



Preliminary Report

June 16, 2005



NEEDS ASSESSMENT COMMITTEE

ACKNOWLEDGEMENTS

On behalf of DeJONG and JAED we extend our appreciation to the Needs Assessment Committee, the Shelby County Commission, Memphis City School District, and Shelby County School District. Special thanks to **Partners in Education** and **Shelby County Schools Educational Foundation** for their commitment and support.

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PREVIOUS REPORTS & PLANNING ACTIVITIES

An analysis and review of the following reports and activities was conducted to ascertain the nature and extent of factors that contribute to capital funding requests. In addition, discussions were held with the Needs Assessment Committee and both Memphis City School and Shelby County School personnel in order to enhance, amplify, and explain the reports and activities so that their observations and experiences could be incorporated as a valuable learning tool for future reference.

- *Capital Needs Report*
Memphis City Schools
December 1, 2004
- *Annual Capital Request Needs Report*
Shelby County Schools
December 1, 2004
- *Addendum to Annual Capital Request Needs Report*
Shelby County Schools
March 8, 2005
- *Comparison of MCS & SCS Space Programs*
EFS
March 8, 2005
- *Best Practices Data, Comparative Analysis*
EFS & Dr. Tom Glass NAC endorsed spaced standards
March 8, 2005
- *School Capacity Analysis 2003-2004*
Memphis & Shelby County Division of Planning and Development
August 4, 2004
- *Memphis City Schools Physical Needs Assessment*
EFS
July 1, 2004
- *Memphis City Schools Design Manual*
EFS
January 24, 2005

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There are multiple variables to develop uniform guidelines and establish equitable, on-going methods of professionally identifying the short-term and long-term needs and capital expenditures of two separate school districts. A work shop was conducted at their April 5, 2005 NAC meeting. A questionnaire focused on guidelines and priorities was used as an impetus to obtain input and build consensus around key planning issues. Individual and group results with comments are included in the Appendix of this report.

A plan, to be successful, needs to have a life beyond the tenure of the individual administrator. This requires collaboration and a collective buy-in to development of the plan, and of the final plan itself. We would like to thank the following participants for their time and effort in the Needs Assessment Committee work shop.

Scott Fleming
 Aubrey J. Howard
 Jimmie Tucker
 Maura Sullivan
 Tom Marshall
 Deni C. Hirsch
 Jay Weatherington
 Richard Holden



Shelby County [1 = Most Important]

	1	2	3	4	5
Growth	1	1	1	1	4
Learn/Needs	12	2	2	4	1
Person	3	3	3	3	3
Public	4	4	4	2	4
Structure/Man	5	5	5	5	5
Other					

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EXECUTIVE SUMMARY

Based on a request from the Needs Assessment Committee of Memphis and Shelby County, the services of DeJONG, an educational planning firm, and JAED Facilities were obtained in order to meet their mission. This encompasses developing uniform guidelines with respect to capital expenditures and establishing an equitable, on-going method of professionally identifying the short and long term needs of Shelby County Schools and Memphis City Schools. Part 1 of these services included a preliminary report with recommendations for square foot per student and cost per square foot at the elementary, middle and high school levels. Findings were as follows.

Square Foot per Student

A major component of facility needs is having adequate space to support the educational program. Spaces were determined by curriculum, provided by both Shelby County Schools and Memphis City Schools in the form of a prototypical program [see Appendix, Page A-8] used by the districts for new construction and the class sizes required by the State of Tennessee. The Tennessee General Assembly, believing that smaller classes increase students' chances of academic success, included class size standards in the Education Improvement Act [EIA] of 1992 that required lower class sizes for all grades by the school year 2001-02. The standards are indicated below.

Grades K-3	20 students average	25 maximum
Grade 4-6	25 students average	30 maximum
Grades 7-12	30 students average	35 maximum

Types of spaces indicated in the prototypical programs included course areas such as classrooms, science labs, art and music, computer labs, cafeteria, gymnasium, media centers, and career and technical education.

