DEPARTMENT OF ADMINISTRATIVE SERVICES

School Building Projects Advisory Council (SBPAC)

Report on a Prototype Model School Building Program

Section 223 of Public Act 17-2 (June Spec. Sess.) charged the School Building Projects Advisory Council ("SBPAC" or "the Council") with considering the viability of utilizing blueprints for prototype model school designs for new construction projects to reduce State funding in the design and construction of public schools.

> Sec. 223. (Effective from passage) The School Building Projects Advisory Council, established pursuant to section 10-292q of the general statutes, shall conduct a study regarding the development and implementation of blueprints for prototype school designs for new construction projects. Such study shall include, but need not be limited to, (1) an analysis of (A) the costs associated with the creation of blueprints for prototype school designs for elementary, middle and high schools, (B) the feasibility of boards of education using such blueprints for prototype school designs as part of the school building project grant program, pursuant to chapter 173 of the general statutes, and (C) any cost savings associated with using such blueprints for prototype school designs, and (2) recommendations concerning the implementation of such blueprints for prototype school designs, and whether the use of such blueprints for prototype school designs should be related to reimbursement percentages for school building projects, pursuant to section 10-285a of the general statutes. Not later than January 1, 2019, the School Building Projects Advisory Council shall submit such study to the joint standing committees of the General Assembly having cognizance of matters relating to education and finance, revenue and bonding, in accordance with the provisions of section 11-4a of the general statutes.

The following is a review of the issues relating to blueprints for prototype school designs and a recommendation from the Council.

BACKGROUND

In 2016, Office of School Construction Grants and Review (OSCG&R) worked with Warner Concepts, LLC to conduct a comprehensive review of the state's school design standards and to develop a maximum cost per square foot for School Construction Grant projects. On recommendation of OSCG&R, the SBPAC established a maximum cost per square foot for school construction (see Appendix A) and allowable area limits for reimbursement and adopted the *Connecticut School Construction Standards and Guidelines*. It also made several recommendations to better control expenditures for school construction. OSCG&R adopted many of those policy recommendations to assist communities in the planning and approval of school construction programs. Each of these actions has as its focus the delivery of schools that meet the programmatic needs of the district in which the school is to be constructed, while limiting the approval of construction costs to only those components of a building project that support the school's approved educational program and are both necessary and reasonable.

The SBPAC considered neighboring states' prototype model school design programs in 2014 focusing primarily on the program adopted by Massachusetts in 2008. The Massachusetts model school program was introduced to seek to adapt and re-use the design of successful, recently constructed elementary, middle and high schools. The SBPAC made the

determination that it was more efficient and economical to develop model educational spaces rather than model school designs. Accordingly, the *Connecticut School Construction Standards and Guidelines* were developed by OSCG&R team and Warner Concepts, LLC to include model spaces to guide a school community during programming and planning. Utilizing model spaces allows for flexibility and adaptability to accommodate differing numbers of students and varying grade configurations. This approach, the SPBAC reasoned, offered districts the best opportunity to respond to their desired method of teaching and learning.

Massachusetts re-evaluated its program in 2016 acknowledging the positives and negative attributes of the program. The SBPAC analyzed the Massachusetts self-evaluation in 2018 and studied the issues raised in its own analysis. The concerns about Massachusetts' program which contribute to the SBPAC recommendation not to develop a prototype model school design program are as follows:

COST TO DEVELOP MODEL SCHOOLS

Cost to Develop Designs for Prototype School Buildings

The "Cost to Develop Designs for Prototype School Buildings" table (see Appendix B) outlines the costs of design services up to and including the Design Development Phase for two designs (one single-story and one two-story) for prototypical elementary, middle and high schools. In addition to the design cost for each prototype, the cost of a Construction Manager as Advisor (CM(a)) is included.

All classrooms are planned to accommodate 25 students.

The prototypical elementary school is based on a school for students in grades K through 5 (6 grade levels) - no Pre-Kindergarten students, 3 classes at each of 6 grade levels, therefore an enrollment of 450 students (3 classes x 6 grade levels x 25 students per classroom = 450 students).

The prototypical middle school is based on 6 classes at each of 3 grades levels: grades 6, 7, and 8, therefore an enrollment of 450 students (6 classes x 3 grade levels x 25 students per classroom = 450 students).

The prototypical high school is based on 12 classes for each of 4 grades: grades 9, 10, 11, and 12, therefore an enrollment of 1,200 students (12 classes x 4 grade levels x 25 students per classroom = 1,200 students).

Thus the pathway is 2 elementary schools transitioning to one middle school and 2 middle schools transitioning to one high school.

