21st Century School Facilities Commission

Martin G. Knott, Jr., Chair

Agenda
September 15, 2016
1:00 p.m.
House Office Building, Room 120
Annapolis, Maryland

I. Call to Order and Chair's Opening Remarks

II. Structure and Funding of Public School Construction Programs in Maryland and Other States

- Rachel Hise, Department of Legislative Services
- Kate Henry, Department of Legislative Services
- Michael Rubenstein, Department of Legislative Services
- Kyle Siefering, Department of Legislative Services

III. Educational Specifications in Maryland

- Barbara Bice, School Facilities Branch Chief, Maryland State Department of Education
- Beth Pasierb, Supervisor of Facilities Planning, Frederick County Public Schools
- Christopher Morton, Supervisor of Facilities Management, Harford County Public Schools

IV. Cost Containment Alternatives

- David Lever, former Executive Director of the Interagency Committee on School Construction

V. Public Testimony

VI. Chair's Closing Remarks and Adjournment

Public School Construction Programs in Maryland and Other Selected States

Department of Legislative Services
Office of Policy Analysis
Annapolis, Maryland
September 15, 2016

Maryland

Governance: The Interagency Committee on School Construction (IAC) was established in 1971 to administer the State's public school construction programs, subject to final approval by the Board of Public Works (BPW) (Governor, Comptroller, and Treasurer).

IAC consists of:

- State Superintendent of Schools (or designee), chairperson;
- Secretary of General Services (or designee);
- Secretary of Planning (or designee);
- one public member appointed by President of the Senate (since 2005); and
- one public member appointed by Speaker of the House (since 2005).

The Public School Construction Program (PSCP) is an independent agency under IAC that ultimately reports to BPW. The IAC staff is led by the Executive Director of the Public School Construction Program, who is appointed by IAC with the approval of BPW.

IAC is staffed by PSCP and the departments of Education, General Services, and Planning, with each agency responsible for certain aspects of the program. PSCP coordinates the overall program and manages the State funding. The Maryland State Department of Education reviews and comments on educational specifications, approves the designs of all State-funded school construction projects, and develops facility guidelines. The Maryland Department of Planning develops the official school enrollment projections and reviews and approves all school site locations. The Department of General Services reviews the design development and construction documents, change orders, and ineligible items. PSCP also administers the school maintenance inspection program.

Allocation of Funds: Maryland pays for up to 100% of the *eligible* costs of public school construction projects. State funding is provided through reimbursement of eligible expenses, with a minimum State share of 50% of eligible project costs. The cost share formula was altered in 2004 to include other indicators of school construction need, such as enrollment growth and economic distress, in addition to local wealth and is required to be updated every three years. The formula was last updated in 2014 for fiscal 2016 through 2018.

Eligible costs for which State funding may be used include site development, construction, renovation, and fixed equipment and furniture. Planning/design, land acquisition, and moveable furniture are among the ineligible costs that local jurisdictions must cover. Local jurisdictions are responsible for any construction costs in excess of the maximum State allocation established for each project. Generally, in order to receive reimbursement from the State, IAC must recommend and BPW must approve a school construction project for planning and funding. Once a project is approved for planning, it is eligible to receive State funding.

Funding Source: State general obligation (GO) bonds, pay-as-you-go (PAYGO) (when available), previously authorized contingency funds, and Maryland Stadium Authority bonds (up to $1.1 billion only for the Baltimore City Public School Construction and Revitalization Program)

Funding Amount: Fiscal 2017 – $280.0 million Public School Construction Program; $40.0 million Supplemental Grant for Local School Systems with Enrollment Growth/Relocatable Classrooms; $44.9 million contingency funds (does not include Aging Schools Program, Qualified Zone Academy Bonds, or Maryland Stadium Authority)

State Share of Capital Outlay (FY 94-13): 26%

Dependent or Independent: Maryland is 1 of 11 states in the United States whose local school systems are fiscally dependent on local governments and do not have their own taxing authority to raise funds. Thus, the local share of school construction costs is funded by the county (including Baltimore City) government.

Process to Receive Funding: Local school systems must submit a Comprehensive Educational Facilities Master Plan to IAC in July annually. Each October, the Governor announces the preliminary amount of funding for public school construction for the upcoming fiscal year. Local boards of education submit their annual and five-year *Capital Improvement Program* (CIP) to IAC in October. Annually, in October and November, IAC staff review the CIP applications and for the upcoming fiscal year:

- determine whether projects are eligible to be approved for planning and/or State funding;
- establish the maximum State allocation for an eligible project, based on projected enrollment for the public school, the applicable square foot per student, and the State-funded cost per square foot. State funding cannot exceed the maximum State allocation that is determined at the time that funding approval is first given;
- calculate the required local share for an eligible project; and
- recommend to IAC which projects should be approved for planning and/or funding (and the amount).

In order to be eligible to receive State funding, the *county government* must provide a letter of assurance that the county will provide the required local share for each project requested for the upcoming fiscal year in the board of education's CIP. Local jurisdictions may appeal the recommendations of the IAC staff to IAC. Each December, IAC develops a list of eligible projects and decides which should be initially recommended to BPW for approval.

IAC must recommend an initial allocation equal to 75% of the Governor's preliminary allocation for school construction before December 31 of each year. In January, local school systems may appeal IAC's recommendations to BPW, and BPW votes on IAC recommendations. (Fiscal 2017 capital budget bill language, however, specifies that there is no appeal beyond IAC for the fiscal 2018 CIP.) The projects approved by BPW become part of the proposed State capital budget. The proposed budget is then submitted to the General Assembly for approval. Annually, by March 1, IAC is required to submit recommendations to the Governor and General Assembly equal to 90% of the school construction allocation submitted by the Governor in the capital budget. In May, BPW allocates any remaining school construction funds to school construction projects recommended by IAC.

Source: http://centerforgreenschools.org/state-our-schools; www.pscp.state.md.us; Maryland Annotated Code, Education Article, Title 5, Subtitle 3; http://facilitiescouncil.org/ncsf-home/; Department of Legislative Services

Alaska

Governance: The State Board of Education has final discretion in making grant awards based on the recommendations of the nine-member Bond Reimbursement and Grant Review Committee, whose members are:

- Commissioner of Education or designee (Chair);
- two legislators appointed by the presiding officers;
- two people with professional degrees and experience in school construction (appointed by the commissioner);
- two people with experience in urban or rural school facilities management (appointed by the commissioner); and
- two members of the public (appointed by the commissioner).

Final authority for bond reimbursement awards rests with the Commissioner of Education, subject to the recommendations of the Bond Reimbursement and Grant Review Committee.

Allocation of Funds: Alaska operates both a school construction grant program and a bond reimbursement program. However, there is a moratorium on bond reimbursement requests for local indebtedness incurred after January 1, 2015, but before July 1, 2020. State support ranges from 65% to 95% of project cost depending on measure of local wealth.

All local school construction plans, specifications, and cost estimates must be approved by the Department of Education (facilities section) before being considered by the committee. In order to be eligible for a state grant, a school system must submit:

- a six-year capital improvement plan;
- evidence that the district has secured and will maintain adequate insurance;
- evidence that the proposed project is a capital improvement project and not part of a preventive maintenance program or regular custodial care program; and
- evidence that the district has a preventive maintenance plan that meets specified criteria, and that the district is adhering to the plan.

Each grant application is ranked according to multiple factors, including the priority given by the district, overcrowding, age of the existing facility, type of project, et cetera.

Funding Source: Statute authorizes use of general obligation (GO) bond revenues or general funds, but only GO bonds are used.

Funding Amount: $45.9 million in fiscal 2016

State Share of Capital Outlay (FY 94-13): 37%

Dependent or Independent: School districts are dependent and have no authority to levy taxes.

Sources: Alaska Department of Education and Early Development; https://schoolfinancesdav.wordpress.com/

Arizona

Governance: Nine-member School Facilities Board (board) appointed by the Governor to four-year terms, subject to Senate confirmation. The Governor appoints the chair from amongst the board members.

Each of the nine voting members is appointed based on expertise in one of the following areas:

- school district governing board member;
- taxpayer representative;
- school construction;
- school facilities management;
- demographics;
- teacher;
- engineering;
- architecture; or
- private business owner.

The Superintendent of Public Instruction or designee serves as a tenth nonvoting member.

The Governor appoints the executive director of the board, subject to Senate confirmation, who manages day-to-day operations for the board. The board is an independent state agency.

Allocation of Funds: The board administers the Students FIRST capital finance program, administering three funds: New School Facilities; Building Renewal Grants; and Emergency Deficiencies Corrections (which requires transfers from New School Facilities as needed).

The board uses Building Adequacy Guidelines, which serve as standards for how district schools are built and maintained. This includes minimum square footage per student requirements, ranging from 90 square feet per pupil for elementary school projects, to 134 square feet per pupil for high schools with more than 1,800 pupils. The Building Adequacy Guidelines also set specifications for building systems, classrooms, nonclassroom space (such as libraries and athletic facilities), and energy standards.

The New School Facilities fund distributes funding to school districts for the purchase of land and costs of construction for new schools. School districts qualify for new space based on annual capital plans and enrollment projections. The board provides funding if enrollment projections indicate that additional space will be needed because school districtwide square footage per pupil falls below the statutory minimum in the current year.

The board administers Building Renewal Grant funds after prioritizing grant requests from school districts, based on which districts have provided routine maintenance on their facilities and their ability to match monies provided from the fund. These projects have eight categories: electrical; general renovation; heating, ventilation, and air conditioning; plumbing; roofing; special equipment; special systems; and surfaces.

Funding Source: A portion of the state transaction privilege tax (which is similar to a sales tax) and state trust land revenues are dedicated to education funding, which can be directed to school construction at the discretion of the legislature.

Funding Amount: $240.8 million in fiscal 2016

State Share of Capital Outlay (FY 94-13): 21%

Dependent or Independent: All but six of Arizona's local schools districts are fiscally independent and have their own taxing authority to raise funds for capital outlay. The state mandates a debt limit for local school districts of 10% of assessed property value.

Court Case: In 1994, the Supreme Court of Arizona ruled in *Roosevelt Elementary SchDist v. Bishop* that the state's school funding system for facilities and equipment violated the state constitution. In 1998, the court approved the state's remedy, which continues in effect. Nonetheless, some school districts have repeatedly challenged the legislature's alleged failure to fully fund the Building Renewal portion of the system.

Sources: http://www.azsfb.gov/; http://www.azleg.gov/briefs/Senate/STUDENTS%20FIRST.pdf; http://www.azleg.state.az.us/ArizonaRevisedStatutes.asp?Title=15; http://centerforgreenschools.org/state-our-schools; http://facilitiescouncil.org/ncsf-home/

Connecticut

Governance: Site and building plans for any school construction project seeking state assistance are subject to review and final approval by the Commissioner of Administrative Services. Applications for state grant support for approved projects are also subject to review and initial approval by the commissioner and then subject to final approval by the School Construction Project List Review Committee of the Connecticut General Assembly. Prior to 2011, the functions carried out by the Commissioner of Administrative Services were carried out by the Commissioner of Education but were transferred to take advantage of the capital construction expertise in the Department of Administrative Services.

The 12 members of the legislative review committee are the chair and ranking member of the committees on appropriation, finance, and education from each house of the General Assembly. This was recently changed from 8 members consisting of 2 members each, selected by the presiding officer and by the minority leader in each house. Any additions to the preliminary list of grantees by the legislative review committee must be projects whose plans have been approved by the commissioner.

Allocation of Funds: State grants are available for projects approved by the commissioner for between 20% and 80% for new and replacement projects and between 10% and 70% for other projects, based on local wealth.

Ineligible costs are generally those related to the repair, replacement, or maintenance of existing systems, except for those needed for code compliance. Planning (architectural and engineering) costs are also ineligible.

Funding Source: State general obligation bonds

Funding Amount: $500.0 million in fiscal 2017

State Share of Capital Outlay (FY 94-13): 57%

Dependent or Independent: Connecticut's 166 school districts are fiscally dependent. Local boards of finance propose entire town budgets, which include the school budget. Voters accept or reject the total budget. Voter approval is required for a new tax increase.

