



Building Quality Schools:

Revisions to the School Construction Formula and Recommendations on Standards

**School Construction
Planning Committee:
Report and Recommendations**



**Institute for Public Administration
College of Human Services, Education & Public Policy
University of Delaware**

and the

Delaware Department of Education



“When we build, let us think that we build forever. Let it not be for present delight nor for present use alone. Let it be such work as our descendents will thank us for: and let us think, as we lay stone on stone, that a time is to come when those stones will be held sacred because our hands have touched them, and that people will say as they look upon the labor and wrought substance of them, ‘See! This our parents did for us.’” John Ruskin

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School Construction Committee 2000-2002 Members

Andrew Brandenberger, Cape Henlopen School District
Kevin Carson, Woodbridge School District
Jeffrey Edmison, Christina School District
Robert Hershey, Appoquinimink School District
Dave Hill, Budget Office
Steve Hudson, Colonial School District
Edward Lupenik, JAED Corporation
William Lybarger, Department of Education
Richard Moretti, Red Clay School District
Michael Morton, Office of the Controller General
Jack Nichols, Department of Education (Retired)
Alexander Settles, University of Delaware
Buck Simpers, Buck Simpers Architects & Associates
Nicholas Vacirca, Department of Education
Mark Dufendach, Department of Education
Jerry Gallagher, Department of Education
Vic Valeski, Caesar Rodney School District

Executive Summary

The construction of an educational facility is the first step in bringing the educational process and philosophy to reality. Through the years, new designs, educational philosophies, architectural creativity, and styles have influenced school design. The most prevalent of all the goals in educational planning is to construct a school in a cost-effective manner that supports the educational process. A facility should enhance, not detract from, the ability to learn.

Significant school construction and renovation projects are planned throughout the state of Delaware over the next five years. In FY 2003, over \$345 million in requests for school construction, renovation, and minor capital project funding was submitted to the Delaware Department of Education (DOE) from Delaware's nineteen school districts. The adopted budget for FY 2002 contained \$95.7 million for school construction. The Governor's Recommended FY 2003 budget contained \$107.9 million for school construction.

Construction and renovation projects are planned and underway across the state. In addition to current projects, school districts from Brandywine to Indian River have held or will hold referendums to request additional funds for capital improvements. Recognizing the extent of school capital improvements planned or underway, the Department is concerned about the quality and financing of these capital projects. As we forge our way into the future of school construction, The State of Delaware and local school districts will need to build structurally sound and educationally effective school facilities in support of our students.

The General Assembly requested in House Concurrent Resolution 17 that the School Construction Planning Committee conducts a systematic review of the current School Construction Formula and to examine the need for standards in school construction. The Committee also reviewed related issues such as standard school plans, school site selection, the impact of technology on school design, and the increase in school facility use and operation. The Committee met from November 2000 until January 2002 and issued a summary of meeting notes in May 2002 and this report in September 2002.

The Committee examined school space needs previously established by another review committee in the early 1990's. The purpose was to determine the new space demands placed on schools due to curriculum evolution and programmatic changes. The School Construction Formula serves two purposes: it sets a square foot cost, and it sets a total square foot size of a new school based on general guidelines for space allocation for different activities within elementary, middle and high schools. The Committee recommends a small increase in the size of classrooms and additional space for those programmatic needs, which are now required by federal or state guidelines. The Committee also recommends establishing a new vocational high school formula of 225 square feet per student.

The Committee gathered and evaluated data on the cost of new construction and the increases in labor and material costs which are driving the current construction cost per square foot to exceed previously established numbers. Previous formulas have not been tied to inflation rates in either the costs of labor or materials. An extensive review of increased construction costs, cost of using high quality long life cycle materials, and the costs of maintenance of schools was also

completed. On the basis of this review, the Committee supports the current allocation of \$175 per square foot for new construction of elementary and middle schools, and recommends an increase to \$181 per square foot for high schools. The latter includes additional \$6 for site work and athletic fields. The Committee further recommends that the increase in the square foot rate be tied to the use of materials that meet DOE defined standards, ensuring long life cycle and reduced maintenance costs.

The Committee recommends that a minimum set of material-based construction standards be established for new construction and renovations. When developed, these standards should be an Education Supplement to a set of statewide Construction Standards or a stand-alone set of specifications for DOE. Districts will receive these standards prior to the development of plans. DOE will require adherence to the standards for construction through the school plan approval process. These standards will include the need for heating, cooling, and ventilation for a 12-month school; electricity and connectivity issues related to technology; and materials, which establish a predetermined life cycle for each building. The intent of this recommendation is to reduce the long-term maintenance and renovation costs for schools. The DOE will be able to grant waivers on a case-by-case basis as long as the substituted materials and designs meet the goal of long-term durability.

Delaware school districts have entered into a phase of increased school construction. The committee recognizes the need for architectural and design guidance as school districts begin, in some cases, to build the first new schools in over twenty years. The Committee does not recommend the adoption of standard plans but does recommend the development of stock plans for classroom additions and a plan repository at the DOE to guide districts in new construction and renovation.

The Committee also reviewed the need for increased guidance in school site selection. Governor Minner signed Executive Order 14 that requires state agencies to review policies for compliance with the adopted State Development Goals. These goals require state agencies to direct state investment into existing communities, urban concentrations, and growth areas including the construction of state funded facilities such as schools.

The Committee supports the increase in the ceiling of the minor capital program for schools from \$250,000 to \$500,000 per project, bringing it in line with current provisions for other state agencies. At the same time the Committee does not recommend that school districts be allowed the ability to construct additional space using minor capital program funds. Although the Committee disagrees about the need for more flexibility for school districts in using their minor capital funding to hire maintenance personnel, it does recommend the revision of the current custodial allocation process in order to include an allocation for maintenance personnel.

The Committee recommends that the formula for allocation of Minor Capital Improvement (MCI) funds be revised to provide sufficient maintenance and repair funds. The Committee recommends that the amount allocated for MCI, for repair and maintenance, be based on four percent of the replacement cost of a facility. The Committee strongly recommends the equalization of the minor capital program. The process of equalization and revision of the MCI formula could be implemented over a ten-year period.

Along with the recommended funding levels, the Committee believes that some changes can be made to the major capital improvement process. The Committee supports changes to the major capital improvement program to include lengthening the time between submissions, narrowing the scope of major capital projects to additions to schools, replacement schools of at the end of the building life-cycle, and new schools needed for expanded student enrollment only, and the implementation of ten-year strategic facility plans.

As a final recommendation, the Committee supports a complete review of the current custodial program. Schools are the centers of communities and as centers of the community the use of facilities has increased, daily hours of operation have been extended, and athletic fields open to non-school use have become standard. Issues such as custodial allocation, initial custodial training, and follow-up training should be addressed. A new committee should be charged with evaluating the custodial allocation process and training program.

Background

The School Construction Formula is a set of guidelines for new school facilities that establishes overall school size for different types of schools at specific student enrollment levels for new construction. The formula contains recommended square feet for specific uses that are used as a basis to build the overall square feet for the school. The State of Delaware established standards for school buildings and sites in 1948 and adopted a school construction formula in 1953 to define its financial participation in local school district construction. This formula was modified in 1967 and 1968 and allowances were added to the formula in the 1970s and 1980s in an ad hoc basis. The formula was re-examined in the mid 1990s and partially adjusted to reflect changes in philosophy concerning classroom size and programming needs within schools.

In the mid-1990s, the Committee concluded the following: (1) classroom per pupil space should be larger, (2) additional space was required for students with Special Education needs who were now included in regular school environments, and (3) the state's Architectural Accessibility Act and the Americans with Disabilities Act have a profound effect on useable square footage. These factors have, once again, been included in the recent review of the space formula and refinements have been made.

