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PUBLIC SCHOOL CONSTRUCTION IN MARYLAND
THE CAPITAL IMPROVEMENT PROGRAM
Report to the Capital Budget Subcommittee
Senate Budget and Taxation Committee

Senator James E. DeGrange, Sr., Chair
Senator Douglas J. J. Peters, Vice Chair

David Lever
Executive Director, Public School Construction Program
March 1, 2016

We would like to thank the Committee for the opportunity to address the FY 2017 capital budget for public school construction. Along with the 24 school systems and the Maryland School for the Blind, we are appreciative of the high level of funding that Maryland has consistently provided for school building activities. Since the founding of the Public School Construction Program in 1971, the State has approved over $7.1 billion for the Capital Improvement Program (CIP), as well as approximately $401 million for other capital funding programs. As projects are completed, this exceptional level of funding translates into visible demonstrations of the State's commitment to public education.

The capital needs of Maryland's school boards and the Maryland School for the Blind continue. In all but three fiscal years since FY 2006, the local requests for CIP funding have exceeded the State's ability to fund by more than 100%. CIP requests themselves do not represent the totality of school facility requirements, since local fiscal constraints generally limit the number of projects that may be requested. Recognizing the need to respect Maryland's debt affordability limits, we believe it is important to maintain at a consistently high level the amount of funding that is provided for school construction.

Concurrently, we wish to assure the Committee that we are working closely with the local educational agencies to reduce facility costs in every way that does not compromise the educational program or impose increased maintenance and operational burdens on the local school boards. We are actively involved with LEA Facility Planners, architects, and constructors in investigating the cost and performance implications of alternative building technologies, and are studying educational specifications to determine areas of possible efficiency. We anticipate that the 21st Century School Commission that has been established by the Presiding Officers will provide a rich forum for the discussion and investigation of these issues.

Following are our responses to questions that have been raised by the Department of Legislative Services.

I. IAC should provide an updated estimate as to the costs of providing window AC units to those jurisdictions that would request them. IAC should also comment on the likelihood of jurisdictions making requests for window AC units and recommending those requests for funding should the proposed regulations be approved.

It is not possible for us to predict which LEAs might request State funding for window air conditioning units if they become eligible for State funding participation. We can, however, provide an approximate cost for implementing window AC in those classrooms that have been reported as lacking any form of cooling.

Statewide Survey Information

In November 2015 the 24 local educational agencies (LEAs) were asked to provide information "on buildings in which a majority of classrooms lack cooling, and for which they would consider requesting State support for window air conditioning units if they were an eligible project type." The MSDE survey did not ask the LEAs to provide information on *all* classrooms that do not have cooling, only on the classrooms in buildings in which a majority (more than 50%) of the classrooms lack cooling.

Three LEAs responded, indicating a total of 1,561 classrooms in school buildings that fit the description. Concurrently, the Department of General Services developed an average cost of $9,700 per window AC unit, which covers purchase and installation of a high-performance unit with insulated panel, electrical upgrades to service the unit, structural support, and a security grate. This cost includes $4,200 for the installed unit and $5,500 for the electrical upgrade. The unit cost may vary widely for any particular installation, depending on the installation conditions as well as the presence or absence of sufficient electrical power to run the units.

Assuming that each classroom would require one unit, this information led to a total cost of approximately $15.1 million, with a State share of approximately $9.5 million if the projects are funded through the CIP.