Costs Basis

An elementary school for 450 students will provide 125.33 square feet (SF) per student, thus building will be 62,040 SF gross. If the cost is $365 per square foot, then the building construction cost is estimated to be $22,644,600. Based on the construction cost of two buildings, fees for Design Consultant and Construction Manager as Advisor to develop designs for two ES prototypes through Design Development is approximately $1.67M.

A middle school for 450 students will provide 168 SF per student, thus the building will be 83,160 SF gross. If the cost per square foot is $365 per square foot, then the building construction cost is estimated to be $30,353,400. Based on the construction cost of two buildings, the fees for the Design Consultant and Construction Manager as Advisor to develop designs for two MS prototype through Design Development is approximately $2.23M.

For the high school of 1,200 students 180.5 SF per student will be needed, thus the building will be 238,260 SF gross. If the cost per square foot is $365 per square foot, then the building construction cost is estimated to be $86,964,900. Based on the construction cost of two buildings, the fees for the Design Consultant and Construction Manager as Advisor to develop designs for two HS prototype through Design Development is approximately $6.09M. (See Appendix B)

It is important to note that this would be the estimated cost of developing the initial versions of these prototype model school designs. Dynamics, including those discussed below, would have the effect of requiring the fairly frequent updating of the prototype models. In some cases, changing circumstances would make model designs obsolete, altogether. This would require an additional state expenditure in the out years for the updated and replacement prototype model school designs.

Additional Work

In addition to the cost to develop six prototypes, there will be a cost to implement the prototypes for individual school construction projects. The cost to implement a prototype will vary depending on site conditions, site limitations, highest projected enrollment, school's grade configuration, specific requirements of educational program, and changes to codes effecting school buildings. Because of these and other project variables prototypes are not anticipated to result in cost savings to districts.

FEASIBILITY OF THE USE OF MODEL SCHOOL DESIGNS

The practical use of prototype model school designs include considerable challenges. These challenges effect whether their use by school districts will allow them to advance local goals. The challenges would tend to have a negative effect on the use of prototype and any cost savings. These factors include:

Ability of a model school design to respond to site conditions

Perhaps the most common reason cited for not selecting or approving a model school design is the fact that no two sites are the same. This is one of the reasons that the model school program in Massachusetts is utilized by only 11% of their new (core program) building projects. Site configuration, access and topography impact building layout, structural design and building orientation all vary from project to project and such variances limit the utility of a prototype blueprint. Changes in any of these factors can impact design and construction costs. Because site costs can vary greatly between projects, the SBPAC recommended that these factors be reviewed and approved for reimbursement on a case-by-case basis even though traditionally considered as a part of the building construction costs. Doing so allows OSCG&R to compare and control building construction cost per square foot between projects. Massachusetts modified their program in 2016 to recognize the various degrees of site development required as part of their evaluation and approval process.

Limited ability of a model school to respond to changes in educational pedagogies

While the intent of the Massachusetts program was to select model projects that are efficient, easy to maintain, sustainable and contain optimal classroom and lab designs, reviewers acknowledge that the way districts deliver their programs can be impacted by the design of their facility. Unless an educational program matches that of the model school, compromises will be made to the program in accepting the design. In their review of the model school program, Massachusetts cited as a concern that a model school design is not directly based on the district's educational program and that it can limit design creativity in response to specific educational needs. In developing the *Connecticut Construction Standards and Guidelines*, Connecticut has addressed these issues by creating a document that allows flexibility and is intended to be modified with ongoing changes in how districts teach, new construction technologies and materials, and evolving building codes.

Impact of legislated requirements on model designs

Building design is impacted not only by changes in building codes but also by changes in legislation. As an example, Connecticut has adopted security standards that most other jurisdictions have not begun to codify. The impact of these standards is only now being realized in completed projects. This makes the availability of completed projects from

which to develop a catalog of designs for elementary, middle and high schools from which districts can select extremely limited. Additionally, Massachusetts recognized that, because of this and other changes, model school designs could become obsolete. This complicates the process of recommending model schools that are intended to represent optimal design.

Massachusetts Model As An Alternative

A different approach to establishing prototype model school designs other than those used in the cost estimate, above, would be, as Massachusetts does, judge the designs of certain schools that have actually been built as the state prototype model designs, to then offer those for use by other districts. The advantage to this approach would be to obviate the need for the state to fund the creation of designs, the cost of which are estimated above. In Massachusetts, schools districts are encouraged to use the model plans as a means of getting projects on the street sooner to reduce impact of cost escalation. But, when, with this approach, a school district elects to use a state prototype model design, they are also choosing to use the particular architectural firm which designed the school judged to be a prototype model design. Because of the limited number of approved model school designs, only select architectural firms would qualify for district projects that are approved to pursue use of a model school building design, thereby reducing competition and potentially increasing costs. This approach also means prototype model designs, since they came from past school projects are static and do not incorporate up-to-date design features for educational needs or changes in law, increasing the cost of re-working the designs to meet current requirements.