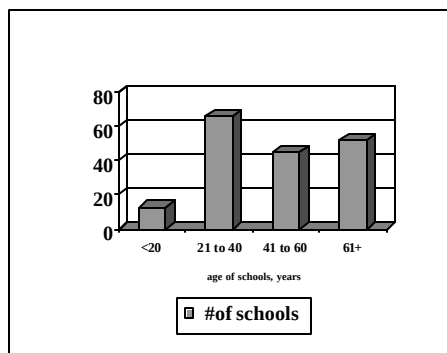
The expanded use of technology continues to impact how schools are designed and operated. As a teaching, learning, and administrative tool, technology requires additional space for managing technology, telecommunications, electrical utilities, and in-classroom design space.

Current Environment: Delaware Schools in the Year 2000

The State of Delaware and its 19 school districts are involved in construction and renovation projects totaling over \$500 million. The increasing population in southern New Castle County and Sussex County has translated into a need for additional and renovated school facilities. School districts in northern New Castle County and Kent County need to renovate and update schools to serve their current school population.

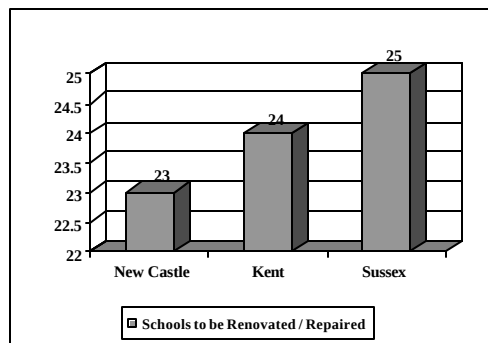
On average, Delaware schools are older than 40 years and a substantial number of schools are over 60 years in age (Figure 1).

Figure 1
Ages of Delaware Public Schools
(Source: 2000 UD-IPA and DOE study)



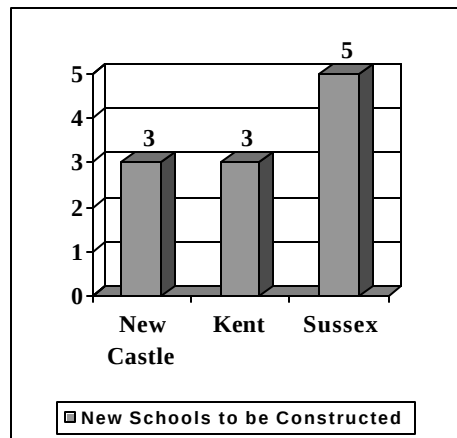
The number of schools to be renovated or repaired submitted by school districts are shown in Figure 2.

Figure 2
Schools to be Renovated/ Repaired
(Source: 2000 UD-IPA and DOE study)



In the same time the majority of new schools proposed or under construction are in New Castle and Sussex Counties due to increases in population and the ages of existing schools within those districts (see Figure 3). New schools to be constructed are in school districts that have faced rapid growth in housing and student populations.

Figure 3
New Schools by County
(Source: 2000 UD-IPA and DOE study)



School Construction

School construction has been increasing significantly over the last eight years. Older and less expensive building systems are becoming too costly to continue to operate and repair. However, more money is being spent on adding to and renovating existing buildings, rather than on constructing new schools. This trend is expected to continue because of increasing enrollments, deteriorating buildings, special programs that require additional space, and the impact of technology on education.

DOE utilizes a standard school construction formula for determining the cost of new school construction for all Delaware school districts. These costs are used as the base upon which state aid for school construction will be allocated to the various districts. The Committee examined the existing school construction formula and the addition of construction standards.

School Construction Standards

The goal of school construction is to construct facilities in a cost-effective manner that supports the facilities' appropriate life cycle based on budgetary considerations. When a school facility is constructed using the proper materials and systems, and generates the proper atmosphere, the educational process is enhanced. The absence of construction standards may lead to a situation where the dollars expended on capital improvements may not produce a product that gives the state its full return on investment. As present facilities are renovated, tax dollars may be expended on duplicative, uncoordinated, or inappropriate repairs. As sub-standard and antiquated systems fail, more and more dollars will be spent on renovations that may have been avoided if a proper system was designed or specified at the beginning of the renovation or construction project.

Studies have demonstrated that a well-planned, well-designed, and properly constructed facility greatly improves the educational environment. A 1998 study by the Carnegie Foundation for the Advancement of Teaching reports that student attitudes about education are a direct reflection of their learning environment. Four additional studies have been conducted reporting a positive link between facility and student achievement (McGuffey, 1982). McGuffey's two general conclusions were that: (1) obsolete and inadequate school facilities detract from the learning process, whereas modern, controlled physical environments enhance it, and (2) facilities have a differential impact on the pupils in different grades and for different subjects.

Proper building maintenance has been found to be related to better attitudes and fewer disciplinary problems in one cited study (Cash 1997). Inadequate or unavailable air conditioning can be a major deterrent to education. Inadequate air conditioning has effects on attention span and comprehension. Research indicates that the quality of air in public school facilities may significantly affect students' ability to concentrate (Cash 1997). The evidence suggests that youth, especially those under ten years of age, are more vulnerable than adults to the types of contaminants (asbestos, radon, and formaldehyde) found in some school facilities (Andrews and Neuroth, 1988).

Lowe (1998) interviewed state teachers of the year to determine which aspects of the physical environment most affected their teaching. Those teachers pointed to the availability and quality of classroom equipment and furnishings, and ambient features such as climate control and acoustics, as the most important environmental factors. In particular, the teachers emphasized that the ability to control classroom temperature is crucial to the effective performance of both students and teachers.

Studies of working conditions in urban schools concluded that “physical conditions have direct positive and negative effects on teacher morale, sense of personal safety, and feelings that the district cares about what went on in the building.” In dilapidated buildings in another district, the atmosphere was punctuated more by despair and frustration, with teachers reporting that “leaking roofs, burned out lights, and broken toilets were the typical backdrop for teaching and learning.” (Corcoran et al., 1988)

On March 9, 1999, a survey was sent to a combination of fifty-one architectural and engineering firms, buildings and grounds supervisors, and educators. The survey was conducted as part of a Master’s Thesis by Nicholas Vacirca for Wilmington College. The survey consisted of 11 questions pertaining to the implementation of school construction standards. Of the 51 surveys sent, 39 surveys were returned, for a return rate of 76 percent (see Figure 4, below).

Figure 4
Percentage of Surveys Returned

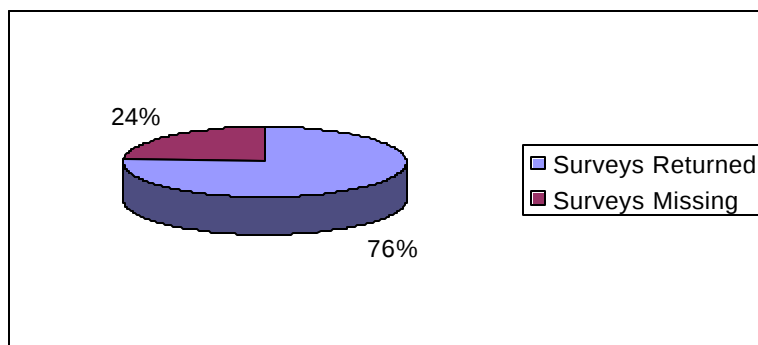
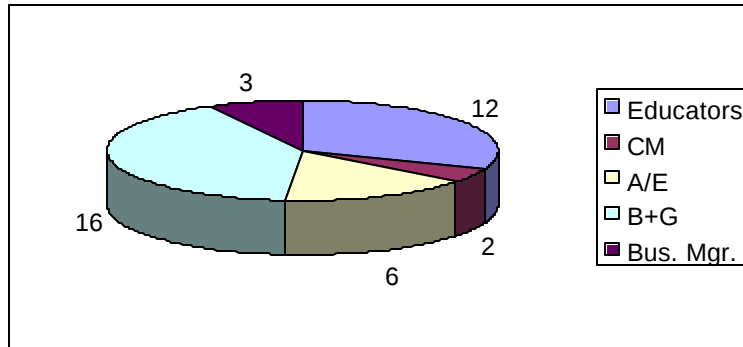