School System	Number of Classrooms without Cooling	Number of Schools	Total Cost for Schools ($9,700 per Classroom)	State Cost Share	State Cost at State Share
Baltimore County	1,109	36	$10,757,300	52%	$5,593,796
Garrett County	36	6	$349,200	50%	$174,600
Baltimore City	416	15	$4,035,200	93%	$3,752,736
TOTAL	**1,561**	**57**	**$15,141,700**		**$9,521,132**

Baltimore City Public Schools

It was recognized that the MSDE survey results for Baltimore City were likely undercounted. City Schools is involved in a detailed study of their air conditioning needs, and the best current information indicates that there are approximately 45 schools that will require air conditioning in 2,004 classrooms. This represents the balance of schools after elimination of the 23 to 28 schools that will be renovated or replaced through the 21st Century Building Program or the CIP; the closure of 26 facilities listed in Exhibit 6 of the *Memorandum of Understanding for the Construction and Revitalization of Baltimore City Public Schools*, dated October 16, 2013 and subsequently amended by the Board of School Commissioners; and schools that have been approved for central air conditioning systems that are now in design. The list does include schools that provide temporary swing space for students while their home school is undergoing renovation or replacement. Because of their size, some classrooms may require more than one unit. City Schools estimates the total cost of this effort to be $27.9 million, with a potential State share of $25.95 million.

Summary of Estimated Costs
Neither the DGS nor the City Schools estimates include a contingency amount; we have shown 3% for unforeseen conditions, abatement of asbestos and other HAZMATS, etc. Noting that the survey and the City Schools assessments cover different ranges of schools, an approximate revised cost is:

Cost to implement air conditioning in all schools in Baltimore County and Garrett County in which more than 50% of the classrooms do not have cooling:	$11,107,000
Cost to implement air conditioning in all classrooms in Baltimore City that do not have air conditioning:	$27,902,000
Subtotal (rounded)**:**	**$39,010,000**
Contingency (3%)	$1,170,000
Total (rounded)**:**	**$40,180,000**

Likelihood of Requests for Window AC Units
We cannot comment on the likelihood of local jurisdictions requesting State funds for window air conditioning units if this becomes an eligible funding category. These are local policy decisions that are now in process, and it would be inappropriate for us to anticipate the decisions that will be made by local boards of education and local governments based on informal communications or remarks made by local officials.

IAC Actions if Window AC Units Become Eligible
If window air conditioning units become an eligible State funding category, and if local boards apply for State funds for this category of asset, we will review the applications using the same criteria that would be applied to other projects submitted in the Capital Improvement Program, the Aging Schools Program, or the Qualified Zone Academy Bond program. These include:

- Comprehensiveness of the project scope (including for window air conditioning units the description of the unit itself and its controls, the availability of adequate electrical power, the structural conditions of the windows, the specification of the insulated panel, and any abatement concerns about removal of the windows).
- Concerns of the Maryland Historic Trust regarding the installation.
- Accuracy of the project estimate.
- The priority given to the project in the total list of the LEA's project requests.
- School utilization (as a rule, the IAC does not approve funding for capital projects in schools that have a current and projected utilization of less than 60%; however, this is a guideline, not a standard, and an LEA may present information to justify a project in a school that shows a utilization of less than 60%)
- The project schedule shows that allocated State funds will be expended, and the project will be completed in a timely manner.
- For CIP projects, confirmation of local matching support; for QZAB projects, the confirmation of 10% private entity contribution.