Size of spaces was based on the number of students to be accommodated and program pedagogy. For example, in a classroom, students may be engaged in lecture, project learning, small group interaction, and individualized education. At times the instruction will be teacher-directed; at other times, it may involve students working with technology. Comparisons were made of both districts' prototypes and square footages were revised reflecting "best practices" throughout the United States.

DeJONG has a vast amount of experience regarding Educational Design Manuals and Facility Standards and has completed more Program and Design Requirements than any other educational planning firm in the country. Such experience includes the *District of Columbia Public Schools Standardized Design Guidelines*, *The Ohio School Design Manual*, and the proposed *Arkansas Educational Facilities Manual*. Based on this experience, the following square foot per student recommendations incorporate the "best practices" in educational facility planning today and are located at the top of the next page. Please refer to the Appendix of this report, page A-1, for resources and additional reference material regarding "best practices" and recommended standards. The current district programs differ to some degree depending upon the specific program allocation.

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- 900 square foot regular classrooms
- 1,000 square foot Kindergarten classrooms
- Cafeteriums/Auditerias at the middle school level
- Average circulation factor [corridors, mechanical, etc.] of 35%

There is a significant difference in the amount of space required based on size of enrollment and type of school. The lower the enrollment, the more square footage per student is required. This may result, for example, when a regulation gym is required to be a certain size regardless of the enrollment of the school. The same size gym for more students results in more efficiency of space. The following table recommends square foot per student based on school enrollment goals derived from the Memphis and Shelby County prototypical programs.

Elementary		Middle		High	
Enrollment	SF/Student	Enrollment	SF/Student	Enrollment	SF/Student
750	120	900	130	800	175
1000	115	1000	125	1200	160
		1200	115	2000	150

The above square foot requirements attempt to encompass the educational programs of both school districts. However, a significant difference is that of the auditorium required by Memphis City Schools at the middle school level. The school districts may provide an educational and/or cost benefit evaluation for spaces which may go above and beyond those included in this report or are required as part of their respective board policy.

Cost per Square Foot

There are dozens of variables that affect the cost of construction. They vary in degree, in the ability to be quantified, and the potential effect they may have on a project. The objective is to establish a baseline cost per square foot to be constructed under the current funding mechanisms. In order to determine a baseline cost, a side by side list of construction standards from both districts was developed in order to analyze the points of divergence that cause the cost variance. The largest of these was the Memphis City Schools standard for Heating, Ventilation, and Air Conditioning [HVAC] which accounts for nearly 2/3 of the current construction costs difference. Our understanding is that this specification is under review but not finalized; therefore, we have to use the specification that was last used.

A mandatory wage rate and benefits package, commonly called Prevailing Wage, is required by Memphis City government for all city funded projects within the city. The Memphis City Schools has adopted this policy as well. The Shelby County government and the Shelby County School system do not have a Prevailing Wage requirement. Since this committee is a recommending body to the Shelby County Government, it will follow the standard of there not being a Prevailing Wage requirement. Experience has shown that this can result in an additional cost factor as high as 15% for applying these factors to construction costs. Please refer to the Appendix, page A-25, for more details regarding Prevailing Wages.

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Because of the many variables involved, the following construction cost per square foot guidelines are recommended.

Grade Level	Cost per Square Foot
Elementary	\$97 - \$107
Middle School	\$99 - \$109
High School	\$122 - \$134

The above costs include construction costs and standard site development only. Land acquisition and development of athletic facilities are not included. Furthermore, the school districts may provide a cost benefit evaluation for building components which may go above and beyond those included in this report or are required as part of their respective board policy.

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CAPITAL NEEDS

As part of the Needs Assessment Committee meeting in April, a questionnaire focused on capital planning was used as an impetus to obtain input and build consensus regarding the varying district priorities. The following summarizes results from both individual and group questionnaires. Please refer to the Appendix of this report, page A-26, for all tabulations and comments.