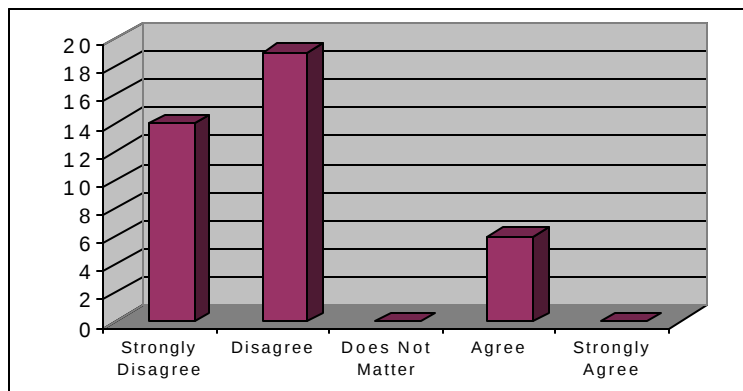
Figure 5 shows the breakdown of respondents by job classification. There was a total of sixteen buildings and grounds supervisors, individuals directly involved in school construction; twelve educators, individuals concerned with the layout of a facility; six Architectural/Engineering firms, organizations directly involved in school design and construction; three construction managers, organizations directly involved with school construction; and two business managers, individuals concerned with the financial aspects of school construction.

Figure 5
Individuals Surveyed by Job Category



The current process of school construction does not guarantee any value to the school facilities that are constructed. (Figure 6)

Figure 6
The Present System for School Construction Is Adequate
(does not include funding)



The school district administration makes suggestions to the architectural firm in relation to what is important to have in a new school. The administration also suggests certain designs or layouts that it wants. The selected architectural firm then turns those ideas into schematic designs of the proposed school. After several revisions to the design, a final design is completed. In some cases, the results of this design process indicate that the facility infrastructure may not be appropriately planned. The facility infrastructure is comprised of the systems that run the building's daily operations.

After a final design is established the architect, engineers, and construction managers estimate the cost to construct such a facility. The cost of the facility is then presented to the local school district. If the cost to construct a school does not match the dollars that were approved in the referendum, the group will begin to eliminate items until the cost of the facility and the dollars approved are equal. At this point in the process, cost cutting may to stay in budget remove or reduce the quality of the facility infrastructure. The items that are typically reduced first are those items that comprise the infrastructure of the building. Reducing the infrastructure of the facility to benefit the architectural wishes of the administration is not forgiving, resulting in the dissatisfaction with the existing process from a long term cost standpoint.

Implementation of school construction standards will guarantee that the infrastructure of a school facility will not be subject to reduction in investment to support other educational wishes (Figure 7, below). If the infrastructure of a building (roof, mechanical system, electrical system, floors, and windows) is established as a given, the State can guarantee an economic value to the school facilities it constructs (Figure 8). Once the infrastructure of a facility is in place, additional changes to the school could be made with less of a financial impact. School construction standards will also benefit the cost estimation of new and renovated school facilities. Standards establish a baseline from which to build.

Figure 7
Implementation of School Construction Standards Will Improve School Facilities

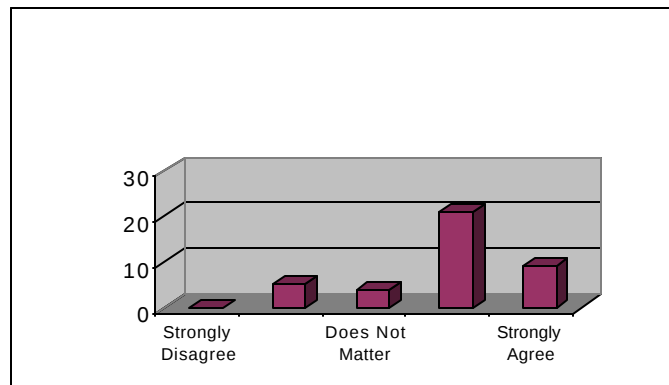
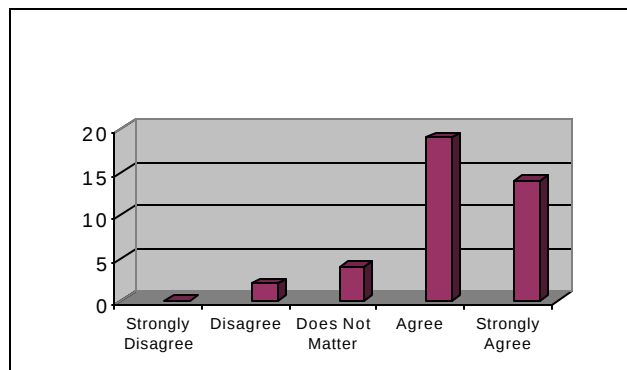
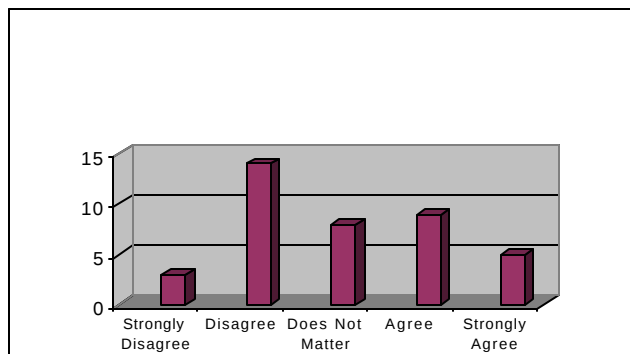


Figure 8
School Construction Should Be Based on Life Cycle Cost



School designs have varied based on the tastes of architects, engineers, educators, and school board members. School facilities have in some cases become statements of prevailing fashion at a particular time. One concern of standardizing school construction is that all schools would start to look alike. The implementation of school standards would attempt to take any design creativity away from the architect, engineer, or the school district (Figure 9, below).

Figure 9
Construction Standards Diminish Design Ownership of an Architect/Engineer



The school district and the architectural firm determine the shape, layout and color scheme of a school. Implementation of school construction standards establishes a minimum baseline for the design and construction of a school. Nothing in the process withholds the school district from constructing something better. The standards give the district and architects a base from which to work. With the implementation of school construction standards, architectural firms are able to proceed with the design of the school facility at a much quicker pace due to “off-the-shelf designs” and clear guidance from the state Department of Education. Implementation of school construction standards may reduce the research, design, and specification time for renovations and new constructions.

Implementation of school construction standards helps to eliminate the burden of making a choice between facility infrastructure and amenities at the local school district level. By implementing school construction standards, the amount of time spent by the school administration on school design should be reduced.

School district personnel will still be afforded the opportunity to give input on school design and layout. School construction standards give the school district a baseline from which to operate. In addition, individuals who are not well versed in construction methods and systems will have information and guidance to avoid decisions that may adversely affect the long-term operation of a facility. Administrators should be administering, while architects, engineers, and construction personnel should focus on the needs for proper systems in building operation. Of those surveyed many believed that construction standards would diminish local input into the overall design process (Figure 10), but the majority believes that the State should adopt standards for construction materials (Figure 11). The survey and the committee discussions indicate

acceptance of materials standardization and the “right” sort of guidance for construction standards.