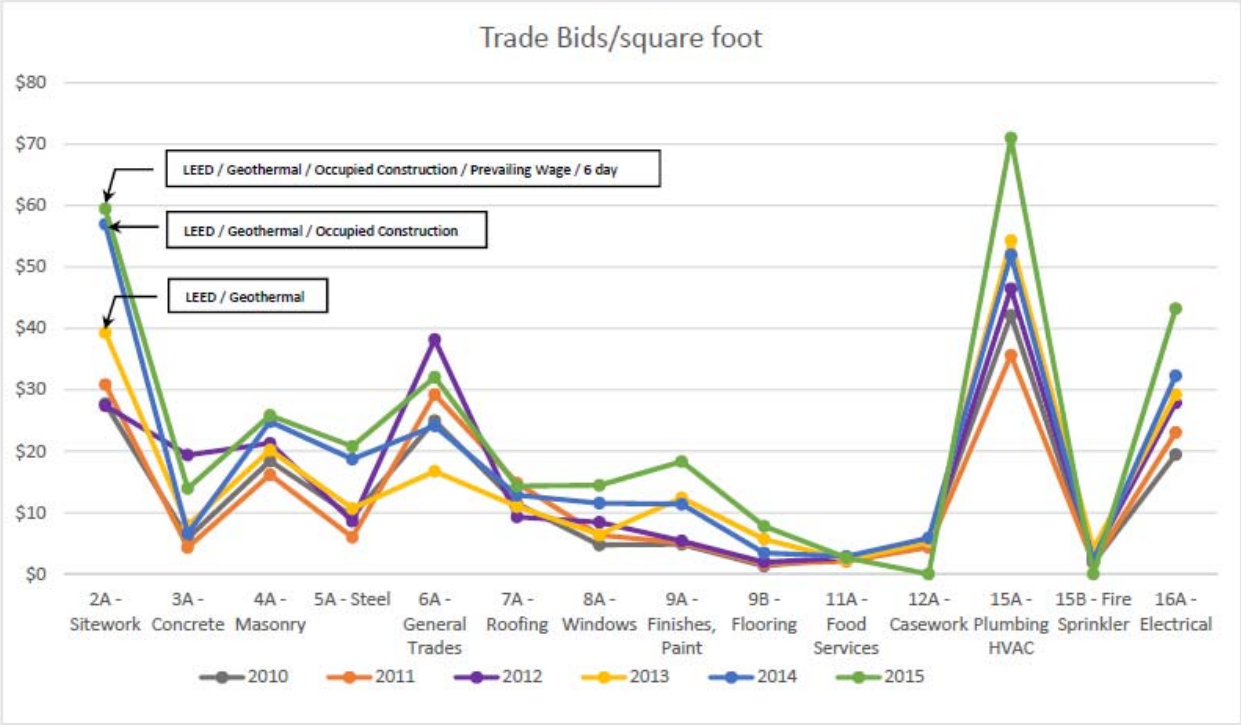
In the case of window air conditioning units, we will recommend to the IAC that these installations be regarded as a temporary measure. The State cost of the window air conditioning units will not be subtracted from the State allocation for any future renovation at the subject school building (as almost all State allocations approved within the previous 15 years are subtracted from renovation project allocations).

However, because the installation of window AC units is viewed as a temporary approach to cooling, the IAC will also ask the LEA about future plans for the school, specifically when central air conditioning will be programmed through a systemic renovation project or as part of a larger

renovation project. The timeframe proposed for such future work may influence the IAC decision whether to recommend or approve the window AC project.

II. IAC should comment on the specific reasons in the market driving the significant increases in cost assumptions.

Since the middle of calendar 2014, the construction market in Maryland has been in a state of great uncertainty and fluctuation. Following three years of reasonably predictable cost increases at about 4% per year, costs suddenly increased by 28.5% between mid-2014 and mid-2015 (see below). The following chart shows how the costs of individual trade items have increased since 2010.[1] According to this analysis, sitework, general trades, finishes, plumbing/HVAC, and electrical have seen particularly large increases, while roofing, flooring, food services and casework have experienced only modest changes.



Basis of information: 24 projects total – 7 new, 17 renovation / 20 ES. 1 HS, 3 HS / Duration 7 months to 48 months)

Through discussion with LEA Facility Planners as well as architects, engineers and constructors, we have identified a number of the factors that are thought to have driven the recent cost increases. These are generalized observations; economic studies would be needed to determine the influence that any particular factor has on bid prices in general, or on the results of a specific project bid. Moreover, factors well outside the mid-Atlantic states, for example China's reported demand for copper, are not accounted for in this listing.