- Participants indicated that there should not be a common set of priorities for both Memphis City Schools and Shelby County Schools.
- Those that ranked categories for Memphis City Schools most often ranked Immediate Needs [emergency projects to maintain a “safe, dry, & healthy” environment] as the highest priority. The next priorities were fairly evenly ranked between Building Renovations, Building Replacements, and School Closures & Mergers. Clearly Growth was indicated as the lowest priority in Memphis City Schools.
- Those that ranked categories for Shelby County Schools most often ranked Growth [includes new construction and additions] as the highest priority. This was followed by Immediate Needs, Building Renovations, Building Replacement, and School Closures & Mergers respectfully.
- Participants indicated that all categories should be funded, however it was unclear how this might be accomplished.
- Most participants estimated that between \$500 million and \$1.0 billion would be necessary over multiple years, perhaps 3-5 years, to address the school facility needs in MCS and SCS.

It is not surprising that the priorities for each district are different. This is a result of two primary factors, average age of infrastructure and demographics. Memphis City Schools maintains older facilities and is therefore concerned with immediate needs and renovations. Shelby County Schools has had large influxes of population and housing development and is therefore concerned with providing enough space to support a growing student population.

The chart on the following page combines the capital funding requests from both districts and provides an annual sub-total. ADA compliance and deferred maintenance have been allocated over three years per their proposed phasing; also, environmental condition improvements were dispersed.

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Project	District	Completion Date	Funding Requested
New SE HS	SCS	2006 [2008]	\$50,000,000
New SE MS	SCS	2006 [2007]	\$12,000,000
New SE Elem	SCS	2006 [2007]	\$12,000,000
Chimneyrock Roof	SCS	2005	\$1,000,000
ADA compl, Group 1	MCS	2006	\$27,497,000
Defered Maint, Group 1	MCS	2006	\$51,540,000
Enviro Cond Improv	MCS	2006	\$33,200,000
Demo abandoned	MCS	2005	\$1,200,000
Demo merged	MCS	2005	\$2,200,000
Rivercrest ES addn	SCS	2007	\$2,000,000
New ES E Cordova	SCS	2007	\$12,000,000
New MS SW Collierville	SCS	2007	\$12,000,000
New S Cordova ES	MCS	2007	\$15,000,000
New Countrywood MS	MCS	2007	\$25,000,000
Treadwell HS renov	MCS	2007	\$10,084,000
Trezevant HS renov	MCS	2007	\$16,069,000
W Station HS renov	MCS	2007	\$19,045,000
Sub-Total			\$301,835,000
Collierville MS renov	SCS	2008	\$6,000,000
Elmore Park Replacement	SCS	2008	\$12,000,000
Shadowtown MS renov	SCS	2008	\$6,000,000
ADA compl, Group 2	MCS	2007	\$8,013,000
Defered Maint, Group 2	MCS	2007	\$41,200,000
Enviro Cond Improv	MCS	2007	\$33,200,000
Sub-Total			\$106,413,000
New MS NE Bartlett	SCS	2009	\$12,000,000
New ES Arlington/Lake	SCS	2009	\$12,000,000
Farmington revov	SCS	2009	\$3,000,000
Dogwood renov	SCS	2009	\$3,000,000
Germantown ES renov	SCS	2009	\$4,000,000
New HS S Collierville	SCS	2010	\$50,000,000
ADA compl, Group 3	MCS	2008	\$5,100,000
Defered Maint, Group 3	MCS	2008	\$17,500,000
Enviro Cond Improv	MCS	2008	\$33,200,000
Sub-Total			\$139,800,000
New MS Arlington/Lake	SCS	2010	\$12,000,000
Harold ES Addn/renov	SCS	2010	\$6,000,000
Sub-Total			\$18,000,000
TOTAL			\$566,048,000

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CONCLUSION

In order to assist the Shelby County Government, it is recommended that the Capital Needs presented by the Shelby County Schools and Memphis City Schools be reviewed for funding on an annual basis. The funding requests presented in this document are based on best assumptions for short-term and long-term facility needs, but as variables change, facility needs may need to be re-evaluated.

