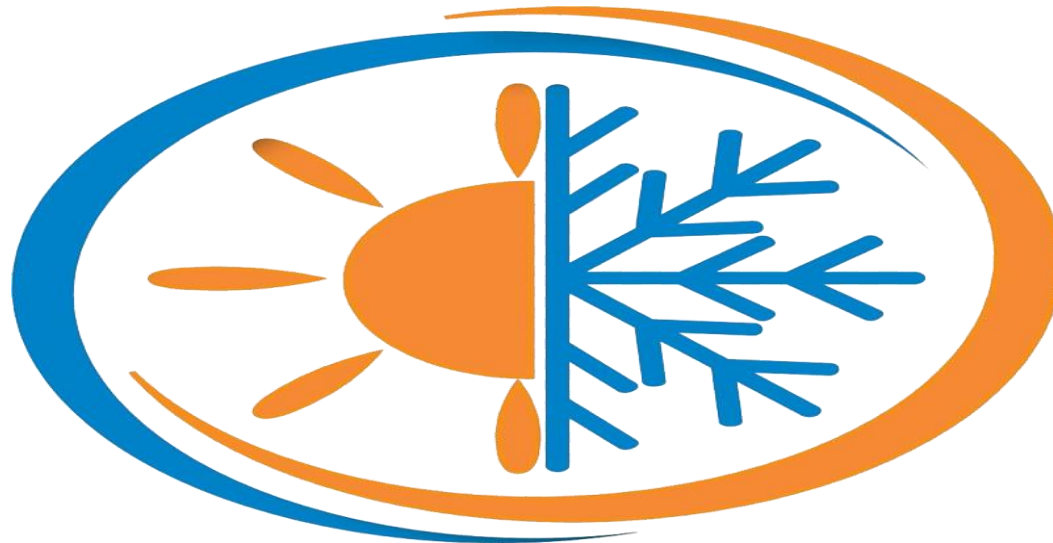
*The walls are within its expected life cycle, so it is assigned to **Category 9**, with a **weight of .25**.*



Component 3

*The HVAC system makes up roughly 1/2 the cost of the facility, with a **replacement value** of **\$300**, and is **75% degraded**. Therefore, its **repair value** is **\$225**.*

*The foundation is within its expected life cycle, so let's start by assigning it to **Category 9**, with a **weight** of **.25**.*



Impact of the HVAC with a .25 weighting

Reminder: A .25 weighting signifies a well functioning system within its expected life

- 1) *Our roof's repair value is **weighted by .25.**
.25 weight x \$75 repair value = \$18.75*
- 2) *Our walls' repair value is **weighted by .25.**
.25 weight x \$50 repair value = \$12.50*
- 3) *Our HVAC's repair value is **weighted by .25.**
.25 weight x \$225 repair value = \$56.25*

$$\mathbf{\$18.75 + \$12.50 + \$56.25 = \$87.50 \div \$600 = 14.6\% MDCI}$$

Even in good shape, the HVAC is 64% of the numerator



Impact of the HVAC with a 1.5 weighting

Reminder: A 1.5 weighting signifies a functioning system 2x beyond its expected life

- 1) *Our roof's repair value is **weighted by .25.**
.25 weight x \$75 repair value = \$18.75*
- 2) *Our walls' repair value is **weighted by .25.**
.25 weight x \$50 repair value = \$12.50*
- 3) *Our HVAC's repair value is **weighted by 1.5.**
1.5 weight x \$225 repair value = \$337.50*

$$\mathbf{\$18.75 + \$12.50 + \$337.50 = \$368.75 \div \$600 = 61.45\% MDCI}$$

In poor shape, the HVAC becomes 92% of the numerator



Impact of the HVAC with a 3.5 weighting

Reminder: A 3.5 weighting signifies a severe code, life, health, or safety issue

- 1) *Our roof's repair value is **weighted by .25.**
.25 weight x \$75 repair value = \$18.75*
- 2) *Our walls' repair value is **weighted by .25.**
.25 weight x \$50 repair value = \$12.50*
- 3) *Our HVAC's repair value is **weighted by 3.5.**
3.5 weight x \$225 repair value = \$787.50*

$$\mathbf{\$18.75 + \$12.50 + \$787.50 = \$818.75 \div \$600 = 136.46\% \text{ MDCI}}$$

In non-functioning shape, the HVAC becomes 96% of the numerator



Comparing the Impacts within Current Categories

*When our HVAC system is weighted at current category 9, .25:
Our MDCl is 14.6%*

*When our HVAC system is weighted at current category 4, 1.5:
Our MDCl is 61.45%*

*When our HVAC system is weighted at current category 1, 3.5:
Our MDCl is 136.46%*



In Conclusion

Due to the relative importance of our HVAC System in our school (Total Replacement Cost: $\frac{1}{4}$ Roof, $\frac{1}{4}$ Walls, $\frac{1}{2}$ HVAC)

*Our HVAC system accounts for a **935% increase in our MDCL Score** when changing weightings from .25 to 3.5*

Of course, a real school will have more systems, but HVAC always accounts for around 20% of the combined replacement value of all the systems.



| Category # | Description | Weight |
|------------|--|-------------------|
| 1 | Immediate Code/Life/Health Threat Used only for critical issues that pose immediate threats to the life, health, or safety of persons within the facility. <ul style="list-style-type: none"> • Obvious friable asbestos • Unprotected exit corridors • Electrical hazards | 3.5 |
| 2 | Sufficiency Deficiency – Space Deficiencies that are related to sufficiency standards for inherent space-based issues in the facility. <ul style="list-style-type: none"> • Not enough classrooms • Lacking square-footage requirements • Missing mission-critical space | 3.0 |
| 3 | Mitigate Additional Damage: Systems or deficiencies that require repairs to mitigate additional damage. <ul style="list-style-type: none"> • Leaking roof • Poor ventilation causing moisture leaks | 2.0 |
| 4 | Degraded w/ Potential Mission Impact Systems or deficiencies that are mission critical and beyond useful life, or most systems beyond 200% expected life. <ul style="list-style-type: none"> • Fire alarm system beyond 200% • Severely damaged walls • Systems past 200% life expectancy | 1.5 |
| 5 | Beyond Expected Life: Systems or deficiencies that are 100% to 200% beyond expected life and show no signs of required repairs. <ul style="list-style-type: none"> • Expired portable buildings • Many interior finishes without damages | .25 to 1.5 |



| Category # | Description | Weight |
|------------|---|------------|
| 6 | Grandfathered or State/District Standards: Systems or deficiencies that are “grandfathered” code issues or specific to the local agency. <ul style="list-style-type: none"> • Fire Sprinklers • Flooring consistent with local architectural standards | .5 |
| 7 | Sufficiency Deficiency – Facility Deficiencies that are related to sufficiency standards for inherent parts of the facility. <ul style="list-style-type: none"> • ADA Issues • Insufficient Parking • Fixed Equipment (such as serving kitchens) | 1.0 |
| 8 | Sufficiency Deficiency – Equipment Deficiencies that a related to sufficiency standards for non-fixed equipment. <ul style="list-style-type: none"> • Missing playgroup equipment | .5 |
| 9 | Normal/Within Life Cycle Systems that are within the expected life cycle and do not require replacement. <ul style="list-style-type: none"> • Functioning, new lighting • A 20 year old system with a 25 year life cycle | .25 |