It is not known whether the cost increases will continue into calendar 2016. Certain factors, for example the reduction of plant capacity and labor force that resulted from the economic recession, are likely to require a number of years to recover; others, for example the increase of contractor margins to compensate for the austerity of the recession years, may already be past. Until bids for

[1] KCI Technologies Inc., presentation, "Cost Impacts on School Construction and Cost Savings Through Design and Construction," May 6, 2015.

new construction are taken in Maryland in the upcoming months, we will not be able to provide an estimate of the future trend in school construction costs.

It should also be noted that construction is a highly local activity; the cost increases we have observed may be specific to Maryland. Multi-state, regional, and national studies on construction costs, while useful in identifying trends and influences, tend to obscure the significant differences that may exist between different states, often resulting from the differences in their regulatory environment. As an example, it is related by architects who have worked on both sides of the Potomac River that similar school projects, involving roughly the same area, educational features, "green" building components, and other building technologies, can be built in Virginia for noticeably less expense than in Maryland. Our analysis of the cost increases in school construction and of the drivers of these increases is pertinent only to the Maryland situation.

Vertical Construction Cost: Cost of Building Only

Every year in July, the IAC announces the construction cost ($/sf) that will apply to projects that will be approved for funding in the coming Capital Improvement Program submission and will generally bid in the following July. This figure is used to determine the State funding allocation for major projects; it is not necessarily the actual cost that the market will deliver on bid day, which depends on a multitude of complex factors.[2]

For three fiscal years, from FY 2012 to FY 2014, the IAC followed the Department of Budget and Management and Department of General Services construction cost escalation factor of 4% per year. This led to construction cost figures ($/sf) that tracked well with actual bid-day costs. In developing the cost for projects that would be approved in the FY 2016 CIP and would likely bid around July 1, 2015, the IAC applied the same 4% increase: the FY 2015 cost of $224.00/sf was increased to $233.00/sf.

However, in early 2015 four large school construction bids showed that the 4% increase was about 16% too low; the figure should have been approximately $271/sf.[3] This figure corresponded to costs reported from construction sources in Maryland.

Sitework Cost as a Percentage of Total Construction Cost

In determining the total State allocation for major projects, the IAC adds to the cost of vertical construction an allocation for sitework that is calculated as a percentage of the vertical construction cost. For new and replacement schools, the IAC's percentage was held at 12% of the cost of vertical construction for many years; applied to the original FY 2016 figure of $233.00/sf, this resulted in a total cost of $260.96/sf.

However, since around 2011 when new stormwater regulations went into effect in Maryland, school facility planners have asserted that the 12% figure was too low: sitework was showing a significant increase as a percentage of total construction. The four bids described above confirmed this observation: they indicated that the sitework percentage should have been increased to 19% of the vertical construction cost, resulting in a total FY 2016 figure of $322.42/sf.[4] (The 19% figure, however, is on the low end of percentages reported by a constructor who has built a large number of Maryland public schools.[5])

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[2] Including, among others, concurrent work bidding in the public and private sectors; the known number of competitors for the project, and the bidder's assessment of their bidding strategies; the availability of subcontractors and vendors; anticipated difficulties in the project; the quality of the bidding documents; and the bidder's level of urgency to procure the contract.

[3] The four projects, all replacements of existing facilities, were Northern High School in Calvert County ($243.12/sf); Westowne Elementary School in Baltimore County ($274.73/sf); Wilde Lake Middle School in Howard County ($265.00/sf); and Frederick High School in Frederick County ($299.72/sf). One major project in Prince George's County that bid in the same period was excluded as an outlier that would have significantly increased the average cost.

[4] Costs with sitework for the four projects: Northern High School $271.60/sf; Westowne Elementary $336.04/sf; Wilde Lake Middle $322.00/sf; Frederick High $360.05/sf.

[5] Mr. Douglas Eder, President, Oak Contracting, Inc.

The combined building-plus-site number of $322.42 that should have been used for FY 2016 represented a full 28.5% increase over the figure used by the IAC for the FY 2015 CIP (projects that bid around July 1, 2014), and was 23.6% higher than the combined cost of $260.96 that the IAC had promulgated for FY 2016 projects that would bid around July 1, 2015.