To encourage districts to use their prototype model designs, Massachusetts has provided districts with grant incentives. However, Massachusetts found that savings in design were being potentially offset by these incentives and the cost of design changes required to adapt a school design. Changes in design staff and consultants are also cited as concerns for the cost effectiveness of their model school program.

Currently, Connecticut legislation requires districts to seek qualifications and proposals from at least four design firms which, if the cost for design services are compared between states, has more than offset any savings that would be gained by adopting a prototype model school program. Also, Connecticut, through its quality based designer selection process, provides districts with the opportunity to engage a design firm whose previous work they find compatible with their needs and with an appropriate fee based on the services required. Also, Connecticut has made process changes to reduce time required to complete designs for bidding in order to address concerns about cost escalation. Further improvements in the Connecticut process are still being evaluated, and the SBPAC may make future recommendations regarding the education of districts in developing appropriate Requests for Qualifications (RFQ) and Requests for Proposals (RFP).

Potential for reduced costs

Reviewers cite as benefits of the Massachusetts model school program that adaptation of an existing design will streamline the design process, saving time and escalation costs, and reduce changes orders during construction. To address these same issues, the Office of School Construction Grants & Review has adopted numerous process changes to improve and facilitate communications with districts and design teams. OSCG&R staff is now working closely with school districts and their design teams, beginning with the initial conception of a project. OSCG&R is asking school districts to look not only at the specific schools they are thinking of building or renovating, but to examine their entire districts, how all of the districts' facilities are currently being utilized, and how the districts have proposed to utilize their schools in future years. Hence districts must relate their facilities to changing demographics, and develop a district-wide plan to address current physical conditions, current demographics, future demographics to include regionalism, and their ability to maintain their facilities. Thereafter OSCG&R staff continues to work closely with the school district and design team to ensure that a proposed project does, in fact, address the Educational Specifications and the design and budget are both reasonable and appropriate.

POLICY RECOMMENDATION

The SBPAC believes while there are some positive attributes to a prototype model school building program, the benefits from the current OSCG&R design and construction process outweigh those attributes and have both the flexibility to deliver educational facilities that are responsive to individual district's program and the protocols in place to control costs. Those protocols have greatly reduced costs since 2015.

A significant aspect of the new policy direction is the prioritization of right-sizing facilities and investigating renovation and consolidation of existing facilities in lieu of building new. New school construction is a last resort, therefore few new schools are being built. The ultimate decision whether to build a new school facility or renovate an existing school funded under the School Construction Grant program is dependent on approval by OSCG&R and the legislature.

Since the ongoing changes have resulted in substantial cost saving and other improvements to the School Construction Grant program, continuing, encouraging and supporting the state's school construction policy development is the most advisable course of action.

Maximum Cost Per Square Foot

Purpose: Evaluation of Connecticut School Construction Costs for Validation of Proposed $320/sf Direct Cost of Construction.

Data: Actual Cost Data from "Closed Projects" provided by OSCGR

Evaluation: Using "Construction Start Deadline Date" in the cost data to establish time of direct cost, the direct cost is escalated to current cost using Historical Cost Indexes. By so doing, costs from different times are brought to a common time, i.e. the current time, in order to provide meaningful evaluation.

Results Table:

Initial Information		72	Count of Schools in "Closed Projects"
Deduct Abnormals		2	Relocatable Classrooms
		1	Addition
		5	Central Administration
		1	transfers grant commitment to Goodwin College
Projects with Costs		63	New School Projects with Costs (includes Magnets and VoAg)
Magnets School Projects	$	473.30	Average Direct Cost of Construction - 15 magnet school projects - all at 95% or 100% reimbursement rate
VoAg School Projects	$	380.50	Average Direct Cost of Construction - 6 VoAg school projects - all at 95% or 100% reimbursement rate
21 of 63 Projects are either Magnet or VoAg. Because Magnets and VoAg represent distinct school types, statistics this box EXCLUDE Magnet and VoAg:			
Analysis of New School Projects with Costs	$	335.64	Average Direct Cost of Construction all Projects
	$	356.59	Average Direct Cost of Construction - Elementary Schools
	$	304.74	Average Direct Cost of Construction - Middle Schools
	$	313.68	Average Direct Cost of Construction - Secondary Schools
Estimate Validation Statistics	$	320.00	Proposed Max Direct Cost of Construction per Square Foot
		22	Number of New School Projects with Costs at or below Proposed Direct Cost of Construction
		52%	Percentage of Projects (all types, excl magnet / VoAg) with Direct Cost of Construction <$320
Reimbursement Rate Statistics	$	314.70	Average Direct Cost of Construction with < 25% reimbursement rate
Excludes Magnet & VoAg	$	304.39	Average Direct Cost of Construction with < 50% reimbursement rate
	$	364.05	Average Direct Cost of Construction with > 50% reimbursement rate
	$	398.82	Average Direct Cost of Construction with > 75% reimbursement rate

Conclusion: $365 maximum building construction cost per square foot for new construction

OSCG&R data for "closed" projects with a construction start deadline date from 1998 through 2010 were analyzed and translated to current dollar values with the conclusion that a reasonable "building construction cost" in 2016 is $365/SF.