The challenges facing Shelby County include renovating and replacing an aging school facility inventory, as well as keeping up with new construction in order to accommodate a growing student population. By adopting some of the future planning recommendations and suggestions brought forth by the NAC members, a process that helps the County and both school districts be proactive in the long-range management of their facilities can be developed. This will result in achieving the ultimate goal of creating attractive and equitable environments that are conducive to efficient and effective learning, teaching, and community activities.

The Needs Assessment Committee submits this report as a preliminary response to the charges set forth by the Resolution as adopted by the Board of County Commissioners and County Mayor A C Wharton, Jr. Looking toward 2006 and beyond, it is recommended that further study and analysis be conducted to include, but not limited to, demographics, construction costs, and life cycle costs.

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SQUARE FOOT PER STUDENT RECOMMENDATIONS

INTRODUCTION

During the past thirty years, the programs in a public school system and the manner in which they are delivered have changed significantly. Repeated arguments are heard that “this school was able to accommodate 600 students thirty years ago and now you are saying it can only accommodate 400 students today. How can this be the case?” Persons making these statements often do not realize that the maximum class size has been reduced for example, from 30 to 25, the music program was being held on the stage, there was no art room and the teacher used a cart, computers had not been invented and there were no computer labs, the Kindergarten program went from half day to full day and severely handicapped special education students that were previously institutionalized are now attending public schools. In addition, many states are legislating a class size of 20 or under for the early elementary grades, schools are expanding pre-school services, and there are many more at-risk student programs.

Historically, school districts throughout North America have determined the capacity of school by counting the number of classrooms in a building and multiplying by an average class size. In facility planning terminology, the term, “design capacity” is used to describe this methodology. Even though at first glance this seems only to be common sense, this methodology does not take into account the programmatic implications of school facilities. In an elementary school there is a need for libraries/media centers, administrative areas, special education classrooms, and specialized spaces for specific program areas such as science, art and music. In a secondary school, in theory it may be possible to use every classroom every period of every day, but from a practical perspective it is not likely. In the facility planning industry, taking program issues into consideration is called “functional capacity”.

Even though functional capacity is a more realistic analysis of what a building can accommodate, it is necessary to apply some common sense. In existing buildings, there are examples in which classrooms have been taken over for other purposes such as teacher prep areas, storage, or offices which can result in a lower capacity figure.

Public schools sometimes use space in school buildings for special purposes such as community activities or district-wide special education programs when space is available in a building. The location of this type of “*non-prototypical*” program impacts the space necessary to accommodate the “*prototypical*” programs. For planning purposes, the square footage per student assumes these special purpose programs could be moved to another location. **Therefore, square footage per student is defined as the gross square footage of the building divided by number of students the building can accommodate assuming a “traditional” or “prototypical” educational program.**

The criteria used for determining the gross square footage of each building and the capacity of each facility, should reflect the programs of the public schools yet should be kept simple for planning purposes. The criteria for determining total square footage per building and capacity is different for elementary, middle and high schools. In general, the methodology is to determine the design capacity and apply a utilization rate [i.e. the percentage of time a teaching station can be kept in use during the day] to yield the

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functional capacity. For buildings built under educational programs prior to several decades ago, it is not uncommon for the functional capacity to be much lower than the design capacity given the changing needs of the educational program.

Overall, a typical methodology would be to start with one program of requirements rather than comparing two different programs. Some generalizations were made to both prototypes in order to categorize spaces for a logical comparison. For example, teacher work stations were named and categorized within the classroom sections of the Memphis City School prototype, while they were categorized separately within the Shelby County School prototype. The square footage of these spaces was not changed, but moved into the same category for the purposes of this report.

Finally, constructing a building includes more than classrooms, gymnasiums, and program spaces. A building also includes circulation spaces and construction factors such as wall thickness. A circulation factor is added to account for hallways, locker areas, vestibules, etc. MCS and SCS have differing circulation factors. In addition, SCS includes some items within a category entitled Building Services that MCS includes within the circulation factor. Again, some generalizations were made to both prototypes in order to categorize spaces for a logical comparison. Furthermore, if the building services square footage was added to the circulation square footage within the SCS prototype, the circulation factors would be within a closer range.