Sources: Connecticut Department of Administrative Services; Office of Fiscal Analysis, Connecticut General Assembly; https://schoolfinancesdav.wordpress.com/

Delaware

Governance: All major capital improvement projects require the approval of the Department of Education. Local school districts must submit detailed capital improvement plans that include the scope and desired educational outcomes of the project and other specified information for approval by the Department of Education. Projects that receive approval and are recommended for state assistance receive a Certificate of Necessity from the department.

After receiving the Certificate of Necessity, districts must hold a referendum for final local approval of the local share of the project. All schematic drawings, lifecycle cost analyses, design development drawings, and final construction drawings and specifications are submitted to the department for approval.

Allocation of Funds: The state funds between 60% and 80% of project costs as determined by the state formula. The dollar amount provided for school construction is determined by the square footage allocated by the school construction formula times a cost per square foot. Except for site acquisition, the cost per square foot is considered "all-inclusive." It is expected to cover fees, construction cost, site development, furniture, and equipment.

Local school boards may build schools that exceed the amount derived by the school construction formula, but any cost over the designated amount is the responsibility of the local board.

The state awards grants based on a prioritization of needs. First priority is given to projects intended to address student growth and projects addressing serious life, health, safety, and/or code violations. Second priority is given to projects for which a functional building and/or program exists, but the project is intended to improve and/or enhance service delivery. Third priority is given to projects intended to improve facility aesthetics, or building project or program enhancement not related to life, health, safety, and/or code violations.

Funding Source: State general obligation debt

Funding Amount: $76.4 million in fiscal 2017

State Share of Capital Outlay (FY 94-13): 57%

Dependent or Independent: All 19 school districts are fiscally independent. Increases in total tax rates for current operations must be approved by referendum.

Sources: Delaware Department of Education; http://www.schoolfinances.info/; Center for Green Schools; Delaware Office of Management and Budget

Florida

Governance: The Florida Department of Education provides monthly disbursements from the Public Education Capital Outlay and Debt Service Trust Fund (PECO) to local school districts based on available revenues. Specific project allocations are determined locally based on the school district's prioritization of needs.

Florida also maintains, as part of PECO, a separate Special Facility Construction Account that may be appropriated to school districts lacking sufficient resources. The proposed projects must be deemed a critical need and must be recommended for funding by the Special Facility Construction Committee, consisting of the following:

- two representatives of the Department of Education, one of which chairs the committee;
- a representative from the Governor's office;
- a representative selected annually by the district school boards; and
- a representative selected annually by the superintendents.

Allocation of Funds: Each year, Florida public school districts complete a Five-year District Facilities Work Plan identifying the need for construction of new education facilities as well as major additions, renovations, or repairs necessary to extend the useful life of buildings. These Five-year Work Plans are used by state agencies in determining district funding. The projects to be funded by the district must be included in the district's educational plant survey, as approved by the Florida Department of Education.

Funds for remodeling, renovation, maintenance, repairs, and site improvement for existing satisfactory facilities shall be given priority consideration by the legislature for appropriations allocated to the boards from the total amount of PECO appropriated. Following a request by districts, the Department of Education distributes to the districts the amount sufficient to cover capital outlay disbursements anticipated from encumbrance authorizations for the following month.

PECO funds from the Special Facility Construction Account are used to provide necessary construction funds to school districts that have urgent construction needs but which lack sufficient resources. A school district requesting funding from the Special Facility Construction Account submits one specific construction project, not to exceed one complete educational plant, to the Special Facility Construction Committee. A district may not receive funding for more than one approved project in any three-year period or while any portion of the district's participation requirement is outstanding.

PECO funds may be used for construction, renovation, fixtures, and furniture. Funds may not be used for landscaping or athletic or performing arts spaces unless special consideration is given.

Funding Sources: PECO funding is provided from bond proceeds and cash. Florida uses a tax on utilities as a dedicated funding source to pay PECO debt.

Funding Amount: Maintenance, Repair, Renovation, and Remodeling Public Schools: $75.0 million fiscal 2017; Special Facility Construction Account: $75.4 million fiscal 2017

State Share of Capital Outlay (FY 94-13): 15%

Dependent or Independent: Local schools districts in Florida are fiscally independent and are supported through local and state tax revenues and financing. They have their own taxing authority to raise funds for school facilities capital outlay. Local districts are not permitted to use the state's credit rating when borrowing for capital projects. Charter schools that meet the statutory eligibility criteria for fixed capital outlay funding receive a monthly allocation of funds for facilities purposes.

Sources: http://centerforgreenschools.org/state-our-schools; http://facilitiescouncil.org/ncsf-home/; http://www.fldoe.org/finance/edual-facilities/; http://www.fldoe.org/core/fileparse.php/5423/urlt/Fefpdist.pdf; http://www.fldoe.org/core/fileparse.php/7501/urlt/1617CPPlan.pdf

Massachusetts

Governance: Seven-member Massachusetts School Building Authority (MSBA)

- State Treasurer (elected statewide), chair
- Secretary of Administration and Finance (or designee)
- Commissioner of Education (or designee)
- four members appointed by the State Treasurer

At least one public member must have expertise in law enforcement, while the remaining public members must have knowledge or expertise in real estate development, construction management, finance, architectural or building design, or any other related field.

MSBA is a quasi-independent government authority created in 2004 to reform the process of funding capital improvement projects in Massachusetts.

Allocation of Funds: The Massachusetts School Building Authority provides matching reimbursement funds to cities, towns, and regional school districts for individual projects. Project funding is determined based on building condition and overcrowding, with funds going to the neediest projects first. State aid matching percentage varies depending on district wealth, up to 80% of project costs for low-wealth districts.

State funds can be used for planning, design/engineering, construction, furniture, fixtures and equipment.

Funding Source: Dedicated revenue stream of one penny of the state's 6.25% sales tax, which is pledged to payment of outstanding debt ($767.4 million in fiscal 2015). By resolution the authority may issue bonds for the purposes outlined in the Massachusetts School Modernization and Reconstruction Trust (SMART); bonds may be issued as general obligation of the authority or as special obligations payable solely from particular revenues or moneys of the authority. Bonds of the authority are not considered to be debt of the state or any of its political subdivisions.

Funding Amount: The amount of grants for *new* projects is limited by statute to $500.0 million in fiscal 2008, which may be adjusted annually by the growth in dedicated sales tax revenue up to 4.5%. From fiscal 2008-2015, the average total new grant amount is approximately $487.5 million annually. The authority is also funding the state's share of 728 prior grant projects and 428 waiting list projects approved under the former program.

State Share of Capital Outlay: 67%

Dependent or Independent: Local schools districts in Massachusetts are fiscally dependent and are supported through allocations of local and state tax revenues and financing. They do not have their own taxing authority to raise funds for capital outlay. The cities and towns are permitted to use the state's credit rating when they borrow funds for school district capital projects.

Process to Receive Funding: Districts can submit a Statement of Interest (SOI) to either the Accelerated Repair Program (facilities that may need roof, window, and/or boiler replacements, but are otherwise structurally sound) or the Core Program (for projects in need of a larger scope of work). MSBA staff reviews the submitted SOIs and works to validate the issues identified by districts in their SOI submissions. During this process, MSBA may seek to obtain additional or clarifying information from districts and determine the appropriate level of due diligence. If MSBA invites a district into the eligibility period which requires a vote of the Massachusetts School Building Authority's Board of Directors, the district and MSBA will work collaboratively to determine potential solutions to the issues identified in the SOI.

Sources: http://www.massschoolbuildings.org/; http://centerforgreenschools.org/state-our-schools; http://facilitiescouncil.org/ncsf-home/

New Jersey

Governance: Fifteen-member Schools Development Authority (SDA)

The members of the authority collectively function as a board, the permanent board consists of:

- Commissioner of Education
- Commissioner of the Department of Community Affairs
- State Treasurer (appointed by Governor)
- Executive Director of the Economic Development Authority
- 11 public members:
    - At least one public member must have expertise in law enforcement, while the remaining public members must have knowledge or expertise in real estate development, construction management, finance, architectural or building design, or any other related field.
    - Public members are nominated by the Governor and confirmed by the Senate.

The authority is required to report to the legislature every six months. SDA is an independent authority in, but not of, the Department of Treasury.

Allocation of Funds: New Jersey School Development Authority pays for 100% of school construction projects in the 31 poor, urban Abbott Districts. The New Jersey Department of Education provides project-level funding to Regular Operating Districts, while Abbott Districts are managed by the state with funds paid directly to contractors. State funds can be used by school districts for planning, design/engineering, construction, land acquisition, environmental assessment and abatement, furniture fixtures and equipment, and debt service. Funding for Regular Operating Districts is provided through grants, with a minimum state share of 40% for eligible project costs. Projects are prioritized by educational need, and before a project can begin, a comprehensive budget and schedule must be approved by the Schools Development Authority Board.

Funding Source: New Jersey Economic Development Authority School Facilities Construction Bonds

Funding Amount: In 2008 New Jersey authorized $3.9 billion for school construction, $2.9 billion for Abbott Districts, and $1.0 billion to leverage construction in Regular Operating Districts. Fiscal 2016 adjusted appropriation was $884.2 million in school construction debt service. Fiscal 2017 has budgeted $936.6 million in school construction debt service.

State Share of Capital Outlay (FY 94-13): 32%

Dependent or Independent: Local schools districts in New Jersey are fiscally independent and are supported through local and state tax revenues and financing. They have their own taxing authority to raise funds for capital outlay, although they are subject to a state-mandated debt limit, which is a percentage of assessed property value that varies by grade level. School districts can use any portion of the municipality's bond cap (3.5%) and can apply for an extension of credit to borrow money above the cap with the assumption that property values will increase in the future.

Local school districts cannot use the state's credit rating when they borrow funds for school district capital projects.

Court Case: In 1998, the New Jersey Supreme Court ruled in the *Abbott v. Burke* case that the State must provide 100% funding for all school renovation and construction projects in special-needs districts. According to the Court, aging, unsafe, and overcrowded buildings prevented children from receiving the "thorough and efficient" education required under the New Jersey Constitution.

Source: http://www.nj.gov/treasury/omb/publications/17bib/BIB.pdf; http://centerforgreenschools.org/state-our-schools; http://www.state.nj.us/education/data/; https://sda01.njsda.gov/PublicReports/SDAGrantProjects.aspx; http://facilitiescouncil.org/ncsf-home/

New Mexico

Governance: The Public School Capital Outlay Council allocates the state share for school construction projects. The chair of the council is selected by the nine members (or their designees), who are all *ex officio*:

- Secretary of Finance and Administration (designee)
- State Superintendent (designee)
- Governor (designee)
- President of the School Board Association (designee)
- Director of the Construction Industries Division (designee)
- President of State Board of Education (designee)
- Director of Legislative Education Study Committee (designee)
- Director of Legislative Finance Committee (designee)
- Director of Legislative Council Service (designee)

Prior to being considered by the council, a school construction project must be first approved by the Public School Facilities Authority based on need, feasibility, maintenance planning, reasonable costs, and other related factors. The authority serves as the professional staffing agency for the council.

Allocation of Funds: Projects are selected for funding by the Public School Capacity Outlay Council in order of greatest need as determined by the application of objective adequacy standards developed and approved by the council. State funds are allocated on a wealth equalized basis.

Since its inception in 2002, the authority has relied on its Facilities Condition Index (FCI), which measures the quality of a building and indicates the level of repair needed. The statewide FCI has improved from 70.58% in fiscal 2003 to 36.19% in fiscal 2015 (a lower score means fewer capital improvements are needed), in large part because the state has focused on its most pressing needs as determined by the index.

Funding Source: Supplemental Severance Tax Bonds, which are funded by a dedicated revenue stream from state extraction taxes on oil and natural gas.

Funding Amount: $198.2 million in fiscal 2015

State Share of Capital Outlay (FY 94-13): 20%

Dependent or Independent: The 89 school districts are fiscally dependent. The maximum local levy without voter approval is a half mill.

Sources: New Mexico Public School Finance Authority; https://schoolfinancesdav.wordpress.com/; Center for Green Schools

New York

Governance: Decisions are made by the Office of Facilities Planning and ultimately the Commissioner of Education, who is appointed by the New York State Board of Regents.

Allocation of Funds: In order for a capital construction project to be eligible for building aid, it must meet the following minimum criteria:

1. The building involved in the project must be used for instruction of students (that is, it must have a state-rated capacity) or the building must be a school bus facility.
2. The work must be capital construction – not maintenance or repair work.
3. The construction contracts must total at least $10,000 (exclusive of incidental costs).
4. The project must have received approval by the commissioner and a building permit prior to advertising for bids.
5. The project must have been properly authorized, generally by a vote of the people (a vote within a school district does not need to occur for emergency projects or certain types of projects which include energy performance contracts).