Figure 10
Construction Standards Diminish Input from the Local School District

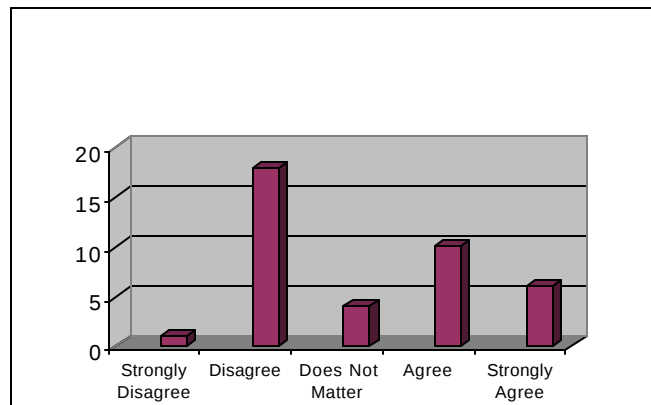
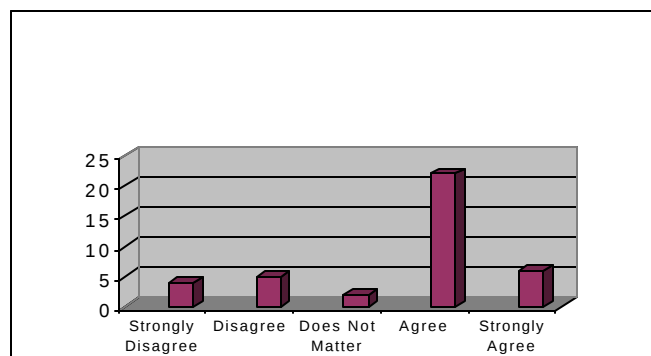


Figure 11
Delaware Should Adopt Standardized School Construction Materials



In addition to the approval for the use of school construction standards is the understanding that material standards will also improve purchasing, maintainability, and reparability of our school facilities, as shown in Figures 12, 13, 14 and 15.

Figure 12
Standard School Construction Materials Will Improve Purchasing

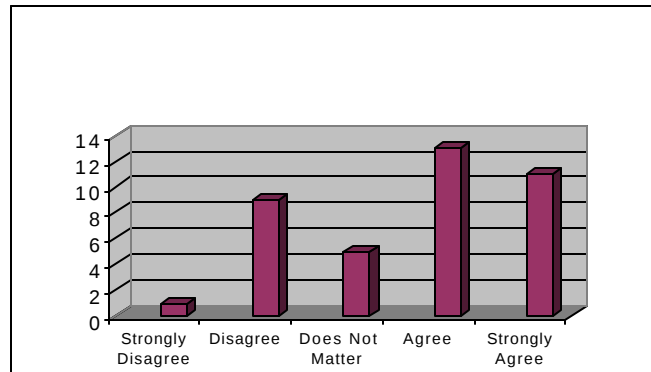


Figure 13
Standardized School Construction Materials Will Improve Maintainability

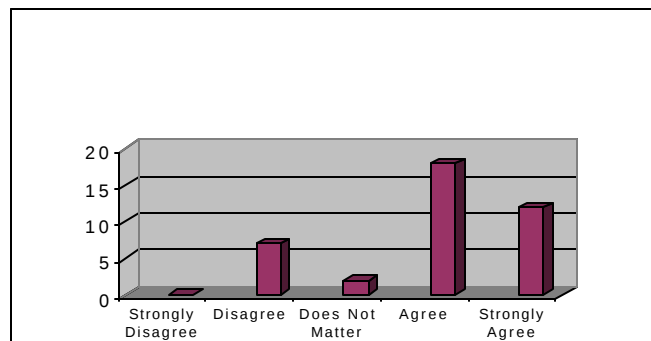


Figure 14
Standardized School Construction Materials Will Improve Reparability

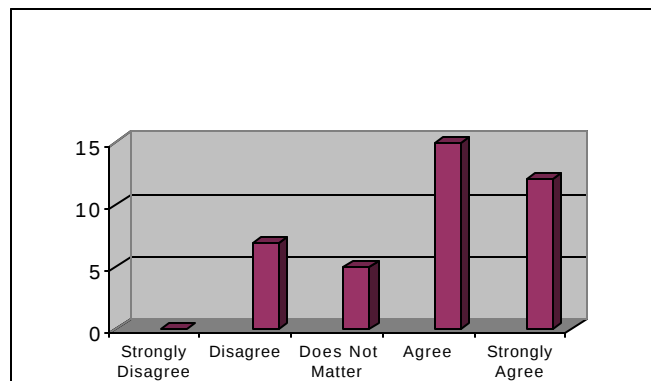
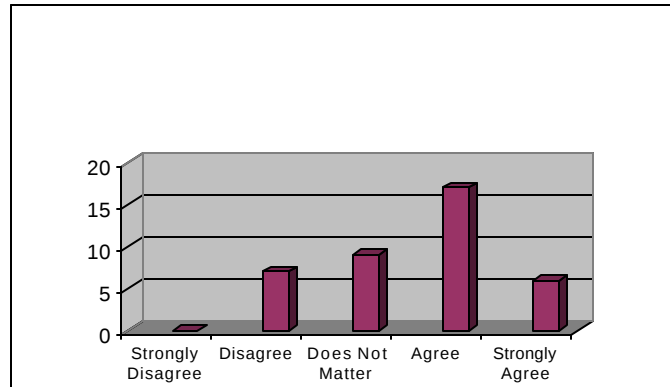


Figure 15
Life Cycle Cost Is the Best Method for Choosing Construction Materials and Equipment



Several additional comments were made on the survey forms in regard to the establishment of school construction standards. The comments were:

- “Recommendations are OK, but I wouldn’t want to see mandatory standards.”
- “A qualified educational design-oriented architect can determine the best valued material for the budget. Probably products that have competitive bidding will create the best value.”
- “Standard materials will make all the schools in Delaware look the same. Increased funding should be used to build more program space not just ‘Taj Majal Materials.’”
- “Cost per square foot is too low for school construction.”

In conclusion, the overall opinion of the group surveyed is that the implementation of school construction standards would benefit all involved in the design, construction, and maintenance of Delaware’s school facilities.

In its report on the condition of urban schools, the Carnegie Foundation for the Advancement of Teaching found that schools are under-funded, morale is low, facilities are decaying, and the dropout rate remains high year after year. Other crises - a flood, health epidemic, a garbage strike, or even snow removal - would generate emergency intervention, the Foundation suggests. But the condition of urban schools is met with calm acceptance (Carnegie Foundation for the Advancement of Teaching, 1998). Previous topics strongly suggest the benefits of implementing school construction standards.

The implementation of school construction standards means that the State of Delaware and local school districts will not need to create from scratch specifications every time a school facility is renovated or constructed. The focus will be to give design options to organizations, where appropriate, while considering the technological, physical, business and human resource implications. As with financial planning, school facilities are long-term investments for the State of Delaware and the local population that supports these schools. Building disposable schools is

not the solution. If schools are to be treated as long-term investments, then the State needs to plan for long-term use. Increased up-front capital expenditures for major renovations and new constructions is the best economic investment the State of Delaware and local residents can make in the education system.

The Department of Education, state and local code officials and the Department of Administrative Services currently review school construction. The review provided by DOE and the Department of Administrative Services provides technical guidance to school districts. The other reviews are intended to provide for the safety and welfare of the students and adults that use the facilities and ensure that the schools operate safely. The Committee recommends that additional school construction standards be set to include life cycle analysis of building materials and construction methods. These standards will provide for efficient, economical, structurally sound, and educationally effective school facilities that include long-term operating and maintenance costs in the planning and design process. DOE has the authority, through existing enabling legislation, to adopt standards as part of its review process of school construction plans.

The Committee also examined the use of standardized plans to reduce the cost of design and standardize building and material selection. The Committee did not recommend the use of standard plans, but did recommend that a selection of recently approved plans and examples be provided to school districts in the early stages of the planning process.

The Committee discussed several reasons why stock plans were not beneficial to the State. Though stock plans may be beneficial from a design and construction standpoint, the differences in the delivery of curriculum has a profound effect on school designs. Constructing the same type of school throughout the State would be tantamount to forcing each district to deliver the educational program in the same manner.