ELEMENTARY SCHOOLS

The following factors need to be incorporated into the determination of square footage per student at the elementary level.

Average Class Size

Even though a class size of 25 is the most common number used by school districts throughout the United States many states and local districts are moving toward smaller class sizes for the early elementary [primary] grades. Both Memphis City Schools and Shelby County Schools have based their prototypes on the state required average of 20 students for grades K-3 and average of 25 students for grades 4-6. Both districts embrace the K-5, 6-8, 9-12 grade configuration, however, both districts maintain varying configurations within their facility inventory, usually as a result of building or site constraints. To determine square foot per student, the state class sizes were utilized.

Special Education

Special Education instruction occurs at various levels of need, varying class sizes, and in various locations throughout a district. Instructional areas for high incident students [learning disabled, behaviorally and mildly mentally handicapped, etc.] are usually found at the elementary level.

For planning purposes, and to reflect both district prototypes, the square footage requirement assumes that low incident students [severely profoundly handicapped] are not located in the building and are being housed at a different district facility.

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For discussion purposes, however, assume that a building can accommodate 400 students with no low incident or severely profoundly handicapped students. If the student population was to change, and the same school identified four classrooms dedicated to serving this population, the capacity should be reduced to 300 students, and therefore more square footage per student will be necessary.

It is suggested, for buildings that house low incident or severely profoundly handicapped students, that two figures for square footage be established: one calculation including this population and one not including this population. The reason being that if the building is not to be used for this purpose in the future, it has the potential for housing more students.

Art and Music Spaces

In nearly every elementary school in North America, art and music instruction is an important part of a well-rounded elementary curriculum. Therefore, spaces for each of these programs should be included in an elementary school. In schools with fewer students, these programs may need to be combined into one space.

Computer Labs

Even though the future solution is to have computers integrated into all instructional spaces, the current practice in both MCS and SCS is to have at least one designated computer lab in an elementary school.

Science Classrooms

State proficiency testing has placed an increased emphasis on science curriculum at the elementary level. Currently, science instruction is limited to what can be done in the regular classroom. Districts will need to decide whether to provide separate classrooms for science or to include it in the regular classroom.

Special Programs

Most school districts provide special programs for at-risk students such as Title I and other programs for gifted students. If these programs are to be provided, space needs to be allocated for these purposes.

ELEMENTARY PROTOTYPE COMPARISON

The table on the following page compares the Memphis City Schools and the Shelby County Schools Elementary Prototypical program spaces. Of all the grade levels, these two prototypes are the closest in terms of square foot per student. Some of the variables include:

- Size of Kindergarten Classrooms: MCS = 940 SF, SCS = 850 SF
- Shelby County Schools includes a full-size gymnasium.
- Memphis City Schools includes a larger media center for a smaller population.

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PROGRAM AREA	Memphis City 750	Shelby County 1,000
CLASSROOMS	33,250	45,000
OTHER INSTRUCTIONAL SPACES	4,550	7,320
PHYSICAL EDUCATION	4,450	8,450
STAGE/PLATFORM	800	820
FOOD SERVICES	6,700	7,200
MEDIA CENTER	3,700	3,300
ADMINISTRATION	3,950	5,611
STUDENT SERVICES	1,790	0
BUILDING SERVICES	In 40% Factor	7,880
Subtotal	59,190	85,581
Memphis City - 40% Factor	23,676	
Shelby County - 25% Factor		21,395
TOTAL	82,866	106,976
SF Per Student	110	107

MIDDLE SCHOOLS

Twenty and thirty years ago, middle schools were called junior high schools and were “mini” high schools. This was followed by a trend toward middle schools that currently makes up most of the United States today. Currently, there is a movement in many school districts to eliminate middle schools and increase the number of elementary schools that continue through the eighth grade.