Implementation is intended for projects for which a grant application is submitted to OSCG&R on or after July 1, 2017. Before implementation the $/SF-cost will be re-evaluated. The re-evaluation will include more current data from LEA - "finalized" projects submitted to OSCG&R, reinforcing the validity of the $/SF-cost for Connecticut projects in 2017 dollars.

Appendix B: Cost Estimate of Developing Prototype Model School Designs

Cost to Develop Designs for Prototype School Buildings (Refer Notes 1 and 7)

Revised 01/03/2019

School Type	Design Variations	Grade Range	Average SF/student	Total Building Enrollment	Net Building SF	Gross SF	SF Cost of Building Construction	Building Construction Cost	Design Consultant Fee (%)	Design Consultant Fee ($)	Construction Manager as Advisor (CM(a)) Fee (%)	Construction Manager as Advisor (CM(a)) Fee ($)	Total Cost to Develop Designs for Prototype School Buildings (Total Fees $)
		(Refer Note 2)	per Regulations (refer Note 3)	(Refer Note 2)	Enrollment x SF/student (Refer Note 3)	Net SF x1.1 (Refer Note 4)	$/SF (Refer Note 5)	Gross SF x $365/sf (Refer Note 5)	thru DD so say 35% of 7.5% for ES and MS...of 7% for HS (Refer Note 6)	(Refer Note 6)	35% of 3% = .0105 (Refer Note 6)	(Refer Note 6)	(Refer Note 7)
Elementary School	Single Story Design	Grades K through 5	125.33	450.00	56,400.00	62,040.00	$365	$22,644,600	2.63%	$594,421	1.05%	$237,768.30	$832,189
	Two Story Design	Grades K through 5	125.33	450.00	56,400.00	62,040.00	$365	$22,644,600	2.63%	$594,421	1.05%	$237,768.30	$832,189
Middle School	Single Story Design	Grades 6, 7, and 8	168.00	450.00	75,600.00	83,160.00	$365	$30,353,400	2.63%	$796,777	1.05%	$318,710.70	$1,115,487
	Two Story Design	Grades 6, 7, and 8	168.00	450.00	75,600.00	83,160.00	$365	$30,353,400	2.63%	$796,777	1.05%	$318,710.70	$1,115,487
High School	Single Story Design	Grades 9 - 12	180.50	1,200.00	216,600.00	238,260.00	$365	$86,964,900	2.63%	$2,130,640	1.05%	$913,131.45	$3,043,772
	Two Story Design	Grades 9 - 12	180.50	1,200.00	216,600.00	238,260.00	$365	$86,964,900	2.63%	$2,130,640	1.05%	$913,131.45	$3,043,772
				Total Cost to Develop Designs for Prototype School Buildings (Refer Note 7)						**$7,043,675**		**$2,939,220.90**	**$9,982,896**

Notes:

1. June Special Session, Public Act. No. 17-2 calls for the School Building Projects Advisory Council to "...conduct a study regarding the development and implementation of blueprints for prototype school designs for new construction projects."
2. Grade configuration can vary with LEA.
   ES assumes no PreKindergarden and 3 classes per grade (6 grades x 3 classes per grade x 25 students per class = 450 students).
   MS assumes 6 classes per grade 9 (3 grades x 6 classes per grade x 25 students per class = 450 students).
   HS assumes 12 classes per grade (4 grades x 12 classes per grade x 25 students per class = 1,200 students).
3. Square feet (SF)/Student is based upon current published State Agency Regulations and calculates to the interior face of exterior walls (i.e. Building Code calculation)
4. Gross SF adds 10% for exterior walls (standard for cost estimating).
5. $365 per SF is current allowable building cost as established in "Connecticut School Construction Standards and Guidelines."
6. Design Consultant fee and Construction Manager as Advisor (CM(a)) pre-construction fees are based upon DAS-CS project guideline.
7. In addition to the cost to develop 6 prototypes, there will be a cost to implement the prototypes for individual school construction projects. The cost to implement a prototype will vary depending on site conditions, site limitations, highest projected enrollment, grade range of school, specific requirements of educational programs, and changes to codes effecting school buildings. Because of these and other project variables, prototypes will not result in cost savings to the District.

Appendix C: Other Documents

Connecticut School Construction Standards and Guidelines

SBPAC Report: February 7, 2014