Assuming that all of the above criteria are properly met, then the determination of how much building aid will be paid on a particular capital construction project is based upon several factors: the state-rated capacity, the cost index in effect the month the contracts are signed, the district's aid ratio (which range between 10%-98%) and the actual amounts expended.

State funding support can be used for planning, design/engineering, construction, land acquisition, environmental assessment and abatement, furniture fixtures and equipment, interest, and debt service.

Funding Source: Funding allocated in the state capital budget

Funding Amount: Average annual expenditure between $4-$5 billion

State Share of Capital Outlay (FY 94-13): 36%

Dependent or Independent: All but five of the local schools districts in New York are fiscally independent and are supported through local and state tax revenues and financing. These fiscally independent districts have their own taxing authority to raise funds for capital outlay. The fiscally dependent districts are New York City, Yonkers, Buffalo, Rochester, and Syracuse. All districts are eligible for state funding. Local school districts are not permitted to use the state's credit rating when they borrow funds for school district capital projects.

Court Case: After a 13-year litigation dispute in *Campaign for Fiscal Equity (CFE) v. State of New York* to enforce the state's constitutional duty to provide the opportunity for a "sound basic education" to New York school children, in 2006, the New York legislature increased school facilities funding statewide by $12 billion, $11.2 billion for New York City. Although the CFE litigation was based in New York City, the legislative solution was statewide.

Source: http://www.p12.nysed.gov/facplan/; http://centerforgreenschools.org/state-our-schools; http://facilitiescouncil.org/ncsf-home/

Ohio

Governance: Seven-member Ohio School Facilities Commission, with three voting members and four nonvoting members. Voting members include:

- Director of Office of Budget and Management
- Director of Administrative Services
- Superintendent of Public Instruction

The chair is elected from amongst the voting members.

Nonvoting members on the Ohio School Facilities Commission include:

- two members of the Senate (from different political parties)
- two members of the House of Representatives (from different political parties)

The Ohio School Facilities Commission exists as an independent agency within the Ohio Facilities Construction Commission, whose executive director also serves as the Executive Director of the Ohio School Facilities Commission.

All construction-related capital funding in Ohio must be released by the Controlling Board. This includes funds provided through the Ohio School Facilities Commission. The Controlling Board consists of seven members: the Director of the Office of Budget and Management or designee; the Chair or Vice Chair of the Senate and House finance committees; a majority member appointed from both the Senate and the House; and a minority member appointed from both the Senate and the House.

Allocation of Funds: The Ohio School Facilities Commission provides matching grants to local school districts based on the rank of the district on an equity list. Districts are ranked through a three-year average "adjusted valuation per pupil," which is determined through the total value of property in the district. Districts become eligible to receive money to fund projects in their Master Facility Plan according to their ranking.

The commission determines the amount for the state matching grants based on districts' percentile rank on the equity list, or through a formula based on districts' existing permanent improvement debt, whichever is higher.

School districts must raise their local share of the project budget within 13 months before the state funding can be released. Districts that fail to acquire funding in that period are considered "lapsed" but can still participate in commission programs once they obtain local funding, provided they request new approval from the commission.

If districts use local funds for projects ahead of their becoming eligible for funding, they may participate in an expedited program that gives them credit toward funding for when they do become eligible.

State facility funds can be used by local districts for planning, design/engineering, construction, environmental assessment and abatement, furniture fixtures and equipment, and interest and debt service.

Funding Source: Funding provided in the capital budget, including pay-as-you-go (PAYGO). The state pays for debt service from the General Revenue Fund.

Funding Amount: $288.5 million (fiscal 2016)

State Share of Capital Outlay (FY 94-13): 27%

Dependent of Independent: Local schools districts in Ohio (612) are fiscally independent and are supported through local and state tax revenues and financing. They have their own taxing authority to raise funds for capital outlay, although there is a state-mandated debt limit of 9% of assessed valuation. Local school districts are not permitted to use the state's credit rating when they borrow funds for capital projects.

Court Case: In 1997, the Ohio Supreme Court held in *DeRolph v. State*, a suit filed by a coalition of most of the states' school districts, that Ohio's school finance system violated the constitutional education article. The court ordered a "complete systematic overhaul," specifically citing the "Foundation Program," over reliance on local property taxes, "forced borrowing," and insufficient state funding for school facilities. A number of state reform efforts, including the establishment of the Ohio School Facilities Commission, improved facilities funding.

Source: http://ofcc.ohio.gov/About.aspx; http://centerforgreenschools.org/state-our-schools; http://facilitiescouncil.org/ncsf-home/; http://www.schoolfinances.info/; http://www.lsc.ohio.gov/fiscal/capitalexpenditures/capital%20spending.pdf; https://ecb.ohio.gov/Public/Authority.aspx

Pennsylvania

Governance: Any local school construction project must first be approved by local referendum or have a public hearing. The Department of Education must review all projects, plans, and specifications for each local school construction project; approval by the department is required for any project seeking reimbursement from the state.

Allocation of Funds: Reimbursement for projects approved by the Department of Education is determined by a formula that incorporates various factors, including building capacity, a state-determined per pupil funding level, and the value of the local bond issue.

The Department of Education employs an 11-stage review process entitled Planning and Construction Workbook (PlanCon). Each PlanCon stage requires the local school board to submit documentation about the project for review by the department and usually involves a meeting between the district and the state. The forms are designed to (1) document a local district's planning process; (2) provide justification for a project to the public; (3) ascertain compliance with state laws and regulations; and (4) establish the level of state participation in the cost of the project (which occurs in Part G, or the seventh stage, of the process). The department estimates that the time to complete Parts A through G is 9 to 12 months. Actual reimbursement begins with Part H, and Part J is the final accounting of the project.

Funding Source: Historically has been state general funds but will be general obligation debt going forward.

Funding Amount: $306.2 million in fiscal 2015, no funding provided in fiscal 2016 and 2017. However, Act 25 of 2016 authorized the sale of $2.5 billion in general obligation bonds by the Commonwealth Financing Authority over the next few years to provide funding to school construction projects already in the PlanCon process but that did not receive funding for the past two years.

State Share of Capital Outlay (FY 94-13): 15%

Dependent or Independent: There are 498 fiscally independent school districts and two fiscally dependent school districts. The school board of directors for independent districts approve the school district budgets without a specific limitation except for having sufficient revenues projected to fund projected expenditures.

Sources: Pennsylvania Department of Education; Pennsylvania General Assembly; http://www.schoolfinances.info/; Center for Green Schools

Virginia

Governance: Eight-member Virginia Public School Authority (the Authority)

The Board of Commissioners for the Authority consists of:

- State Treasurer (appointed by the Governor)
- State Comptroller
- State Superintendent (or designee)
- Five members appointed by the Governor subject to confirmation by the General Assembly

Commissioners serve six-year terms. Chair of the board is designated by the Governor to serve a two-year term – the chair is Chief Executive Officer and can only be from the five appointees of the Governor.

The Authority acts as a conduit to the bond market for small localities who might not have a bond rating. Two bond sales occur each year, applications are due March 1 and September 1, for the September 2016 issuance 6 localities are looking to bond for $100 million. The Authority generally has 6-10 localities each issuance. A local general obligation bond is issued directly to the Authority which is used to pay back the Authority.

Funding Source: The Literary Fund provides low-interest loans for school construction, grants under the interest rate subsidy program, debt service for technology funding, and support for the state's share of teacher retirement required by the Standards of Quality. The Literary Fund is a permanent and perpetual school fund established in the Constitution of Virginia. Revenues to the Literary Fund are derived primarily from criminal fines, fees, and forfeitures; unclaimed and escheated property; unclaimed lottery winnings; and repayments of prior Literary Fund loans.

Funding Amount: The legislature authorizes and the Department of Education administers loans from the Literary Fund, for fiscal 2016 $52 million was authorized. The waitlist to receive a Literary Fund loan is long, the projects using fiscal year 2016 funds had been on the waitlist for seven to eight years.

State Share of Capital Outlay (FY 94-13): 5%

Dependent or Independent: Local schools districts in Virginia are fiscally dependent and are supported through allocations of local tax revenues and financing. They do not have their own taxing authority to raise funds for capital outlay. However, the state does permit the local municipalities to use the state's credit rating and it provides some school construction funds at subsidized interest rates to school districts that meet program criteria. The Authority, through its bond sales program, assists school districts in the sale of their local bonds for school construction.

Source: http://www.pen.k12.va.us/boe/meetings/2016/04-apr/agenda-items/item-a.pdf; http://centerforgreenschools.org/state-our-schools; http://facilitiescouncil.org/ncsf-home/

West Virginia

Governance: Eleven-member School Building Authority (SBA). The authority consists of:

- Governor or designee, who serves as the chair;
- the State Superintendent of Schools, who serves as an *ex officio* member;
- three members of the State Board of Education, elected by the state board for nonconsecutive three-year terms; and
- six citizens of the state, appointed by the Governor for three-year terms with the advice and consent of the Senate. One of the citizen members must represent the interests of the construction trades.

The Executive Director of the School Building Authority is appointed by the Governor, with the consent of the Senate.

SBA was established as an independent government agency but operates closely with the Governor's office due to its structure.

Allocation of Funds: The state provides reimbursements directly to individual approved capital projects. SBA evaluates projects for funding using established criteria that includes health and safety, reasonable travel time, regional planning, adequate space for projected enrollment, history of efforts to pass local bond issues, regularly scheduled preventative maintenance, and efficient use of funds.

School construction funds are distributed through one of the four following grants:

- Needs Grants program for major capital improvement;
- Three Percent Statewide Grants for projects that are statewide in scope, such as the School for the Deaf;
- Major Improvement Project Grants for projects between $50,000 and $1,000,000; and
- Emergency Grants for projects subject to "Acts of God."

New construction and renovation are eligible for State funding. Items such as carpet and furniture are ineligible for funding.

Funding Source: General State Revenue and Authority-issued capital improvement bonds, which are repaid through lottery revenues.

Funding Amount: Needs Grants – $56.6 million (most recent quarterly meeting, 2015)
Major Improvement Project Grants – $7.7 million (most recent quarterly meeting, 2016)
Three Percent Statewide Grants – $2.2 million (most recent quarterly meeting, 2016)

State Share of Capital Outlay: 9%

Dependent or Independent: Local schools districts in West Virginia are fiscally independent and are supported through local and state tax revenues and financing. They have their own taxing authority to raise funds for capital outlay. Local districts are not permitted to use the state's credit rating when they borrow funds for school district capital projects.

Court Case: In 1979, in *Pauley v. Kelly*, the West Virginia Supreme Court of Appeals held that education is a fundamental right under the West Virginia constitution and found that the state's education financing system was unconstitutional. After a long series of proceedings over the legislature's response to this ruling, in 2003 the court ended its jurisdiction over the state financing system.

Source: http://centerforgreenschools.org/state-our-schools; http://facilitiescouncil.org/ncsf-home/; http://www.sba.wv.gov/Pages/default.aspx; http://www.legis.state.wv.us/wvcode/

Wyoming

Governance: The School Facilities Commission is comprised of seven Governor-appointed members from geographic appointment districts. The Governor designates a chairman from amongst the appointees. The appointments are subject to Senate approval and serve four-year terms. No more than four appointees can be of the same political party. Four of the seven appointees are appointed for having expertise in one of the following areas:

- building and facility engineering, construction, and operations;
- building design and specifications;
- estimating, bidding, and building construction; or
- school district administration.

The State Superintendent of Public Instruction serves as an *ex officio*, nonvoting eighth member.

The School Facilities Division works under the commission to implement policies, guidelines, and standards. The director of the division is appointed by the Governor. The commission as a whole operates as a state agency.

Allocation of Funds: The commission provides nonmatching grants to local school districts for approved capital projects, paying the full cost of all projects it funds – no local match is required. Project funding is determined by combining scores from a facility condition assessment, educational functionality, and capacity, identifying the most critical projects across the state.

The commission does not fund school enhancements, which it defines as any renovation, construction, replacement, repair, or other improvement by the school district that exceeds the statewide building adequacy standards. For example, under the current adequacy standards, athletic facilities would all be considered enhancements and not eligible for state funding.