Both Memphis City Schools and Shelby County Schools embrace the middle school concept, although there are some variations in grade configuration incorporated by both. The middle school philosophy places students in teams. The size of teams varies from school to school. A team may be two teachers and 50 students or teams may be as large as 6-8 teachers and 150-200 students. Regardless of the size of the team, the program typically consists of a core curriculum [English/language arts, math, science and social studies] and an exploratory curriculum of physical education, art, music, band, computers, technology, and foreign language. There maybe other exploratory areas as well, depending on the individual middle school.

Students usually attend the core curricular areas every day throughout the school year. There are a wide variety of schedules associated with the exploratory programs. Students may attend an exploratory program every day for 6-18 weeks and then move on to another exploratory program or they may attend exploratory programs on alternating days. There are as many different schedules as there are middle schools and you need to be a middle school student to figure it out.

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For schools that operate as middle schools, a modification of the elementary school method for determining square footage applies. The state mandated class size of 25 for grade 6 and 30 for grades 7-8 was used to determine a recommended square foot per student.

A school may have 30 classrooms for core curricular programs. This school may also have exploratory classrooms [art, band, choral, computer, technology, life skills, and physical education] and special education classrooms. The square footage of the building would be determined by the specific programs offered by the local school districts. Evaluation of the results of those educational program decisions on the use of square footage is best done on a value added basis where the specific needs of each element of the program is assigned the resulting square footage requirement. At that point the local requirement of area can be compared to comparable program elements used elsewhere for purposes of benchmarking the allocation of footage. Ultimately the educational program of each district is determined by the respective school boards and the scope of this committee is evaluating the impact on square footage of area.

MIDDLE SCHOOL PROTOTYPE COMPARISON

The following table compares the Memphis City Schools and the Shelby County Schools Middle School Prototypes. There is less contrast between the MCS 1,200 student middle school and the SCS 1,000 student middle school based on square foot per student. However, a major difference with both Memphis prototypes is the inclusion of an auditorium.

PROGRAM AREA	Memphis City 900	Memphis City 1,200	Shelby County 1,000
CLASSROOMS	20,950	24,150	33,000
OTHER INSTRUCTIONAL SPACES	24,170	26,520	14,164
PHYSICAL EDUCATION	15,250	13,450	10,280
AUDITORIUM / PLATFORM	9,750	12,000	836
FOOD SERVICES	8,750	8,750	7,200
MEDIA CENTER	4,125	4,125	3,600
ADMINISTRATION	4,380	4,380	3,405
STUDENT SERVICES	1,960	1,960	0
BUILDING SERVICES	1,258	1,258	5,810
Subtotal	90,593	96,593	78,295
Memphis City - 43% Factor	38,955	41,535	
Shelby County - 28% Factor			21,923
TOTAL	129,548	138,128	100,218
SF Per Student	144	115	100

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HIGH SCHOOLS

High schools operate on a totally different basis than elementary schools. Students are not in self-contained environments occasionally traveling to another location for a special class. At the high school level, students typically change classes each period.

High schools are undergoing significant change in program delivery. Many schools are adopting block scheduling and/or various teaming approaches. The method for calculating the square feet per student at the high school level needs to be flexible to deliver a traditional departmentalized program or the newer evolving methods of program delivery.

Average Class Size

There is currently a wide range of class sizes in a high school and from school to school. It is not uncommon to find some very small classes in advanced placement courses and upper level foreign languages. At the same time, it is not uncommon to find 60 or more students in a band or choir class.

Several states have attempted to determine the capacity of a building by establishing a capacity for each type of room in a building. This may be appropriate, but often results in a much larger capacity than what is realistic. For example, the band room may be rated as a capacity for 75 students. The fact is that the full band only meets one period per day. The rest of the day, the room is being used for smaller sectional or specialized bands such as a jazz band. To say that the capacity of the band room is 75 assumes that the room is used every period of the day for that number of students. In reality, the band room may be used for 75 students one period per day and less than 20 students each of the remaining periods, or the room may only be used as a band room 3-4 periods per day.