States such as Georgia and Florida have researched the use of stock plans and determined that it was not as economical as it seemed. A state would need several stock plans for each grade level and each school capacity. Once a school district changes the required school capacity, a modification would have to be made to the floor plans. Site issues would also cause the design of a stock floor plan to change. Each school site is inherently different and would warrant additional design changes to the layout of the school. The belief is that there will always be the need to modify a plan for each grade, capacity, teaching philosophy, and site. These changes are large enough to prohibit the use of stock floor plans.

Maintenance and Minor Capital Improvements

The Committee recommends that the allocation of a percentage of the building's replacement cost will allow districts to maintain facilities for longer periods of time. The allocation of such amounts will reduce the number of major capital improvement programs that are requested each year. As this funding mechanism is implemented, major capital request would, in the future, only include additions, replacement schools, or new schools. The amount of money allocated through the proposed program will increase the quality of maintenance and life cycle of our facilities.

Benefits of the proposed program include the ability to maintain and repair facilities and the reduction in the number of referendum that are held each year. This would reduce the time between major renovations for facilities. Referendum would still be required for new schools, replacement schools, and additions. A referendum would also be required when a school district would submit a major renovation capital improvement program at the end of a buildings life cycle.

The subtotal of those schools already assessed by the Department of Education would require an annual allocation of \$54 million for maintenance and repair of those school facilities. Not all schools or districts have been assessed to date. The Appoquinimink and Lake Forest districts have not been assessed. The final statewide total would be larger than this estimate. The total amount required for each facility or district would be based on a 60/40 state and local match currently in effect with the Minor Capital Improvements program. The average MCI allocation has been \$7.5 million in recent state budgets, with exception of one-time funding. The proposed program would shift the repair and renovation costs from the Bond Bill major capital program to the Operating Budget Bill MCI program. It is anticipated that by making needed annual schools repairs the long-run costs would be reduced through early and constant maintenance. Renovation projects hopefully would be reduced and the Bond Bill allocation would be used for new or replacement schools.

An additional benefit would be the reduced need for the Department of Education and the Budget Office to contact the school districts to determine the required funding for projects is each fiscal year. Maintenance and Repair (M&R) funding would be allocated to each district in a central fund. The district has the authority to complete any project for any school as scheduled according to their needs. This process would reduce the amount of coordination required between DOE, the Budget Office and the school district. The regulations currently used for the Minor Capital Improvement program should be revised to give appropriate spending regulations within the new M&R program. The new M&R program funding would allow districts to allocate funds to janitorial supplies, site maintenance, equipment filters, parts, and other materials to complete needed M&R. Full-time district employee salaries (custodians, maintenance mechanics, skilled craftsmen) still would not be paid out of M&R funding.

Recommendations

Construction Formula and Square Foot Formula

1. The Committee supports the current allocation of \$175 per square foot for new construction and recommends the establishment of a clear connection between increased funding and the quality of construction to ensure durability and reduce long-term maintenance and repair costs. An additional \$6.00 per square foot should be added to the \$175 per square foot for high school construction for site work and athletic fields. The total cost for high school construction should be \$181 per square foot.
2. The school construction space formulas should be modified to reflect changing demands on schools to provide technology, larger classrooms, and additional specialized instruction services. The recommended school construction formulas are included in Appendix A.
3. The established vocational high school formula should be of 225 square feet per student, based on the last vocational high schools planned between 209 and 246 square feet per student.
4. The Committee should make recommendations for improvements of the School Construction Formula to the Secretary of Education on an annual basis. Establishing the School Construction Committee as the inter-governmental body that reviews, updates and modifies the School Construction Formula is a benefit to the department and the state.

Maintenance and Minor Capital Program

1. To base the allocation of maintenance and repair funds on four percent of the replacement cost of a facility. The current formula for allocation of minor capital funds based on enrollment should be eliminated. The process of implementation should be spread over a ten-year period. Along with the recommended funding levels, the Committee believes that some changes can be made to the major capital improvement process. Implementation of the M&R funding plan would reduce the number of required referenda, reducing the amount of backlog maintenance that occurs due to failed referenda. Funds allocated to the M&R funding plan will carry a three-year life similar to current Minor Capital funding. If adopted, the proposed M&R funding plan would replace the current Minor Capital Improvement program.
2. To increase the ceiling of minor capital program from \$250,000 to \$500,000 per project, bringing it in line with current provisions for other state agencies.
3. To equalize the minor capital program.
4. A review of the current formula for energy funding. Energy funding based on enrollment is insufficient. A new formula based on building size, age, and construction should be established.

Custodial Issues

1. To revise the current custodial allocation process in order to include an allocation for maintenance personnel. A committee should be charged with evaluating the custodial allocation process and training program.
2. The Committee supports a complete review of the current custodial program.

Other Recommendations

1. In cooperation with the Department of Administrative Services set standards for school construction. These standards will guide the design of schools, assist local school districts with choice of materials, and provide accountability in school construction.
2. Assist school districts in selecting school sites under the guidelines outlined by Governor Minner's Livable Delaware program.
3. To clarify the minor capital allocation guidelines in order to include the hiring of contract services for athletic fields maintenance.

Appendix A: School Space Formula

ELEMENTARY SCHOOL SPACE FORMULA

Item	#	480	#	600	#	720	#	840
Kindergarten @ 1300	1	1,300	2	2,600	2	2,600	3	3,900
Classrooms @ 1100	19	20,900	23	25,300	28	30,800	32	35,200
Gym / Cafeteria	1	8,000		10,000		10,000		10,000
Library / Media Center	1	2,000		2,600		2,600		2,600
Administration	1	2,000		2,400		2,400		2,400
Student Services @ 10% of Classrooms	2	300	3	450	3	450	4	600
Health / Nurse	1	800		900		900		900
Music	1	1,000		1,400		1,400		1,400
Art	1	1,000		1,200		1,200		1,200
Faculty Work Room	1	360		360		360		360
Faculty Lounge	1	360		360		360		360
Conference	1	300		300		300		300
Systems / Utilities @ 85	20	1,700	25	2,125	30	2,550	35	2,975
Corridors @ 252	20	5,040	25	6,300	30	7,560	35	8,820
Special Education 10% Capacity @ 38	48	1,824	60	2,280	72	2,736	84	3,192
Sub Total		46,884		58,575		66,216		74,207
8% Walls & Partitions		3,751		4,686		5,297		5,937
Total		50,635		63,261		71,513		80,144
SF / Pupil		105.49		105.44		99.32		95.41

Outside Storage for Elementary School

500 SF

Cost @ \$175/SF: Does
not include site purchase

\$8,861,076

\$11,070,675

\$12,514,824

\$14,025,123

MIDDLE SCHOOL SPACE FORMULA

Item	#	500	#	700	#	1,000	#	1,200	#	1,600
Classrooms @ 900	13	11,700	18	16,200	25	22,500	30	27,000	40	36,000
Physical Education	1	8,000		9,000		11,000		13,000		15,000
Cafeteria	1	3,300		4,900		5,800		6,300		7,000
Library / Media Center	1	2,270		3,370		4,490		5,140		6,440
Administration	1	900		1,900		1,900		2,600		3,400
Student Services @ 10% of Classrooms	2	300	2	300	3	450	3	450	4	600
Health/Nurse/Wellness	1	2,200		2,200		2,300		2,400		2,400
Guidance Office	1	650		750		900		1,000		1,250
Tech. Educ./Exploratory	1	9,100		11,700		14,800		17,800		19,400
School Based Alternative	1	1,400		1,600		2,000		3,000		4,000
Science	1	3,860		5,480		7,720		8,840		10,960
Pupil Activities	1	450		900		900		900		900
Teacher Rooms	1	400		700		700		700		700
Auditorium	1	6,825		7,380		8,400		9,450		12,075
Computer Lab	1	900		900		900		900		900
Special Education 5% Capacity @ 38	25	950	35	1,330	50	1,900	60	2,280	80	3,040
Permanent Obstructions @ 80	44	3,520	54	4,320	71	5,680	81	6,480	103	8,240
Sub Total		56,725		72,930		92,340		108,240		132,305
Toilets, Walls, Storage, Corridors. Utility Rm., & Services @ 33%		18,719		24,067		30,472		35,719		43,661
Total		75,444		96,997		122,812		143,959		175,966
SF / Pupil		150.89		138.57		122.81		119.97		109.98