Funding Source: Funded through the state budget, which is passed biennially. State has dedicated nearly 100% of funds from Coal Lease Bonuses for school construction.

Funding Amount: $2.2 million fiscal 2017-2018

State Share of Capital Outlay (FY 94-13): 63% (Full funding established in 2002)

Dependent of Independent: Local schools districts in Wyoming are fiscally independent and are supported through local and state tax revenues and financing. They have their own taxing authority to raise funds for capital outlay. Local districts are not permitted to use the state's credit rating when they borrow funds for capital projects.

Court Case: In 1980, the Wyoming Supreme Court ruled in *Washakie County Sch. Dist. v. Herschler* that the state's system of financing public education, which was based principally on local property taxes and resulted in low-property-wealth school districts consistently receiving less revenue per student than higher property-wealth ones, failed to afford equal protection in violation

of the state constitution. Then, beginning in 1995, a series of decisions by the Wyoming Supreme Court in *Campbell v. State* led to extensive legislative reform of the state's school funding system, including the creation of the Wyoming School Facilities Commission.

Sources: http://centerforgreenschools.org/state-our-schools; http://facilitiescouncil.org/ncsf-home/; http://sfd.wyo.gov/; http://legisweb.state.wy.us/InterimCommittee/2016/2016EndofSessionSummary&Charts.pdf; http://legisweb.state.wy.us/InterimCommittee/2016/SSF_0615AppendixB.pdf; http://legisweb.state.wy.us/InterimCommittee/2015/SSF1028Appendix6.pdf

Overview of Public School Construction Programs

Presentation to the
21st Century School Facilities Commission

Department of Legislative Services
Office of Policy Analysis
Annapolis, Maryland

September 15, 2016

Structure and Funding of School Construction Programs

- Maryland and 36 other states plus the District of Columbia (DC) provide some state funding and oversight of public school construction

- Hawaii and DC contribute 100% of funding

- 12 states require local school districts to fund all of the costs

Selection of 14 States to Research

- Neighboring states – Delaware (DE), Pennsylvania (PA), Virginia (VA), West Virginia (WV)
- States that changed their program recently – Arizona (AZ), Massachusetts (MA), New Jersey (NJ), New Mexico (NM), New York (NY), Ohio (OH), Wyoming (WY)
- Mix of state funding shares and fiscally independent and dependent school districts – Alaska (AK), Connecticut (CT), Florida (FL)
- Like Maryland, school districts in about half of the states are fiscally dependent (AK, CT, MA, NM, VA) or a hybrid (AZ, NY, PA) and rely on local government to fund the local share of costs

State Funding for Capital Outlay

- Maryland covered 26% of total school construction costs from fiscal 1994-2013, which ranks fifteenth among the 50 states
- Of the 14 selected states:
  - 4 covered over 50% of costs (CT, DE, MA, WY)
    - WY has funded 100% of costs since 2002
  - 4 covered 25%-50% of costs (AK, NJ, NY, OH)
  - 6 covered less than 25% of costs (AZ, FL, NM, PA, VA, WV)

Structure of Programs

- Maryland has a unique structure – no other state has an executive function board like the Board of Public Works that approves school construction projects or funding (closest is Ohio's Controlling Board)

- Connecticut is also unique – a 12-member legislative committee reviews a preliminary list of projects that has been approved by the commissioner of administrative services and may add approved projects to the list

Independent Entity

- Eight states have an independent agency or board that oversees school construction (AZ, MA, NJ, NM, OH, VA, WV, WY)
  - In six states, several board members are appointed by the Governor and subject to confirmation by the Senate or General Assembly
  - Ohio's commission includes four nonvoting legislators
  - Two boards are led by the State Treasurer (MA, VA) – in MA, four members are also appointed by the State Treasurer
  - Many states require board members to have expertise in specific areas

Department of Education

- In most states, the Department of Education is part of the program's structure, either in a review or approval capacity
- The state board or department of education has final approval of projects/funding in five states (AK, DE, FL, NY, PA)
- Alaska and Florida have review committees that make recommendations to the board/department (includes two legislators in Alaska)
- The State Superintendent (or Commissioner) of Education) is usually a board member and sometimes chairs the board

Other Comparisons

- Half of the 14 states have altered their programs recently – mostly due to court cases (AZ, MA, NJ, NM, NY, OH, WY)

- In most states, representatives of a state construction management agency and department of budget are either *ex officio* or voting members of boards

MARYLAND STATE DEPARTMENT OF EDUCATION
PREPARING WORLD CLASS STUDENTS

Maryland State Department of Education

Educational Specifications Presentation

21st Century School Facilities Commission

September 15, 2016

What are Educational Specifications?

- Narrative description of the school:
  - Educational programs
  - Instructional delivery methods
  - Enrollment projections
  - School organization
  - Staffing requirements
  - Community programs
  - Comfort, safety, and security

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What are Educational Specifications?

- Basis for design:
  - Space requirements
  - Performance expectations for building, site, and individual rooms
  - Relationships between spaces
- Post-occupancy evaluation and starting point for next school project

3

How are Educational Specifications Developed?

- Local school system
  - Identifies instructional requirements
  - Reviews standard program of spaces
  - Factors in special considerations of community or site
- Local Board of Education approves document and proceeds into design

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How are Educational Specifications Developed?

- Interdisciplinary Project Planning Team
  - Teachers/Administrators
  - Curriculum Specialists
  - Parents/Community Representatives
  - School maintenance supervisors
  - Local school facilities planners
  - Maryland State Department of Education (MSDE) school facilities architect

What does the State facilities planner contribute?

- Developments in State Board of Education curriculum/regulations & access to MSDE specialists
- Consistency (equity) across State
- Similar programs/examples in State
- Trends in Maryland/other states
- Interagency Committee on School Construction (IAC) rules, approvals, schedules, funding
- MSDE Facilities Guidelines

MSDE Facilities Guidelines

- State Board of Education establishes standards and guides
  - Guidelines developed by team of local, state, private sector specialists
  - Guidelines address specific programs and issues - Fine Arts, Physical Education, Health Services, Library Media Centers, Classroom Acoustics, others
- Required facilities in public schools
  - Physical Education Program - gymnasium
  - School Health Services – suite

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MARYLAND STATE DEPARTMENT OF EDUCATION
PREPARING WORLD CLASS STUDENTS

Interagency Committee on School Construction (IAC)

- Established 1971
- Members:
  - State Superintendent of Schools
  - Secretary of Maryland Department of Planning
  - Secretary of Department of General Services
  - 1 public member appointed by President of Senate
  - 1 public member appointed by Speaker of House
- Executive Director, staff from agencies

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IAC Agency Areas of Responsibility (Major Projects)

- Department of Planning
  - Demographics, site approvals, master plans
- Maryland State Department of Education
  - Educational Specifications, Schematic design
- Department of General Services
  - Design development, Construction documents
- Public School Construction Program
  - Funding, overall coordination

School Size and State Funding

- Local Board of Education establishes:
  - Enrollment capacity
  - Square foot size
  - Total budget
- IAC establishes:
  - Approved projected enrollment (analysis of adjacent schools)
  - Maximum gross square foot allowance (gsf/student)
  - Maximum State funding allocation ($/gsf)

State Funding - Notes

- Maximum gross area allowance, GSF/student, is not a design guideline
- Only hard construction costs are “eligible”
- State/local cost sharing formula ranges from 50 – 100% of eligible costs
- Local absorbs all other project costs – site acquisition, design, furniture, equipment,

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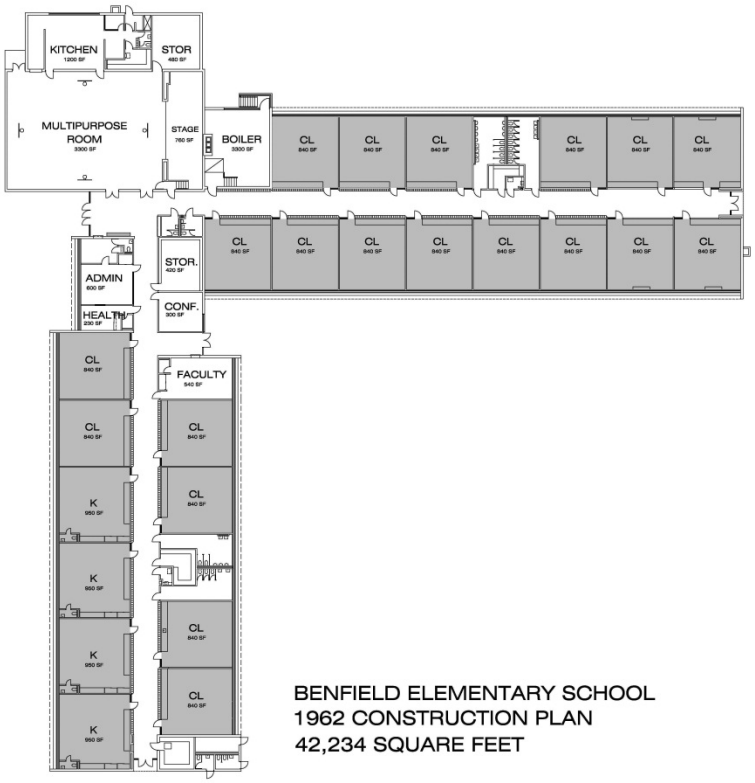
Built vs. State-Funded Area

- Locals are free to design and construct larger or smaller facilities than IAC approves
  - FY15 CIP analysis *(14 LEAs/ 26 new schools)*
    Local GSF = 128% x IAC max. gross area allowance
  - FY17 CIP analysis *(13 LEAs/25 new schools)*
    Local GSF = 123% x IAC max. gross area allowance

FY17 CIP AVERAGES	Capacity	IAC gsf	LOCAL gsf	Percentage of IAC gsf
ELEMENTARY	629	67,792	89,554	132%
MIDDLE	844	113,896	154,113	135%
HIGH	1,330	212,436	232,992	110%

1962 Elementary School 24 classrooms



BENFIELD ELEMENTARY SCHOOL
1962 CONSTRUCTION PLAN
42,234 SQUARE FEET

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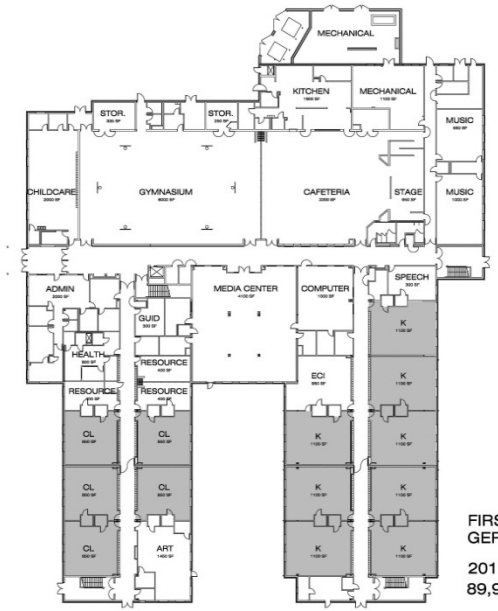
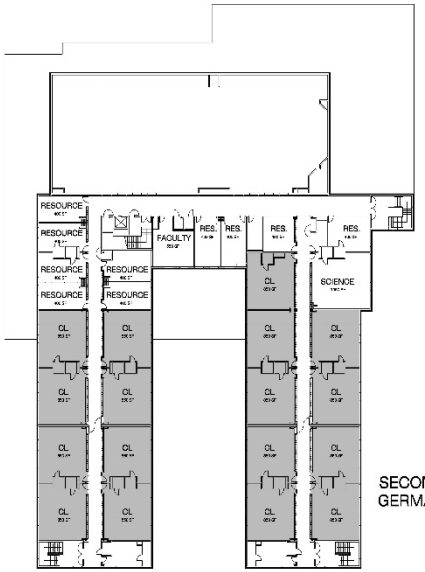
MARYLAND STATE DEPARTMENT OF EDUCATION
PREPARING WORLD CLASS STUDENTS

2011 Elementary School 30 classrooms



FIRST FLOOR
GERMANTOWN E.S.

2011 CONSTRUCTION PLAN
89,998 SQUARE FEET



SECOND FLOOR
GERMANTOWN E.S.