Drivers of the 2014-2015 Cost Increase

In May of 2015 and at several other meetings with LEA Facility Planners, including one held in January 2016, the causes of this unexpected and dramatic increase of costs were discussed. The following represents our efforts to understand the situation.

- Market Conditions:

  - *Reduced Competition*. The recovering economy offers contractors attractive opportunities that compete with school construction. School construction is a notoriously difficult construction sector due to the stringent deadlines, the complexity of the design (driven by the educational programmatic needs), and the difficulties of working on sites that are embedded in communities and may be occupied by students and staff. The decline of contractor interest in school construction is very noticeable: in March 2010 the Calvert High replacement project in Calvert County drew nine bidders; in February 2015, the replacement of Northern High drew only two bidders for a project with approximately the same scope of work and in the same county.

  - *Reduction of Contractor and Vendor Capacity*. As demand dropped during the lengthy recession that began in 2008, a number of contractors and plants that produce construction materials and equipment were eliminated. The reduction of available contracting firms contributes to the reduced competition for bids, and the reduction of vendors leads not only to higher costs, but also to longer lead times for building components, for example HVAC equipment.

  - *Decline of Skilled Workforce*. The recession has caused a shortage of labor, particularly skilled: workers who left the trades because of lack of work opportunities have not returned to construction. In the meantime, it appears that fewer young people are entering the trades as other areas, particularly information technologies, offer interesting and remunerative alternatives. While efforts to increase the supply of trained mechanics are underway, it will take time to develop a skilled workforce. This is a slowly growing crisis that may lead to still higher costs in the future: when subcontractors cannot find skilled workers to carry out their jobs, they cannot offer prices to general contractors, who in turn will not compete for work that requires those particular subcontracting services.

  - *Recovery of Margins*. For years during the recession, contractors bid at cost or even below cost simply to stay in business. This meant that they could not invest extensively in the renewal of their construction equipment, their office and other facilities, or their information technologies. With increasing work opportunities, these contractors have increased their margins (overhead and profit) in order to invest in their businesses. Whether they will continue to carry high margins is an open question.[6]

- Regulations/Codes/Standards:

  - *Increased Direct Costs*:

    - *2011 Stormwater Management Regulations*. Under the Environmental Site Design (ESD) requirements promulgated in 2011 by the Maryland Department of the Environment, a developed site is intended to achieve the hydrological characteristics it

[6] Gilbane Building Company's Fall 2015/Winter 2016 *Construction Economics Report* will likely address this issue when it is released in the spring.

enjoyed prior to development (i.e., typically as a forested site). This requires that the number of stormwater facilities must increase significantly and that they be dispersed throughout the site. Both factors tend to increase the cost of site development. The prior regulations permitted fewer facilities and in a more concentrated arrangement. (The new stormwater facilities are also reported to increase site maintenance costs significantly; at this time we do not know the cost implications of this aspect of the new regulations).

- *High Performance School Certification*. Since 2008, Maryland has required that all new and replacement schools must achieve high performance building standards (LEED Silver certification or MD-IgCC compliance).[7] There is considerable debate about whether these requirements increase the cost of a school facility above the cost to meet basic code requirements; LEAs report a cost increase in the range of 3% to 5% (including additional architectural and engineering services).

- *Ventilation and Energy Code Requirements*. With the emphasis on energy conservation and indoor air quality, code requirements in these areas have increased significantly in recent years. For example, the goal of ASHRAE Standard 90.1-2010 was to achieve energy savings of at least 30% compared to the same building constructed in 2004; ASHRAE Standard 90.1-2013 mandates additional requirements that are reported to result in a 38% energy savings compared to 2004.[8] It is believed that the cost to achieve these requirements has led to HVAC construction costs that are now fully 30% to 33% of the total cost of vertical construction.