Outside Storage for Middle School 500 SF

Cost @ \$175/SF: Does
not include site purchase **\$13,202,744** **\$16,974,458** **\$21,492,135** **\$25,192,860** **\$30,793,989**

HIGH SCHOOL SPACE FORMULA

Item	#	500	#	700	#	1,000	#	1,200	#	1,600
Classrooms @ 900	13	11,700	18	16,200	25	22,500	30	27,000	40	36,000
Physical Education	1	10,866		10,973		21,409		21,514		25,532
Cafeteria	1	3,300		4,900		5,800		6,300		7,000
Library / Media Center	1	2,500		3,590		4,700		5,300		6,700
Administration	1	900		1,800		1,900		2,500		3,300
Student Services @ 10% of Classrooms	2	300	2	300	3	450	3	450	4	600
Health/Nurse/Wellness	1	2,200		2,200		2,300		2,400		2,400
Guidance Office	1	600		750		900		1,050		1,300
Tech. Educ./Exploratory	1	17,970		19,970		24,470		25,870		30,470
School Based Alternative	1	1,400		1,600		2,000		3,000		4,000
Science	1	5,380		7,000		8,840		10,680		13,700
Pupil Activities	1	500		840		840		840		840
Teacher Rooms	1	400		700		700		700		700
Auditorium	1	6,720		8,820		10,500		10,500		13,650
Computer Lab	1	900		900		900		900		900
Special Education (Self Contained)		1,200		2,000		2,400		2,400		3,500
Permanent Obstructions @ 80	43	3,440	53	4,240	69	5,520	79	6,320	100	8,000
Sub Total		70,276		86,783		116,129		127,724		158,592
Toilets, Walls, Storage, Corridors, Utility Rm., & Services @ 33%		23,191		28,638		38,323		42,149		52,335
Total		93,467		115,421		154,452		169,873		210,927
SF / Pupil		186.93		164.89		154.45		141.56		131.83
Outside Storage for High School				750 SF						
Cost @ \$175/SF: Does not include site purchase		\$16,356,739		\$20,198,743		\$27,029,025		\$29,727,761		\$36,912,288

**ELEMENTARY SCHOOL
TOTAL FORMULA COMPARISON**

FORMULA	CAPACITY				
	360	480	600	720	840
Current Elementary School Space Formula in Square Feet	30,827	39,913	51,977	60,423	69,530
SF / Student	85.6	83.2	86.6	83.9	82.8
Originally Proposed Elementary School Space Formula in Square Feet	34,781	46,149	57,512	67,303	76,975
SF / Student	96.6	96.1	95.9	93.5	91.6
Proposed Elementary School Space Formula in Square Feet	0	50,635	63,261	71,513	80,144
SF / Student	0.0	105.5	105.4	99.3	95.4

MIDDLE SCHOOL TOTAL FORMULA COMPARISON

FORMULA	CAPACITY				
	500	700	1000	1200	1600
Current Middle School Space Formula in Square Feet	68,157	86,615	112,907	132,392	161,611
SF / Student	136.3	123.7	112.9	110.3	101.0
Originally Proposed 1994/95 Middle School Space Formula in Square Feet	75,228	96,415	122,214	143,361	175,168
SF / Student	150.5	137.7	122.2	119.5	109.5
Proposed Middle School Space Formula in Square Feet	75,444	96,997	122,812	143,959	175,966
SF / Student	150.9	138.6	122.8	120.0	110.0

HIGH SCHOOL TOTAL FORMULA COMPARISON

FORMULA	CAPACITY				
	500	700	1000	1200	1600
Current High School					
Space Formula in					
Square Feet	84,777	105,814	144,995	158,965	196,648
SF / Student	169.6	151.2	145.0	132.5	122.9
Originally Proposed					
1994/95 High School					
Space Formula in					
Square Feet	91,951	113,506	151,778	166,801	206,858
SF / Student	183.9	162.2	151.8	139.0	129.3
Proposed High School					
Space Formula					
in Square Feet	93,467	115,421	154,452	169,873	210,927
SF / Student	186.9	164.9	154.5	141.6	131.8

Appendix C: References

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Appendix D: Meeting Minutes Summary

November 11, 2000

Review of Issues:

- Program effects on the space formula
- Federal & state requirements
- Space needs for district offices
- Space needs for early childhood centers
- Space needs for professional development centers
- District pool formula
- Custodial formula
- Building materials and minimum standards

December 20, 2000

The first item reviewed was the proposed square footage formula presented to the bond bill committee several years ago and formula review and data.

The data compiled by the last committee was reviewed. The information gathered was a list of square footages per student from award-winning schools across the country. Also presented the ranges for square feet per student that the Council of Educational Facilities Planners International (CEFPI) has established. The average square feet per student from the proposed formula from the previous committee falls in line with the CEFPI averages at both the middle and high school levels. The average square foot of the proposed formula falls short of the CEFPI averages at the elementary level.

Data that was presented explained that even though the proposed formula is in line with the national average square feet per student of award winning schools, it is not in line with the regional average square feet per student.

This issue raised the question of planning our formula based on national averages or regional averages. The national average is skewed somewhat based on weather, economics, and funding mechanisms for school construction.

A review of the proposed formula (elementary) on an individual space basis was also conducted. A review of the square foot was undertaken to determine if the square foot allocated for each individual space was sufficient. In many cases the proposed formula allocated an adequate amount of square foot for each space. Areas that remain in question are the Library, Cafeteria, Gym/Auditorium, Health, Music, and Art.

The question that remains is, should the above reference spaces be consistent in size no matter what capacity school you are constructing? The core spaces in a facility would be constructed of a size that would allow expansion of classrooms without needing to expand the facility core. If the spaces are to remain consistent at all capacities, then there may be a need to regulate their size. Is regulation of room sizes what is needed?

The Committee also reviewed the number of classrooms that the proposed formula allocates. With current laws on class size, there may be a need to increase the number of classrooms allocated to bring the formula more in line with current needs.

Another issue that it is hard for the Committee to address is full day kindergarten because it is not regulated or required. Until the issue becomes a requirement we should not plan space for it.

The Committee may want to complete a site visit of several schools to look at core facilities and how they operate. This will give the Committee a better understanding of the needs and whether or not the proposed square feet allocations work.

The second topic of discussion was minimum standards and how they should be established. Due to the amount of time spent on formula discussion, there was not adequate discussion on standards. The Committee had some discussion on the topic. The general feeling is that the specifications should be somewhat more specific to guarantee a certain quality.

Building envelope should have a 50-60 year life cycle and the interior should have a 30-40 year life cycle.

January 9, 2001

FORMULA

1. Possibly split the gym and cafeteria.
2. There should be flexibility in the square footage for those districts that do not want to build a school that are expandable or cannot be expanded due to site constraints. Implement a "reversal type " formula.
3. The formula should allow for the elimination of square footage if a school does not want to build the recommended square feet for core spaces.
4. Handicap restrooms should be planned for 80 square feet per restroom.
5. Increasing cost of land may prohibit districts from building more schools so expandable schools may be necessary.

STANDARDS

1. The question was asked: "Should the Committee recommend as part of the package that each district will have the authority to hire a general contractor or construction manager without prior approval of Administrative Services?"
2. Should the State implement a standard roof warranty?