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MARYLAND STATE DEPARTMENT OF EDUCATION
PREPARING WORLD CLASS STUDENTS

Changes in Last 30 Years

- Local/State/Federal Mandates
  - Special education, full-day kindergarten, health suites, separate gymnasiums, accessibility
- Social/Demographic Influences
  - Immigration, Title 1 support, school breakfast, school-based health centers, before/after-school programs
- Community Expectations
  - Equity across all neighborhoods, recreation programs, IAC State-funding of 3,000 gsf for cooperative, shared use facilities
- Educational Program Enhancements
  - HeadStart, Science, Technology, "maker spaces"

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“Specific Subject Programs” Regulations

- Library Media Services – 1986, 1994, 2000
- Pupil Services – 1985, 1987
- Fine Arts – 1988
- Environmental Education – 1989
- Comprehensive Health Education – 1990
- Technology Education – 1993
- Non-English & Limited-English Proficient Students - 1995
- Physical Education – 1996

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Intervention Program Spaces

- THEN: design for specific disability
  - 60 - 140 nsf/student
  - 3-4 students to 8-10 students per class
  - Specific room sizes: 480, 540, 560, 640, 660, 700, 750 nsf

  (From A. Abend, M. Bednar; V. Froehlinger, Y. Stenzler, Facilities for Special Education Services: A Guide for Planning New and Renovated Schools, 1979, Council for Exceptional Children)
- NOW: anticipate flexibility and reassignment
  - Provide 1 full-sized classroom (750-900 nsf)
  - Office/service space for 4 specialists or conversion to general purpose classrooms as needed

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Facilities Planner/Planning Team

- Does not unilaterally decide what to cut
- Does critically assess requests/proposals from curriculum specialists/administrators
  - Demonstrated success in other schools
  - Projections of staffing, training
  - Readiness of staff to implement new techniques and fully utilize additional areas, furniture, & equipment
  - Available funding to sustain programs/services
  - Available capital funding
- Continually assessed throughout process

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For further information

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SUMMARY OF PROJECT SPACE REQUIREMENTS
New Butterfly Ridge ES & New Sugarloaf ES

Space	Butterfly Ridge ES No. Rooms	Butterfly Ridge ES Net Sq. Feet (NSF)	Sugarloaf ES No. Rooms	Sugarloaf ES Net Sq. Feet (NSF)
Administration				
Secretarial/Reception Waiting Area	1	450	1	450
Workroom	1	200	1	200
Principal's Office	1	180	1	180
Asst Principals' office @ 150 sq. ft.	2	300	2	300
Conference Room	1	200	1	200
Administrative Bathroom	1	60	1	60
Nurse's Office	1	100	1	100
Health Room w/small shower	1	500	1	500
Student Bathroom	1	300	1	300
Teacher's Lounge with Bathroom	1	400	1	400
School Store	1	60	1	60
Total Administration		2,750		2,750
Media Center				
Media Office	1	110	1	110
Open Resource Area (w/informal reading area)	1	3,350	1	3,350
Small Group Insruction Room	1	450	1	450
Equipment Storage/workroom	1	350	1	350
Conference Room (s/door off of main hallway)	1	150	1	150
Media Broadcast Room	1	180	1	180
Computer, TV, Communications Main Disribution Frame	1	110	1	110
Total Media Center		4,700		4,700
Art				
Art Studio A	1	1,000	1	1,000
Storage for Studio A	1	150	1	150
Art Studio B	1	1,000	1	1,000
Storage for Studio B	1	150	1	150
Total Art		2,300		2,300
Music				
Vocal/Instsrumental Music Room	1	1,100	1	1,100
Instrumental Music Room	1	350	1	350
Music Storage Room	1	75	1	75
Total Music		1,525		1,525

Physical Education				
Gymnasium, full basketball court size (64'x98')	1	6,272	1	6,272
Indoor/Outdoor equipment storage	1	400	1	400
Bathrooms Area - Boys and G irls	1	120	1	120
Teacher office/bathroom/shower/dressing	1	150	1	150
Total Physical Education		6,942		6,942
Computer Instruction				
Computer labs @ 900 sq. ft.	2	1,800	2	1,800
Telecommunications Equipment Room	1	150	1	150
Total Computer Instruction		1,950		1,950
Pre-Kindergarten				
Pre-Kindergarten classrooms @ 1,100 sq. ft.	2	2,200	2	2,200
Pre-Kindergarten bathrooms @ 40 sq. ft.	2	80	2	80
Pre-Kindergarten Storage Room @ 100 sq. ft.	2	200	2	200
Total Pre-Kindergarten		2,480		2,480
Kindergarten				
Kindergarten Classrooms @ 1,100 sq. ft.	5	5,500	5	5,500
Kindergarten Bathrooms @ 40 sq. ft.	5	200	5	200
Indoor/Outdoor Storage Rooms @ 200 sq. ft.	2	400	2	400
Total Kindergarten		6,100		6,100
Learning Area, Grades 1-5				
General Classrooms @ 800 sq. ft.	25	20,000	25	20,000
General Classroom Bathrooms @ 40 sq. ft.	25	1,000	25	1,000
Storage Room @ 150 sq. ft.	1	150	1	150
Planning/Storage Rooms @ 300 sq. ft.	5	1,500	5	1,500
Total Learning area, Grades 1-5		22,650		22,650
Supporting Services Area				
Speech/Language and Itinerant Sesrvices, OT/PT @ 360 sq. ft.	2	720	1	360
Special Education Resource Rooms @ 400 sq. ft.	4	1,600	3	1,200
Special Education Resource Room Bathroom @ 40 sq. ft.	2	80	1	60
ELL office/teaching space/storage @ 840 sq. ft.	2	1,680	1	840
Math Intervention with bathroom @ 840 sq. ft.	2	1,680	1	840
Reading Intervention Planning/Teaching Storage with bathroom	1	840	1	840
Enrichment (highly abled learners)	1	840		
Judy Center/liaison resource	1	840		
LLS Room			1	300
Reading Office/Teaching Space/Storage	1	400	1	400
Outside Therapy/testing	1	180		
Individual Testing and speech room			1	120
Community Liaison Offfice/Storage	1	400	1	200
Guidance Offices @ 200 sq. ft.	2	400	2	400
Total Supporting Services		9,660		5,560

Food Services					
Kitchen - Serving/Food prep/Transport	1	1,200	1	1,200	
Dry Food Storage	1	300	1	300	
Non-Food Storage	1	60	1	60	
Refrigerated Storage - walk-in	1	130	1	130	
Frozen Food storage - walk-in	1	120	1	120	
Office	1	80	1	80	
Locker/restroom/washer & dryer area	1	120	1	120	
Dishwashing area	1	220	1	220	
Inside receiving area	1	60	1	60	
Covered outside unloading area (100 sq. ft); 18' tailgate height	1		1		
Total Food Service		2,290		2,290	
Cafetorium					
Dining area (3 lunch shifts, or 250 @ 16 sq. ft. per student)	1	4,000	1	4,000	
Stage	1	850	1	850	
Chair Storage	1	150	1	150	
Table Storage	1	200	1	200	
Custodial Room	1	30	1	30	
Total Cafetorium		5,230		5,230	
Custodial Operations					
Custodial Office	1	150	1	150	
Locker room/shower/bathroom, women	1	90	1	90	
Locker room/shower/bathroom, men	1	90	1	90	
Central Indoor Storage	1	300	1	300	
Indooor Satellite Storage @ 50 sq. ft.	4	200	4	200	
Outdoor Storage	1	350	1	350	
Total Custodial Operations		1,180		1,180	
Maintenance					
Maintenance Office	1	120	1	120	
Maintenance storage area	1	400	1	400	
Total Maintenance		520		520	
TOTAL NET SQUARE FEET		**70,277**		**66,177**	**NSF**
TOTAL GROSS SQUARE FEET @ 1.4 net to gross ratio		**98,388**		**92,648**	**GSF**
SCHOOL CAPACITY CALCULATION					
Pre-Kindergarten, 2 @ 20		40		40	
Kindergarten, 5 @ 22		110		110	
General Classroom 25@23		575		575	
STATE RATED CAPACITY		**725**		**725**	
Parks & Rec Facility (Add Alternate)					
Recreation Center Activities Room		1,400		1,400	
Recreation Center Office/Storage		400		400	
Recreation Center Bathrooms w/exterior access		300		300	
TOTAL PARKS/RECREATION CENTER ADDITION		2,100		2,100	
TOTAL NET SQUARE FEET with ADD ALTERNATE		**73,102**		**69,002**	**NSF**
TOTAL GROSS SQUARE FEET with ADD ALTERNATE		**102,343**		**96,603**	**GSF**

21ST CENTURY SCHOOL FACILITIES COMMISSION

CONTAINING THE COST OF CONSTRUCTION

David Lever

September 15, 2016

FACILITY COSTS: BASIC PRINCIPLES

There are no magic bullets:

- The market remains the single largest determinant of building construction costs.
- The only way to significantly reduce construction cost is by reducing anticipated lifespan:
  - Switch from a 40 – 50 year facility objective to a 25 year objective
  - Concurrently:
    - Guarantee that maintenance budgets will be increased (a less durable building requires a higher level of maintenance)
    - Guarantee that funds will be available in 25 years to renovate or replace the facility, e.g:
      - Establish a dedicated, escrowed, interest-bearing account that cannot be touched in the meantime (similar to intent of the federal Highway Trust Fund); or
      - Establish a robust and dedicated revenue source, e.g. a portion of the sales tax (as in Iowa).
      - Establish an infrastructure bank dedicated to school funding, using low-cost loans, certificates of participation, revolving loan fund, etc.
- There is no single choice of building system that will result in overall cost reductions of 1/3 or 1/2 of current school construction cost
- Cost reduction requires looking at:
  - Building systems
  - Life-cycle implications
  - Project procurement methods
  - Project delivery methods

For a 50-year facility, a target cost reduction of 10% would be ambitious:

- Requires the kind of detailed, intensive work that has been carried out by Allegany, Calvert, Dorchester and Frederick County Public Schools to bring their high school projects within budget
- Cannot involve a single building system: Building systems are interconnected, changes in one affect changes in the others (e.g. reduction of window quality implies increase of HVAC capacity)

School boards and facility planners are conservative by nature:

- They have in trust a vulnerable and precious population
- Mistakes are costly financially and may be costly educationally
- Mistakes are often likely to go uncorrected for a long time because of budget constraints
- The public has an exceptional level of concern about the safety and health characteristics of school facilities
- Therefore with budgets always constrained, tendency is to err on the side of caution

Factors a school board or facility planner will consider in making choices:

- First cost
- Supply chain of vendors and installers to ensure no construction delays
- Life cycle implications:
  - Skill levels of in-house staff for O&M, or availability of external service providers
  - Training implications, including refresher training and for new personnel
  - Complexity of routine operation
  - Ease of replacement with similar materials or systems
  - Long-term reliability of parts, replacement elements

- Special equipment that must be purchased or rented for O&M (e.g. lifts)
- Special accommodations to protect the installation (e.g. tennis balls on chair legs to protect tile flooring)

- Environmental impact:
  - Off-gassing: odors, volatile organic compounds (VOCs)
  - Acoustics
  - Hygienic qualities (tendency to collect dirt or harbor mildew/mold, difficulty of cleaning)
- Appearance

ALTERNATIVE BUILDING TECHNOLOGIES

Experiments that have worked in Maryland:

- ***Geothermal ground-source heating and cooling:***
  - *Goal*: Use the thermal capacity of the earth to heat and cool buildings, significantly lowering energy costs while reducing fossil fuel consumption and emissions, and simplifying the mechanical system.
  - *Result*: Initial specification problems have been resolved, costs have been reduced in some parts of the state, but there is still a premium for drilling the wells; concurrently, mechanical engineers are re-evaluating the potential of new-generation conventional HVAC equipment.

- ***Variable Refrigerant Flow (VRF) heating and cooling:***
  - *Goal*: Reduces the size of ductwork by moving the refrigerant to the point of service (rather than moving conditioned air or water to the point of service); used successfully in Japan for decades, now being applied to renovation and new projects in the U. S.
  - *Result*: School applications to date appear to be successful; however, concern that entire system will require replacement at about 20 years.