- *Prevailing Wage Rates and Associated Labor Requirements*: Based on a sample of 266 side-by-side bids (i.e., both with and without prevailing wage rates) between January 2012 and December 2015, the average cost increase attributable to prevailing wage rates was 11.7%.[9] The bids were conducted by LEAs in five jurisdictions for 68 separate trade packages associated with 26 separate projects. The average increase for eight (8) mechanical projects in this group was 12.72%; the average increase for 17 roof replacement projects was 9.67%.

  Increases due to prevailing wage rates have been recorded on three major projects:

  - North Frederick Elementary School Replacement, May 2013: 13.98% total increase for 16 accepted trade packages (all included in the list of 266 submitted trade package costs).

  - Annapolis High School Performing Visual Arts Addition, October 2012: 8.45% for 11 general contractors.

  - West Meade Early Childhood Center Kindergarten Addition: 9.96% for 9 general contractors.

  Regulations that apply to projects with prevailing wage rates also lead to a higher ratio of journeymen in relation to apprentices, and forbid the use of laborers or helpers. This means that the profile of workers on the job will shift toward the higher paid trades people, who will receive the generally higher prevailing wage rate rather than the market rate for their trade.

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[7] LEED refers to Leadership in Environmental and Energy Design, a program managed by the U. S. Green Building Council; MD-IgCC refers to the International Green Construction Code as modified for application in Maryland and approved by the Secretaries of DBM and DGS in December 2014.

[8] TRANE *Engineer's Newsletter*, Volume 44-1 2015. ASHRAE stands for American Society of Heating, Refrigeration, and Air Conditioning Engineers; the ASHRAE standards are widely used in American building codes, including in Maryland.

[9] Side-by-side bids provide an incontrovertible test of the impact of prevailing wage rates, because all other variables are held constant: the bidder, the scope of the work, and the time the bid is taken.

- *Emergency Electrical Power Regulations* (COMAR 23.03.02). Regulation requires that every State-funded project that involves a replacement or upgrade of the electrical system must provide full electrical power to areas indicated for sheltering purposes by the Maryland Emergency Management Agency. There is a range of technologies available to meet this requirement, with costs ranging from as low as $25,000 for a transfer switch to $500,000 for a full-power emergency generator.[10]

- *Increased Indirect Costs*: It has been reported that some contractors decline to bid on Maryland school projects not only because there are other attractive opportunities available, but also because they find the regulatory environment for public school construction excessively burdensome. For small contractors in particular, management of the paperwork associated with prevailing wage rates and Minority Business Enterprise (MBE) requirements is difficult because they cannot dedicate an employee to these tasks; concurrently, the penalties for noncompliance are particularly onerous for small contractors working to very narrow margins. Their absence from bids on smaller projects not only tends to drive costs upward, but also means that a rich field of contracting opportunities that are well within their skill capabilities and bonding limits are not being accessed.