January 23, 2001

The discussions on the school space formula and standard construction were continued. Once again most of the meeting was spent on the space formula. Our next meeting will consist of agreement on a space formula, and further discussion and establishment of construction standards.

In general all members agree that it is not in the best interest of all parties to regulate specific core spaces of the school space formula. The formula needs to be an adjustable formula similar to the one currently being utilized.

The Committee's goal is to adjust the elementary school space formula to bring it more in line with CEFPI national averages without removing the flexibility of the internal spaces. Schools have a larger need to expand program space that may not affect core facilities.

A draft of the new proposed formula for review. The formula should start with a 600-pupil elementary school at square feet per student of 104+/- and adjust as the capacity for the school increases. This will give flexibility in use of the total square foot formula, while allowing districts to build core spaces to meet potential needs.

February 7, 2001 and February 21, 2001

The Committee continued our discussions on the school space formula and standard construction. Once again most of the meeting was spent on the space formula. Our next meeting will consist of agreement and finalization of the space formula. We will also briefly discuss the inclusion of school construction standards into the construction standards being established by Administrative Services, Division of Facility Management.

In general all members continue to agree that the Middle and High School space formulas established by the last Committee are within the national average for square feet per student. There were a few modifications made to the Middle and High School formula to meet current day requirements.

1. Classroom size at the Middle and High School level was increased from 840 to 900 square feet per classroom.
2. Auditorium space should increase proportionately as the capacity of the school increases.
3. A line item for Student Services has been added to incorporate shared space that is required for services such either required by the state or federal government. These services usually service approximately 10% of the students in a given school. The space is calculated at 10% of the number of classrooms multiplied by 150 sq/ft per space. The formula would look like this for a school

with 30 classrooms. $30 \text{ classrooms} \times 10\% = 3 \text{ spaces}$. $3 \text{ spaces} \times 150 \text{ sq/ft per space} = 450 \text{ sq/ft for student services}$.

4. Storage has been added to the line item that accounts for 33% increase in the square footage formula.
5. Committee members questioned why auditorium space at the middle and high school are different. How are the spaces utilized at each grade level?

All Committee members continue to agree that the increases that have been made to the elementary school formula will bring the current formula in line with national standards for square feet per student. There were a few modifications made to the elementary school formula to meet current day requirements.

1. A line item for Student Services has been added to incorporate shared space that is required for services such either required by the State or Federal Government. These services usually service approximately 10% of the students in a given school. The space is calculated at 10% of the number of classrooms multiplied by 150 sq/ft per space. The formula would look like this for a school with 30 classrooms. $30 \text{ classrooms} \times 10\% = 3 \text{ spaces}$. $3 \text{ spaces} \times 150 \text{ sq/ft per space} = 450 \text{ sq/ft for student services}$.
2. Storage space at the elementary school level is included in each of the spaces allocated in the formula.
3. The System/Utilities line item in the elementary school formula should be increased by 10%.

Additional points of interest include:

1. Total square footage as established by the formula for new school construction has a 1% +/- factor of allowance in the total square footage allocated. For example, a new school of 68,000 sq/ft established by the formula can be constructed at a total square footage of 68,680 sq/ft.
2. School districts cannot increase the total size of the school above the 1% allowed. Even if the architect/engineer can save money on materials or services of the construction of the school, the facility can be no larger than the formula establishes.
3. The Delaware Center for Education Technology (DCET) will be contacted and a determination of what the recommended square footage is for technology wiring closets.
4. A copy of Administrative Services construction standards will be obtained for review.

5. The Committee needs to make sure that the education standards included in the State's construction standards are life-cycle and quality based specifications and not product based.

March 20, 2001

The committee focused most of our time on the concept of standard or stock floor plans for schools. The meeting will consist of agreement and finalization of the space formula. We will also briefly discuss the inclusion of school construction standards into the construction standards being established by Administrative Services, Division of Facility Management.

In an effort to include everyone's input on the subject of stock plans we conducted a round robin process giving each Committee member an opportunity to make comments. The following list includes comments from each member who was present:

- Approves stock plans
- Stock plans will help set cost and set the amount of work required to complete a project
- There should be a set of stock plans that can be used or a district has an option to design their own
- There were concerns with "cookie cutter" schools. It may take away the flexibility in design from individual school districts
- Several states have attempted to utilize stock plans. States such as Georgia and Florida have researched the use of stock plans and determined that it was not economical
- As the space formula for school construction changes you would be required to change the stock plans to coincide with the formula
- The State does not own the plans. We only own the design. There is still the need to involve another architect to sign and seal the plans
- Approves of the idea of flexibility in design remaining with the district
- Agrees that components of a facility can be standard
- Stock plans can be an option to a school district who needs to build quickly
- Stock plans will help in the timing of the design phase with some adjustments
- There should be some parallel between stock plans and the bid process for professional services
- In favor of the use of plans that have already been developed
- The cost would be set when using stock plans, also helping with the funding schedule of such projects
- Flexibility to the school district should still be there
- Stock plans work if two sites are identical. Problems occur when you try to site an existing school on a new site, changes are inevitable
- Not really in favor of stock plans for the above reason
- There will always be a need to modify the plan for site and mechanical that will change the design significantly
- If we utilize stock plans there will have to be a change in philosophy for teaching; teaching instruction will have to be standard for the state

- Stock plans could benefit those districts who lack knowledge in construction
- The approval process for plans will be easier
- There is definitely a benefit in the construction time
- Likes the idea of standard modules that are added onto to schools for a specific number of classrooms
- Keep in mind the State's current funding cycle. Even if design and construction time are shortened, the financial support can only be funded so fast
- Supports material or component standards
- The concept sounds good, but I have never seen it work without changes
- Have seen and read reports for states that have tried it then scraped the idea
- School districts have the ability to use the plans from another district. They just need to use the same architect or hire a new architect to make any changes
- We should standardize materials or components only and leave the flexibility in design to the district. Gives ownership to the process
- We could use stock plans for classroom additions
- Unless teaching instruction is standard, then plans cannot be standard

Many comments focused on the standardization of materials or components. Stock plans inevitably will be changed to meet individual district requirements or will require changes due to site constraints. Stock plans for classroom additions could be developed to expedite the design and construction of school expansions. The current system allows school districts to utilize plans from another district, in essence a non-legislated stock plan process.

In addition to the need for flexibility in school plans, there is support for flexibility in classroom instruction throughout the state. Unless a standard method of instruction is established for all educational facilities in Delaware, a one-plan-fits-all or stock plan concept will not work.

There is still some discussion required to determine if the standards that will be established are mandated in regulation or general guidelines. If the standards established are considered guidelines for construction they will not serve the purpose of retaining best value for the capital expended.

Many Committee members continue to believe that if the cost per square foot for school construction increases there should be some minimum standards.

September 12, 2001

Epilogue language in the fiscal year 2002 Bond & Capital Improvement Acts legislated the continuation of the school construction planning committee. The following items were discussed at the meeting. In addition to the items discussed additional research is required for inclusion in our follow-up report to the General Assembly. The comments that will require additional research I have highlighted in bold face type.