- ***Alternative Project Delivery Methods:***
  - *Goal*: Introduce greater flexibility, economy, quality, and accountability into the delivery of school projects, as alternatives to traditional general contracting under Design-Bid-Build format.
  - *Result*:
    - *Construction Management Agency* (CMA): Used regularly by many jurisdictions since 1990s.
    - *Construction Management At-Risk* (CMF): First applied on Eastern Shore after enabling legislation in 2004; now used successfully by a small number of LEAs.
    - *Design-Build* (DB): Not used by any LEA for a major project; used for smaller projects when design parameters are clear and limited (e.g. HVAC replacement, open-space pod enclosure).
    - *Job Order Contracting* (JOC): Similar to Design-Build

Experiments that went wrong, or that led to disappointment:

- ***Open space plan of 60s and 70s:***
  - *Goal*: A valid educational philosophy that aligned with the post-War desire to reduce costs while meeting a supposed one-time Baby Boom effect.
  - *Result*: The educational program was not supported by staffing or small class size, and the buildings were (and remain) unworkable for contemporary education; renovation for educational suitability is very difficult because of the floor plan.

- ***Ice-storage air conditioning:***
  - *Goal*: Anticipating large increases in electrical rates, uses ice generated with off-peak electrical rates to cool the building during the peak hours of the day.

- *Result*: Many engineering and mechanical failures, and electrical rates did not increase as expected. Systems are being replaced at great cost.

- ***Ytong aerated concrete block masonry system:***
  - *Goal*: Substitutes a light-weight masonry system used successfully in Europe in place of conventional CMU (concrete masonry units), significantly reducing labor costs.
  - *Result*: Cost efficiencies appear to emerge only on large, straight-run facilities, unlike schools; mid-Atlantic supply chain is not well developed; skills need to be developed.

Experiments that should be considered:

- ***Modular construction:***
  - *Goal*: Build some repetitive portions of the building, particularly classrooms, offsite to improve costs and schedule, reduce site impacts, improve safety.
  - *Precedents*: Alberta, Canada's large school construction program.
  - *Obstacles*: Overcome stigma from past poor performance.
  - *Action*: Develop a pilot program of two repeat schools, incentivize a local board to undertake the pilot to compare costs, schedule, building performance.

- ***Finished concrete floors:***
  - *Goal*: A highly durable, attractive, and easily maintained floor at lower cost.
  - *Precedents*: Bennett Middle School, Salisbury; North Frederick Elementary School, Frederick.
  - *Obstacles*: User and community acceptance of "industrial" look; limited number of contractors.
  - *Action:* Track performance, O&M of current installations.

- ***Unfinished ceiling or floating ceiling:***
  - *Goal:* Allow easy access to MEP systems for maintenance, replacement. Floating ceiling can be lowered for access.
  - *Precedents:* Sudlersville Middle School, Queen Anne's County; Preston Elementary School, Caroline County.
  - *Obstacles:* User and community acceptance of "industrial" look; maintaining cleanliness of exposed pipes, ducts.
  - *Action:* Track performance, O&M of current installations.

- ***Building Information Management (BIM) combined with Computerized Maintenance Management System (CMMS)***
  - *Goal*: Translates inputs from design and construction into an efficient facility management program in order to improve preventive maintenance and control life-cycle replacement projects.
  - *Precedent*: Wicomico County Public Schools implemented a partial program at a new middle school.
  - *Obstacle*: Education of facility planners and training of school staff; will require additional local operational funding (but promises excellent ROI).
  - *Action:* Fund a pilot project to determine costs and benefits.

The following individuals have contributed their time, energies, and experience to develop the Cost Containment Matrix:

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George Leah, Calvert County Public Schools
David Clements, AIA, Charles County Public Schools
Roger Fritz, Frederick County Public Schools
Ray Barnes, AICP, Frederick County Public Schools
Bradley Ahalt, Frederick County Public Schools
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Facility Planners from Harford and Washington County Public Schools
Steve Parker, AIA, Grimm + Parker Architects
Melissa Wilfong, LEED AP, Grimm + Parker Architects
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INNOVATION AND COST CONTAINMENT - MASTER FORM

Outline of Building Systems

DRAFT: September 15, 2016

		QUANTITATIVE CONSIDERATIONS						QUALITATIVE CONSIDERATIONS			
	BUILDING SYSTEM	**CONSTRUCTION COST** ($/s.f. unless otherwise specified; mid-2016) LOW	HIGH	**ANTICIPATED LIFE OF SYSTEM** (years)	**AVG. ANNUAL M&O** ($/s.f./year)	**AVG. ANNUAL LIFE-CYCLE RENEWAL COST** ($/s.f./year)	**LIFE CYCLE COST**	**PROS**	**CONS**	**OTHER CONSIDERATIONS**	**COMMENTS**
1	STRUCTURAL										
a.	**Masonry Bearing** Reinforced masonry bearing walls, open web bar joist roof framing, wide flange beam floor framing	$23.92	$26.13	50+ years	Frame does not require maintenance	Frame does not require maintenance	Frame does not require maintenance	Efficient material use; durability; lateral bracing; flexibility of program and system design; fireproof; easily procured in all delivery methods; no column protrusions. Perceived as a more durable wall structure than a steel bearing structure infilled with light gauge construction. May come out of the ground quicker due to shorter lead time for materials.	Slow construction due to steel not being set until masonry walls are constructed; limits future modifications; limited flexibility for openings. Installation requires specific weather conditions, or measures (additional cost) must be taken to continue progress.		Includes cost of CMU walls. HVAC costs are comparable among framing systems, depend mainly on the quality of the system selected.
b.	**Steel Frame** Steel column and beam frame, open web bar joist roof framing, wide flange beam floor framing	$26.82	$36.57	Frame - 50+ y	Frame does not require maintenance	Frame does not require maintenance	Frame does not require maintenance	Quick steel erection; flexibility of building plan independent of columns; infill walls can be less expensive (GWB); extremely flexible for openings; easily procured in all delivery methods. Can be erected in most weather conditions. Often quicker to get building dried in. Less maintenance.	Redundant use of materials (steel frame + infill walls); additional expense of lateral bracing; steel is not fireproof. Initial fabrication time. Can be perceived as less durable depending on exterior envelope selection		Low cost includes frame only; high cost includes 8" non-bearing CMU infill walls. HVAC costs are comparable among framing systems, depend mainly on the quality of the system selected.
c.	**Pre-Engineered Metal Building** Pre-engineered steel bents for column and roof framing, roof purlins between bents, wide flange beam floor framing	$23.42	$32.83	Frame - 50+ years	Frame does not require maintenance	Frame does not require maintenance	Frame does not require maintenance	Can result in lowest initial cost when envelope is entirely provided by the PEMB manufacturer in their design/build delivery method; permits accelerated fast track design/manufacturer/construction schedule.	Associated PEMB system components required to achieve lowest cost are not durable and increase life cycle cost; pre-purchased design/build single source delivery method is difficult to procure for public projects; inflexible to some system types i.e. rooftop units; inflexible to future changes/loading changes; additional expense of lateral bracing; system cannot be fireproofed; angled bents can protrude into spaces.	Design engineer MUST accurately anticipate all structural loads (DL, LL, Seismic, Wind). Should also anticipate future loads for new roofing (re-roofing) and similar systems.	HVAC costs are comparable among framing systems, depend mainly on the quality of the system selected.
d.	**Tilt-up Wall Construction**	No information at this time; third-party research appears to be lacking. Indications that cost savings accrue above 50,000 sf. Concrete may be less subject to cost fluctuations than steel.		Indefinite for structural components; exterior and interior finishes depend on quality, installation.	No information.	No information.		Speed of building enclosure, with overlapping with sitework; no transportation of exterior wall panels is required; smaller work crews; locally sourced materials; durable and fire-resistant; very low exterior maintenance unless finishes are applied.	Requires large, uninterrupted slab area for onsite manufacture of panels, or construction of separate casting bed; best suited to building types with long straight runs, e.g. warehouses; concrete exterior walls continue to harden throughout life, may limit ability to install new openings for programmatic or building system requirements; limitations on ability to install new wiring etc. on interior. Requires interior finishing with gypsum board.	Early, intensive collaboration of architect, modular manufacturer and onsite contractor is essential. Supply chain is untested for schools in mid-Atlantic. May work best under a Design-Build methodology.	HVAC costs are comparable among framing systems, depend mainly on the quality of the system selected. Can accommodate a range of aesthetic approaches to treatment of building envelope.
e.	**Insulated Concrete Form** (ICF)	No information at this time. May reduce costs through worker productivity gains. Concrete may be less subject to cost fluctuations than steel.		Indefinite for structural components; insulation life will depend on usage and finishes; exterior and interior finishes depend on quality, installation.	No information.	No information.		Very high energy performance due to continuous insulation and thermal mass properties; exterior wall construction and insulation done in single step. Consistent air-infiltration reduction. As a bearing wall system, allows for reduction of structural columns.	Concrete exterior walls continue to harden throughout life, may limit ability to install new openings for programmatic or building system requirements; interior foam thickness is said to accommodate changes to wiring etc., but this will reduce thermal capacity. Requires interior finishing with gypsum board - full height through interstitial. Relatively few area school contractors experienced in this construction technique.	Supply chain is untested for schools in mid-Atlantic. May work best under a Design-Build methodology.	HVAC costs are comparable among framing systems, depend mainly on the quality of the system selected. Can accommodate a range of aesthetic approaches to treatment of building envelope.

	BUILDING SYSTEM	CONSTRUCTION COST ($/s.f. unless otherwise specified; mid-2016) LOW	HIGH	ANTICIPATED LIFE OF SYSTEM (years)	AVG. ANNUAL M&O ($/s.f./year)	AVG. ANNUAL LIFE-CYCLE RENEWAL COST ($/s.f./year)	LIFE CYCLE COST	PROS	CONS	OTHER CONSIDERATIONS	COMMENTS
f.	**Modular Construction** (defined as offsite manufacture and assembly of complete wall, floor or ceiling assemblies, or complete spatial units, for assembly onsite)	Insufficient sample to compare to conventional construction; cost difference is likely to depend on design, site conditions, distance of manufacturer from site.		25-50 years, depending on materials, construction.	No information; likely to vary per quality of design and construction.	No information; likely to vary per quality of design and construction.		From a 2015 report comparing modular to conventional construction: Cost savings of up to 16% (but users claim cost effectiveness rather than cost savings, i.e. avoidance of change orders); schedule savings of up to 45% (due to concurrency of sitework with offsite premanufacture and preassembly, avoidance of weather-related delays); improved safety record and quality control; reduced waste and site damage during construction.	2015 report: State highway permitting and transportation requirements of units limits size and may impose delays; lack of flexibility to alter design after initial decisions.	Early, intensive collaboration of architect, modular manufacturer and onsite contractor is essential. Finished building can be indistinguishable from site-built. Available in wood, steel, concrete. May work best under a Design-Build methodology.	May convey a bad image due to poor-quality products from the past; the industry is said to have improved substantially in quality, durability, ability to meet client needs, and acceptance by architectural profession. Used extensively for schools in Alberta, Canada; no recent experience in Maryland.
2	**MECHANICAL / HVAC**										
a.	**Variable refrigerant flow** (VRF) with supporting dedicated outdoor air systems (DX cooling + gas-fired heating)	$40	$44 - simple system w/ fresh air. $65 - meets ASHRAE standards	16-20 years (entire system, including piping)	$0.70	TBD	~ $6.3M (based on 20-yr LCCA)	Excellent for retrofit and additions projects, as well as administration areas; short lead times; smaller ductwork sizes; flexible design for space zoning; flexible during phased construction; quiet operation; low first cost; good energy efficiency with built-in smart thermostats; space conditioning systems are separate from ventilation systems, reducing size of ductwork; permits independent heating or cooling within each space; distributed system lessens single point of failure, effective in classrooms; energy recovery easily incorporated; easy to maintain.	Controls integration concerns with central energy management systems, intermittent communication with BAS; less flexibility of control; not as effective in very cold temperatures; manufacturer dependency (equipment not interchangeable); limited system redundancy; limited application in large spaces; ventilation system is designed and constructed separately; difficult to expand or modify an existing system once installed; entire system will require replacement at end of its operating life, including refrigerant piping line sets; refrigerant leaks can be difficult to locate.	Great for stand-alone building projects (no central county energy management system). No guarantee refrigerants will be the same in 20 years. Training on equipment is very important. most manufactures will provide free training if their system is installed.	Ceiling cassette units lower cost; horizontal ducted units higher cost
b.	**Four-pipe variable air volume** (VAV) rooftop units with single duct terminal units (need four-pipe arrangement with VAV, unless cooling is DX)	$48	$50	25 years overall: 20 years equipment, 20-25 years chiller, 30-35 years boiler, 35-40 years piping and ductwork.	$0.75	TBD	~ $7.2M (based on 20-yr LCCA)	Allows for independent heating or cooling within each space; reduced filter maintenance; less mechanical equipment than other system options; central heating system redundancy easily accomplished; minimal floor area required to support system; "free-cooling" (economizer) available; quiet operation.	High first cost; larger ductwork sizes; difficult for retrofit projects, not as flexible for changes to floor plans over time; space conditioning and ventilation systems are not independent; higher minimum outdoor air quantities; difficult to incorporate energy recovery.	If system is operated as a two-pipe system, the thermal comfort benefit of this system is eliminated; therefore, first cost increase of system (as compared with two-pipe systems) is essentially wasted. Reuse of central equipment (boilers and chillers), ductwork, and piping feasible when other equipment needs replacement.	Costs assume non-fan powered VAV Units
c.	**Four-pipe fan coil units** with supporting four-pipe dedicated outdoor air systems	$45	$46	20 years equipment, 20-25 years chiller, 30-35 years boiler, 35-40 years piping and ductwork.	$0.85	TBD	~ $7.0M (based on 20-yr LCCA)	Good for retrofit projects; smaller ductwork sizes; good energy efficiency; central heating system redundancy easily accomplished; space conditioning systems are separate from ventilation systems; permits independent heating or cooling within each space; energy recovery easily incorporated.	High first cost; equipment may need to be located outside of classroom area for compliance with LEED acoustical requirements; some maintenance staff not familiar with system operation.	If system is operated as a two-pipe system, the thermal comfort benefit of this system is eliminated; therefore, first cost increase of system (as compared with two-pipe systems) is essentially wasted. Reuse of central equipment (boilers and chillers), ductwork, and piping feasible when other equipment needs replacement.	