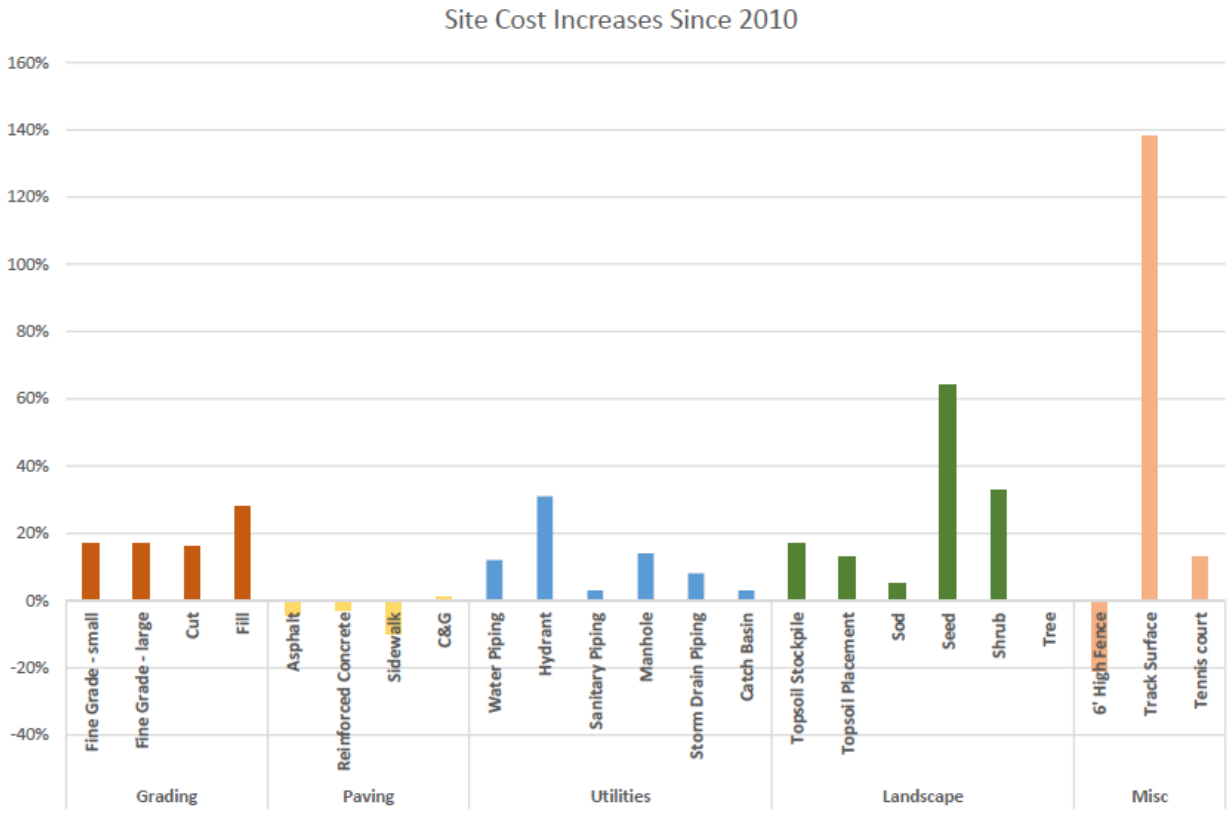
- Schedule: It is reported that substantially longer times are now required to obtain permits, particularly for sitework. This reduces the time available to complete the projects and may result in higher costs associated with acceleration or phasing of construction activities. In addition, for projects that are subject to prevailing wage rates, regulations regarding overtime pay increase project costs beyond the higher costs already incurred due to the wage rates themselves.

- Sites: Particularly in the urbanized areas of Maryland, it has become increasingly difficult to find good sites for school construction. New sites tend to be compromised by size, configuration, access conditions, topography, or watercourses. When the site of an existing school is used for a replacement school and the students cannot be relocated to another facility during construction, efficient sitework is further constrained by the presence of the existing building as well as by phasing and safety considerations. Such sites generally involve higher development costs, requiring soil mitigation or extensive import/export of soils. These increased costs are combined with the increased cost of stormwater management noted above.

  An engineering firm with extensive experience in school design and construction has provided the following chart to show how cost increases have affected almost every aspect of sitework. They particularly note that working on a small, occupied site with steep slopes increases costs significantly.[11]

[10] Emergency generators are now a standard feature of new schools and major renovations, but they are typically sized only for the electrical loads required for emergency purposes (exit signs, alarm systems, emergency lighting, elevator).

[11] Mr. Michael Lambert, P.E., KCI Technologies, Inc., presentation May 6, 2015.



5 Major Areas of Site Construction – General Items in Each Area

The IAC continues to track school construction costs and is in frequent discussion with architects, engineers, and constructors on the variable influences that affect costs. It is actively seeking solutions that will lower construction costs while preserving the integrity of school buildings and supporting the educational program.