School Construction

1. The School Construction Committee: Report and Recommendations to the Department of Education were handed out or mailed to each Committee member. Additional copies were given to the Department of Education.
2. All Committee members should review the report and have additional comments for the next meeting.
3. The State puts a large portion of funding towards school construction and then we let them deteriorate. What are the ways we can maintain our buildings long-term. Are there additional funding options that can be implemented to achieve this?
4. Currently schools are spending approximately 50 cents per square foot to maintain a school facility. Corporate companies such as DuPont are spending 80 cents/sq ft. Additional research is required to determine the amount of money the State is spending to maintain its facilities. What dollar figure should be set aside to really help maintain facilities?
5. Equalization of Minor Capital funding would benefit a large portion of districts and enable them to complete additional maintenance requirements. Leaving current maintenance needs unattended increases future maintenance costs. The Joint Finance Committee directs Minor Capital funding and the Bond Bill Committee directs Major Capital funding.
6. Enhanced Minor Capital funding was a great benefit to the districts. If enhanced Minor Capital funding is not going to be re-instated, then the equalization of minor capital funding is a must.
7. Passing of a local referendum for the construction of a new school is easier than passing a referendum for operating expenses. What good is a school that is built without the operating expenses to support it? Should the capital cost and operating cost of a facility be included together when a district goes to referendum. Meaning, if the construction of a new school is approved by referendum vote the operating cost incurred with the new school are automatically approved.
8. Find a correlation between Maintenance Cost and Major Capital funding.
9. Once research is completed in reference to building maintenance budgets, set the bar and adjust accordingly each year.
10. When a Major Capital project is approved include funding to maintain the building for 20 years.
11. Look at a formula for Vo-Tech spaces that can be added to the base high school formula. A menu of square footages that are commonly used for different Vo-Tech classrooms.

12. Ask a company like EDIS to track construction market changes. The information gathered will be utilized by the Committee to adjust the cost per square foot allocation for new construction.

Custodial Issues

1. School districts are finding it very difficult to retain quality custodial employees. The compensation of positions needs to be reviewed. Compare the State's salary structure for custodians to other industry standards.
2. Research other states and how they handle custodial allocations, training, compensation and schedules.
3. How facility use has changed is greatly affecting the utilization of manpower. There should be a separate allocation for maintenance personnel and a separate allocation for custodial personnel.
4. Improve the training of maintenance and custodial personnel.
5. The ability to turn custodial positions into dollars would allow a district to outsource school cleaning while still overseeing maintenance operations.

September 28, 2001

The following items were discussed at the meeting.

School Construction

1. Should the size of schools be regulated to a maximum?
 - a. ES 480 – 720
 - b. MS 500 – 1000
 - c. HS 500 – 1500
2. When a major capital project is voted on the operational portion to operate the school should be included in the referendum as one vote.
3. We need to contact each district and determine what their maintenance and operation budget is district-wide for facilities. This should not include minor cap or utilities. What percentage of the districts total budget is spent on maintenance and operation?
4. What are districts across the country doing for maintenance and operation of their facilities?
5. What does the State (Facility Management) spend on maintenance and operation of facilities?
6. How do we obtain the local match when we set the bar for maintenance and operation?

7. What is each district doing for the local match for custodians? Custodians do more than cleaning, they also accomplish operational needs.
8. What is the potential of hiring maintenance personnel out of the union and not using custodial staff for smaller districts?
9. When a major capital project (new school) is approved include funding to maintain the building each year. Once we establish what the cost per/sq. ft. is for M&O that will be the allocation annually to maintain the facility. In this case minor capital funding could be eliminated. The annual allocation for each school is put into a central M&O pot for each district for them to spend the way they require. There would need to be regulations set for the M&O budget similar to the regulations that already exist for minor cap.

October 25, 2001

The following issues were discussed during the meeting:

Maintenance & Operations

1. Data was discussed concerning required site work for athletic fields and stadiums in high school projects.
2. Additional information will be gathered on what school districts spend on M&O for facilities. This data should include Minor Capital expenditures.
3. Many school districts pay outside contractors out of the Minor Cap line.
4. The Committee recommended a review of the process by which school districts sign contracts with local union halls for maintenance personnel. This process would work well for smaller districts that do not have a separate maintenance staff. The process includes school districts signing contracts with local union halls for maintenance personnel. When a district is in need of maintenance work for a specific trade, they would call the hall and hire as many workers as needed. The district would be responsible for the wages of each worker. When the work is complete, all personnel returns back to the union hall. This would eliminate the district from continually paying overhead and profit to a contractor for small maintenance and repair jobs.
5. The possibility of pre-qualifying contractors at the state level will be examined.
6. Salary information for maintenance and custodial personnel from districts will be collected.

Custodial Issues

1. Many were in agreement that contracted cleaning is not economical. If districts were given flexibility in using Minor Capital monies they would not be taking from the custodial staff for maintenance personnel. This would allow the allocation of more personnel back to the cleaning of facilities.
2. Construction wage rates should determine salaries for district maintenance personnel. Leveling of salaries would limit the change over of personnel.
3. Flexibility of using MCI to hire maintenance personnel and show a relationship to M&O for facilities.
4. Should school districts be allocated a specific position for grounds maintenance? Due to the cost of purchasing grounds equipment and the ability to operate the same, flexibility in utilizing MCI to hire grounds people would benefit the district.
5. There is also a need to revise the allocation of custodial units for school sites.

Vocational School Formula

1. It was suggested that a baseline formula be set for high schools with a menu style formula added for vocational space. The concern is what prevents a district from changing curriculum after space is built and using it differently.
2. It was suggested that the Committee recommends the establishment of the current 225 square foot operating formula as the regulated formula.

November 7, 2002

The following issues were discussed during the meeting:

Maintenance & Operations

1. It was recommended that the Committee contacts Administrative Services and ask about the software package that they utilize to project maintenance.
2. It was suggested that the ability to construct new space up to a specific dollar figure be included in the Minor Cap program.
3. Middle school athletic fields are becoming more and more like high school athletic fields. Middle school athletics should focus more on an intramural model. High school athletics should focus on the competitive model. The State should support this notion. It was suggested that the formula reflect how fields are utilized at each grade level.

4. Additional information should be obtained from the data service center on pre-qualifying of contractors.
5. The Committee reached general agreement that school districts should use contracted repair actions for large projects, and in-house personnel can accomplish PM type maintenance. This issue will change the utilization of custodial personnel. We can support this issue by adding flexibility into the Minor Cap program.
6. Many agreed that the process for allowing school districts the ability to raise additional Major Cap money is in place with the market pressure funding mechanism included in the FY2002 Bond Bill. The Committee believes that this process should continue with additional flexibility added into the process to cover unforeseen construction changes. The decision to increase local taxes to raise money will be left to the local board.

November 19, 2001 and December 4, 2001

The following items were discussed:

BSA&A did research into what private schools use for maintenance and repair of school facilities. What was found is that a percentage of the total school cost is put aside for maintenance of the facility. Private schools also calculate maintenance and repair cost by building, and they do not use enrollment as a factor. Custodial services are budgeted on a dollar per square foot basis. The average cost for custodial services is 3-4 dollars per square foot.

Facilities Management has two categories:

- Minor Capital Improvements
 - Correction of code violations
 - Imperative system upgrades
 - Tenant program changes and layout conversions
- Maintenance & Repair
 - In-kind repair or replacement
 - Interior and exterior finish replacement
 - Cleaning, testing and servicing of building equipment

Division of Facility Management uses MP-2 software program for preventive maintenance and predictive maintenance. DOE and school districts have the capability to add this type of computer program module onto the facility assessment system.

It was recommended that DOE have a cleaning company do a study on the cost for a contract company to clean a school. If the custodial training program is revised it should be matched to a certificate program that drives the pay scale. The Committee reviewed adding the flexibility of hiring maintenance mechanics to Minor Cap so that the districts can put the custodians back into the buildings for general housekeeping. The custodial salary schedule should be reviewed and adjusted.

The Institute for Public Administration (IPA) links the research and resources of the University of Delaware with the management, information, and leadership needs of schools and local, state, and regional governments in the Delaware Valley. IPA provides assistance to agencies and local governments through direct staff assistance and research projects as well as training programs and policy forums. IPA's wide range of program areas includes civic education, conflict resolution, health-care policy, land-use planning, local, state and international government, school leadership, water resources, and women's leadership. IPA's main office is on the University's Newark campus in 180 Graham Hall. Jerome Lewis is the director of the Institute and can be reached at 302-831-8971.



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