	BUILDING SYSTEM	CONSTRUCTION COST ($/s.f. unless otherwise specified; mid-2016) LOW	HIGH	ANTICIPATED LIFE OF SYSTEM (years)	AVG. ANNUAL M&O ($/s.f./year)	AVG. ANNUAL LIFE-CYCLE RENEWAL COST ($/s.f./year)	LIFE CYCLE COST	PROS	CONS	OTHER CONSIDERATIONS	COMMENTS
d.	**Two-pipe fan coil units** with supporting two-pipe dedicated outdoor air systems	$42	$43	20 years equipment, 20-25 years chiller, 30-35 years boiler, 35-40 years piping and ductwork.	$0.70	TBD	~ $6.4M (based on 20-yr LCCA)	Good for retrofit projects; smaller ductwork sizes; low first cost; good energy efficiency; central heating system redundancy easily accomplished; space conditioning systems are separate from ventilation systems; energy recovery easily incorporated; lower first cost than four-pipe systems.	Occupant temperature complaints typical during the spring and fall seasons; potential for overheating interior spaces during the winter; equipment may need to be located outside of classroom area for compliance with LEED acoustical requirements.	Occupant thermal comfort must be considered before proceeding with this system. Reuse of central equipment (boilers and chillers), ductwork, and piping feasible when other equipment needs replacement.	
e.	**Vertical geothermal heat pump units** with supporting dedicated outdoor air systems (ground source heating and cooling)	$44 (excludes geothermal field)	$45 (excludes geothermal field)	20 years equipment, 35-40 years piping and ductwork, 40-50 years outdoor geothermal piping.	$0.70	TBD	~ $6.9M (based on 20-yr LCCA)	Smaller ductwork sizes; no central equipment (boilers or chillers); excellent energy efficiency; energy recovery easily incorporated; space conditioning systems are separate from ventilation systems; permits independent heating or cooling within each space; energy recovery easily incorporated; distributed system allows less overall disruption when maintenance needed (no central plant), .	High first cost; large "open" site area required, all sites may not support well fields; risk of unforeseen conditions during drilling of geothermal borings; equipment typically located outside of classroom area for compliance with LEED acoustical requirements; fans have limited abilities; some maintenance staff not familiar with system operation; large amount of heat pump machinery to maintain; remediation can prove costly if system is not properly designed.	Operating setpoint of geothermal pumps must be properly established during balancing to provide energy efficiency; reuse of building piping and site piping feasible when other equipment needs replacement. Unknown life cycle of geothermal field, could limit future use of sites depending on location of well field.	Cost of geothermal field ~ $12 to $13 per LF of vertical geothermal well. Improvements in equipment and automatic temperature controls, combined with continuing high cost of geothermal wells, makes this option less attractive than it used to be.
3	**ELECTRICAL**										
a.	**Standard fluorescent**	$4.00	$4.50	30,000 hours linear fluorescent/ballast (avg).				Readily available materials and installers. O&M well known.	Shorter life; color quality can be problematic.		
b.	**LED lighting** (vs standard fluorescent lighting)	$4.10	$4.60	40-50 years fixture housings; 50,000 hours LED boards/drivers; 20,000 hours fluorescents	Fixture wattage x Hours per Year x Electric Utility Rate	LED / driver replacement every 15-years	First Cost + Lamp & ballast/driver replacement	LED has excellent energy and maintenance considerations; higher efficacy (lumens per watt) and reduced frequency of lamp replacement; tighter and more accurate optic control from lamp source; fewer fixtures needed to achieve same lighting levels (9 LED is equivalent to 12 fluorescent).	LED has higher first cost; bare lamp can create harsh light (glare); color rendition is a challenge in areas with special lighting requirements; dimming systems more expensive than for standard fluorescent bulbs.	LED technology continues to improve and costs begin to align with fluorescent. New fixtures are primarily designed around LED technology; exact life cycle capabilities are unknown. Costs of LED will continue to decline.	10% to 20% premium for LED fixtures, as compared with fluorescent; premium reduced with added level of lighting controls.
c.	**Daylight harvesting**	$2.00	$3.00	20 years	Typically an annual service contract is maintained w/ controls manufacturer	N/A	First Cost + Annual Service Contracts	Improves overall energy savings (vs basic controls).	Higher cost than basic lighting controls; May require higher level of programming; Requires proper start-up and commissioning. Increase of window area may require increase of HVAC capacity. With reduced cost and improved quality of LED lighting, advantages of light harvesting diminish.	Required by applicable Energy Codes for most facilities and select space types; required for most sustainable design compliance paths.	
d.	**MC (metal clad) cable vs rigid conduit**	$0.40/l.f. for MC cable	$0.50 for rigid conduit	40 years	N/A	N/A	First Cost	Can pull additional or replacement wiring in rigid conduit; Rigid conduit results in cleaner installation; MC Cabling can be installed in tight spaces.	Rigid conduit has higher material and labor installation costs than MC Cabling	This is typically a value-engineering decision for branch circuit installation; not applicable for feeders.	Average costs
e.	**Aluminum wire vs copper wire mains** (From main electrical disconnect to subpanels only)	$0.60/l.f. for aluminum	$0.75/l.f. for copper	40 years	N/A	N/A	First Cost	Copper wire sizes typically smaller than aluminum; copper terminations are more durable and do not experience same thermal expansion issues as aluminum.	Copper has higher first cost; aluminum terminations may require regular thermal imaging; larger aluminum wiring size may require increase in conduit size.	This is typically a value-engineering decision for feeders; Not applicable for branch circuits or connections to motors.	Average costs; copper typically a 20%-40% premium; costs highly fluctuate.

	BUILDING SYSTEM	CONSTRUCTION COST ($/s.f. unless otherwise specified; mid-2016) LOW	CONSTRUCTION COST HIGH	ANTICIPATED LIFE OF SYSTEM (years)	AVG. ANNUAL M&O ($/s.f./year)	AVG. ANNUAL LIFE-CYCLE RENEWAL COST ($/s.f./year)	LIFE CYCLE COST	PROS	CONS	OTHER CONSIDERATIONS	COMMENTS
f.	**Emergency generator and switch gear**	$50,000 per installation	$75,000 per installation	40 years	N/A	N/A	First Cost	Provisions are easy to incorporate in distribution system design for new construction.	High maintenance cost for permanent generator; may be difficult to design in partial renovations or additions; provisions may never be utilized (or underutilized); additional space requirements for generator and distribution equipment; statewide standards for connection points for portable generators (docking stations) have not been created.	Purchase of a generator sufficient in size for shelter use is costly, as well as maintenance. Not installing a generator requires an agreement w/ a rental outfit or another governmental entity to ensure a generator will be available in an emergency. Schools are not high as priority for emergency rental.	Costs based on new construction; $75,000 - $100,000 premium for renovations; costs include generator equipment.

	BUILDING SYSTEM	CONSTRUCTION COST ($/s.f. unless otherwise specified; mid-2016) LOW	HIGH	ANTICIPATED LIFE OF SYSTEM (years)	AVG. ANNUAL M&O ($/s.f./year)	AVG. ANNUAL LIFE-CYCLE RENEWAL COST ($/s.f./year)	LIFE CYCLE COST	PROS	CONS	OTHER CONSIDERATIONS	COMMENTS
4	**PLUMBING**										
a.	**PVC vs cast iron** (for sanitary and storm water conveyance. Below ground and above ground)	$34/l.f. (PVC)	$39/l.f. (cast iron)	35-40 years for both types	N/A	N/A	N/A	Cast Iron is typically quieter than PVC (application of piping insulation may help with achieving similar noise levels). PVC has a lower cost, is easier to install, and is typically easier to maintain.	PVC piping is not acceptable for return air plenums, which may be present within retrofit type projects (not new construction).	Always contact maintenance personnel regard piping material preference.	~$0.40-$0.60/sf savings with PVC.
b.	**Piped secondary roof drainage** (internal overflow drains) vs. through-the-wall scuppers	Not available	Not available	35-40 years for piped systems; 20 years for scuppers	N/A	N/A	N/A	Through-the-wall scuppers reduce cost by eliminating secondary drainage piping, saving ceiling space within the building. Piped secondary roof drainage systems provides flexibility in locating roof drains.	Different systems require different roof tapers and slopes; structural steel design (slopes) may not permit through-the-wall scuppers; flashing at scuppers can become problematic over time; scuppers are typically less aesthetically pleasing; require protection of exterior walls from staining and erosion control at ground. Scuppers in lieu of piped secondary roof drainage can provide a visual confirmation of primary drains issues/failure.	Schematic level VE consideration - utilize through-the-wall scuppers in lieu of piped secondary roof drainage. Both require high level of routine maintenance to prevent blockage by leaves, debris.	~$0.75-$1.00/sf premium for piped secondary drainage; premium reduced with PVC.
5	**BUILDING ENVELOPE**										
5A	**Exterior Walls**										
a.	**Light gauge metal framing with 4" brick veneer** 1¼" air space, 2½" cavity spray foam insulation with 5/8" gyp. sheathing, 6" metal studs, 5/8" gyp. board	$31.00	$33.00	45+ yrs.				Very durable, graffiti resistant, very tight system against wind inflitration, requires little maintenance, not as temperature sensitive as full masonry systems, not subject to UV degradation, wide range of colors,	Spray foam insulation temperature sensitive, veneer temperature sensitive		
b.	**Light gauge metal framing with insulated aluminum panels**	$32.00	$35.00	45+ yrs.				Not as temperature sensitve as masonry systems, good thermal, characteristics,	Metal panels subject to denting, subject to vandalism/graffiti, more maintenance required for caulk joints		
c.	**CMU** with insulated cavity and 4" brick veneer	$35.00	$37.00	45+ yrs.				Provides very durable interior and exterior surfaces	Interior CMU walls temperature sensitive, avaialbilty of skilled masons becoming problematic, not as wind tight as other systems, difficult to install utility infrastructure	Most new school masonry is installed in winter. Requires tenting and temperature control	
d.	**Light gauge metal framing with exterior insulation and finish system** (EIFS)	$23.00	$26.00					Framing not temperature sensitive, EIFS finish is temperature sensitive, provides good themal characteristics, wide variety of color	Very prone to damage/vandalism; colors fade/hard to match color; subject to moss/lichen etc. growth in certain exposures		
e.	**Pre-cast autoclaved aerated concrete wall panels** with 4" brick veneer (AAC)	$63.00	$65.00	45+ yrs.				Easy to work with, pre-cast block very light weight, can be routed to install utilities, excellent thermal properties	Limited suppliers, unfamiliarity in industry		
5B	**WINDOWS & STOREFRONTS**										
a.	**Aluminum frame** with thermal break & insulated low-E glass	$975 ea. installed		45+ rs.				Frames require little maintenance, do not rust like steel, insulated glass and thermal breaks minimizes heat transfer and condensation, frames do not require painting, Low E coating reflects solar UV & infrared energy	Aluminum has a large coefficient of expansion	This is standard system used in commercial construction	All costs based on 3' X 5' window size
b.	**Vinyl frame** with insulated glass	$500 ea. installed		10-15 yrs.				Lower first cost than aluminum, frames do not require painting, more dimensionally stable than aluminum	Vinyl doesn't hold up well to UV, becomes brittle, significantly shorter lifespan than aluminum	Typically used in residential construction	
c.	**Fiberglass frame** with insulated glass	$600 ea. installed		10-20 yrs.				Dimensionally stable, frames do not require painting, lower first cost than aluminum	Fiberglass deteriorates with UV exposure and exhibits "fiberbloom", shorter lifespan than aluminum	Typically used in residential construction	
d.	**Vinyl clad wood frame** with insulated glass	$750 ea. installed		15-20 yrs.				Lower first cost than aluminum, frames do not require painting, more dimensionally stable than aluminum	Vinyl doesn't hold up well to UV, becomes brittle, significantly shorter lifespan than aluminum	Typically used in residential construction	
e.	**Metal clad frame** with insulated glass	$675 ea. installed		20-30 yrs.				Lower first cost than aluminum, frames do not require painting, more dimensionally stable than aluminum	Paint fades and chalks from UV exposure, longer lifespan than vinyl and fiberglass	Typically used in residential construction	

	BUILDING SYSTEM	CONSTRUCTION COST ($/s.f. unless otherwise specified; mid-2016) LOW	HIGH	ANTICIPATED LIFE OF SYSTEM (years)	AVG. ANNUAL M&O ($/s.f./year)	AVG. ANNUAL LIFE-CYCLE RENEWAL COST ($/s.f./year)	LIFE CYCLE COST	PROS	CONS	OTHER CONSIDERATIONS	COMMENTS
6	**ROOF**										
a.	**Standard 4 ply hot asphalt** with CSPE (Hypalon) flashings over sloped structure with 2-part insulation system	$11 - $14	$18 - $22	25-35+ yrs.				Redundancy, durability, tried and true technology, long lifespan, withstands foot traffic, can obtain 25 year warranty	Higher first cost, more difficult to repair,requires hot asphalt, produces fumes, may require school to be vacated, limiting the time available for installation to summer.	Very few flashing failures with CSPE flashing over the last 25 years	All 1st costs based on 2 layers of R-25 polisocyanurate insulation & 1/2" coverboard w/o vapor barrier
b.	**Single ply TPO**	$16 - $18	$14 - $17	10-15 yrs.				Low first cost, heat welded seams, 10' wide sheets, less odor than hot asphalt	Only one layer of protection, about 15 yrs. on market, exhibits premature shrinkage, subject to cracking where water ponds (excluded from warranty), subject to UV, requires skill to weld seams, difficult to repair, very slippery, vulnerable to impact (hail, stones, etc.)	Most new school roofing performed during winter. Not conducive to cold adhesives	
c.	**Single ply mechanically fastened EPDM**	$10 - $12	$13 - $15	18-20 yrs.				Low first cost, 50 yrs. experience, requires litle skill, 10' wide sheets, no hot asphalt odors	Only one layer of protection, prone to seam failures, seams fail "all at once", material shrinks from UV exposure, not as durable as multi-ply systems, cold adhesives temperature sensitive,	Most new school roofing performed during winter. Not conducive to cold adhesives	
d.	**Cold 2 ply modified bitumen**	$13 - $16	$15 - $18	15-20 yrs.				lower cost than 4 ply systems, provides better durabilty than single ply systems, available in light colored granules	Shorter life expectancy than 4 ply systems, granular surface not as protective as stone ballast, granules wear off exposing ply, seams are weak point, cannot fill ponding areas like hot systems	Most new school roofing performed during winter. Not conducive to cold adhesives	
e.	**Steel standing seam metal** (aluminized steel with Kynar finish)	$25.00	$35.00	30-35 yrs.				Very durable, available in range of colors, little maintenance, long life,	High first cost, must be installed over sloped structure, requires snow guards along roof edges, requires external gutter system subject to snow/ice damage, difficult to re-paint finish, large coefficient of expansion	Subject to wind blown leaks at joints. Attic area can be used for mechanical equipment, ducts, piping, etc.	
f.	**Fluid applied** (urethane)	$13 - $16	$16 - $19	25-35?				Highly reflective, flexible elastomeric coating withstands expansion/contraction, requires little skill, long life expectancy anticipated.	Temperature sensitive, not a long history with this product	Most new school roofing performed during winter. Not conducive to cold applied products	
7	**FLOOR**										
a.	**Conventional vinyl composite tile** (VCT) flooring systems	$1.50	$3.00	15				Good wear properties if properly cleaned and maintained. Readily available product and installer base. Large color palette. Relatively quick installation. Understandable O&M requirements. Good hygiene levels.	Relatively short life cycle. Easily damaged soft product, scuffs easily from chairs, tables. Poor accoustic qualities. Requires extensive O&M; chemicals required to routinely strip and wax. Not environmentally/green friendly. Telegraphs subfloor imperfections if latter is not prepared correctly.	Essential to maintain adequate "attic stock" for occasional replacement.	
b.	**Convential quartz tile** flooring systems	$2.65	$3.00	20				Readily available product. Readily available installer base. Large color palette. Relatively quick installation. Understandable O&M requirements. Good hygiene levels.	Relatively longer life cycle. Not easily damaged. Poor acoustic qualities. Requires moderate O&M. Chemicals required for O&M. Higher initial costs than VCT.	Essential to maintain adequate "attic stock" for occasional replacement.	
c.	**Carpeted** flooring systems	$2.50	$4.40	8-10 to 12-14				Readily available product and installer base. Large color palette. Comes in squares/tiles/rolls. Relatively quick installation. Understandable O&M requirements. Good acoustic qualities. Realtively poor hygiene levels.	Relatively shorter life cycle. More easily damaged. Increased O&M requirements. Damage cannot easily be fixed when rolled goods used. Can promote mold and mildew if not properly cleaned and dried; need to run the A/C and fans to dehumidify and dry spaces post cleaning. Not environmentally/green friendly.		
d.	**Terrazzo** flooring systems	$12.00	$25.00	40-100				High quality product and appearance. Most durable. Easy to O&M. Good hygine levels.	Higher first costs might be prohibitive. Limited installer base. Longer to install. Weight must be taked into consideration by design team. Limited color palette. Poor accoustics.		

	BUILDING SYSTEM	CONSTRUCTION COST ($/s.f. unless otherwise specified; mid-2016) LOW	HIGH	ANTICIPATED LIFE OF SYSTEM (years)	AVG. ANNUAL M&O ($/s.f./year)	AVG. ANNUAL LIFE-CYCLE RENEWAL COST ($/s.f./year)	LIFE CYCLE COST	PROS	CONS	OTHER CONSIDERATIONS	COMMENTS
e.	**Epoxy or poured resinous** flooring system	$10.00	$14.00	15-20				Quality product and appearance. Relatively durable. Lage color palette. Relatively easy to O&M. Good hygiene levels.	Higher first costs might be prohibitive. Limited installer base. Longer to install. Limited color palette. Poor accoustics. Not as environemtnally/green friendly.		
f.	**Finished concrete**	$2.50	$20.00	40 - 100				Very durable product that is very easy to clean and maintain (regular floor cleaning required). Can have an attractive, terrazzo-like finish quality using different aggregates and glass. Excellent slip resistance	Limited number of contractors, quality is contingent on contractor. Grinding process affects the construction schedule. Poor acoustics. Joints may not be asthetically appealing. Potential visible defects (exposed rebar, foot prints, rust, non-uniform appearance). Floor protection during construction is required (additional cost). Use of burnisher may be necessary to restore finish (gloss). Requires greater shrinkage crack control. Concrete cracks, cracking will show in exposed floor. Control joints will be visible and must be carefully filled. Limited color and pattern options.	Grinding process (wet vs. dry). Consideration of install timing during construction could impact cost. Staining of concrete can provide greater aesthetic options, however stains are not UV stable. Will require refreshing of stain every 10 years	Cost varies by finish: Cream Finish $4.00-$6.00/sf Sand Finish $6.00-$10.00/sf Exposed $10.00-$16.00/sf Several levels of polishing greatly influence initial cost of flooring. Exposed aggregate finishes can mask cracking, however costs approach terrazzo system.
8	**WALL (interior)**										
a.	**Conventional CMU** wall systems	$10.50/s.f. of wall - 8" CMU	$15.00/s.f. of wall - 12" CMU; as high as $35.00/sf of wall	40-100	Requires little maintenance			Readily available product and installer base. Rugged and durable product. Good color palette once painted, or with integral color. Low O&M requirements. Can aid in acoustics. Environmentlaly/green friendly.	Higher first cost. Not as adaptable as drywall partitions. Slower construction speed. Weight must be acounted for by design team.		
b.	**Conventional gypsum wallboard** (drywall) system	$7.00/s.f ($10.50/l.f.)	$9.75/s.f.	20				Lower first cost. Readily available product and installer base. Quicker installation process. Good color palette once painted. Readily adaptable to changes in space configuration.	High O&M requireemnts. Can deteriorate quickly under ordinary use in school. Not appropriate for high traffic areas.		Costs are for wall 10'-12' high
c.	**High impact gypsum wallboard** (drywall) systems	$8.25	$11.00					Relatively higher first cost than conventional gwb/drywall. Readily available product and installer base. Quicker installation porcess. Good color palette once painted. Readily adaptable to changes in space configuration. More durable than conventional gwb, but appropriate grade of durability must be selected.	High O&M requirements. Requires more O&M than CMU or glazed tile surfaces.		
d.	**Tiled wall overlayment** systems	$10.00	$13.50					Readily available product and installers. Useful in high traffic areas. More durable than drywall alone. Good color palette. Easy to clean. Does not require painting. Environmentally/green friendly.	Higher first cost than drywall alone. Longer instalatin time than drywall alone.		
9	**CEILING**										
a.	**Conventional 4'x2' lay in acoustical ceilings tile** and grid systems	$2.20	$3.00					Readily available product and installer base. Reasonable pattern palette. Relatively quick installation. Understandable O&M requirements. Easy to replace tile by tile. Good accoustic qualities. Environmentally/green friendly. Provides accessibility to MEP systems above ceiling.	Relatively soft product. Easily damaged by contact or moisture. Can sag in high humidity renvironments. Can support mildew or mold growth.		
b.	**Conventional 2'x2' lay in acoustical ceilings tile** and grid systems	$2.70	$3.50					Readily available product and installer base. Reasonable pattern palette. Relatively quick installation. Understandable O&M requirements. Easy to replace tile by tile. Good acoustic properties. Environmentally/green friendly. Provides accessibility to MEP systems above ceiling.	Relatively soft product. Easily damaged by contact or moisture. Can sag in high humidity environments but less so than 4'x2' tiles. Can support mildew or mold growth.		
c.	**Drywall** (hard) ceiling systems	$6.00	$8.75					Readily available product and installer base. Good color palette once painted. Understandable O&M requirements. Good hygiene levels. Environmentally/green friendly. Stable and durable.	Higher first cost. Limits access to above ceiling space and equipment. Can be damaged by humidity and water leaks.		

	BUILDING SYSTEM	CONSTRUCTION COST ($/s.f. unless otherwise specified; mid-2016) LOW	HIGH	ANTICIPATED LIFE OF SYSTEM (years)	AVG. ANNUAL M&O ($/s.f./year)	AVG. ANNUAL LIFE-CYCLE RENEWAL COST ($/s.f./year)	LIFE CYCLE COST	PROS	CONS	OTHER CONSIDERATIONS	COMMENTS
d.	**Perforated metal pan** type ceiling systems	$20.00	$50.00					Limited product availability. Limited installer base. Understandable O&M requirements. Good hygiene levels. Provides limited accessibility to MEP systems above ceiling. Good acoustic qualities.	High first cost. Limits access to above ceiling space and equipment.		