Even though this seems like an over simplification, using an average class size of 30 students across the board has worked quite well in determining capacity at the high school level.

Teaching Stations/Classrooms

Teaching stations are defined as areas in which students receive instruction in core curriculum courses as well as exploratory/elective curriculum areas. These areas should be adequately sized to meet the needs of the programs included in the space. Program areas include English, math, social studies, foreign language, science, art, music, family and consumer science, business, vocational/technology education, and physical education. In a high school the gym should be counted as one or more teaching stations. Even though it is not a regular classroom, it is a location in which students receive instruction on a hourly/daily bases. Likewise, when an educational program requires such uses, a food lab, science lab, business computer lab, and vocational/technology lab are all counted as teaching stations.

Auditoriums and library/media centers are not counted as teaching stations since these spaces are not assigned for "regular" instruction.

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Utilization Factor

It is very difficult to schedule every teaching station every period of the day. There may be a specialized space such as a vocational/technical lab for which there is insufficient enrollment to conduct classes each period. At times it is advisable for the classroom to be available to the teacher during a teachers prep period. At other times it is just not possible to maintain an average enrollment of 25 students and there needs to be some room to adjust.

It is recommended that the utilization factor of 85% be used at the high school level. This would represent approximate utilization of five out six periods in a six period day or six out of seven periods in a seven period day. This may indicate that some spaces are being used more than 85% of the time whereas others may be used less.

Block scheduling provides another dilemma. There are a variety of block schedules but many are based on a four 90-minute period day. Some of the time it is the same four periods every day. At other times, it is four periods on alternating days. Arguments have been made to reduce the utilization to 75% which would represent three out of four periods per day. On the surface, 75% may seem logical but it is not efficient use of space. This would mean that 25% of classroom space would be idle at any one time.

Using the 85% factor in a school which utilizes a block schedule would mean that a room would be available one period every other day on the alternating block schedule. Or, that approximately half of the rooms would be utilized 100% and the other half would be utilized 75% on the schools which have the same four periods every day.

Experience has shown that if the 85% factor is used for planning purposes, the high school has the ability to increase the utilization to 90% or higher in the event of short-term overcrowding issues. Experience will also show that once a building surpasses 90% utilization, scheduling of spaces and students becomes increasingly difficult.

[Authors' note: if space is going to be used less than 50% of the time, consideration should be given to reusing the space for another purpose or determining some type of multi-use of the space to increase its utilization.]

In the past, high school capacity was determined by counting the number of teaching stations in a facility and multiplying by an average class size. In facility planning terminology this is called the "design capacity" of the building. However, this methodology does not take into account programmatic implications. By applying the utilization factor to the design capacity, the functional capacity can be obtained and finally the square foot per student. An example is included below.

# of Teaching Stations	40
Average # of Students	<u>X30</u> X 85% = 1020 Capacity

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HIGH SCHOOL PROTOTYPE COMPARISON

The following table compares the Memphis City Schools and the Shelby County Schools High School Prototypes. Again, there is less contrast between the larger MCS prototype the SCS high school based on square foot per student. This time, while all three prototypes include an auditorium, Memphis City Schools provides a larger auditorium in relation to the size of student population. In addition, the circulation factors for all three grade levels differ between the two districts.

PROGRAM AREA	Memphis City 800	Memphis City 1,200	Shelby County 2,000
CLASSROOMS	33,340	44,240	83,906
CAREER & TECHNICAL EDUCATION	12,250	12,250	17,900
SPECIAL EDUCATION	1,850	1,850	4,800
OTHER INSTRUCTIONAL SPACES	3,500	3,800	4,000
PHYSICAL EDUCATION	16,900	21,100	30,980
AUDITORIUM	11,950	13,450	11,510
FOOD SERVICES	7,710	8,750	11,670
MEDIA CENTER	4,350	5,925	8,000
ADMINISTRATION	5,150	5,780	8,570
STUDENT SERVICES	2,545	2,655	3,910
BUILDING SERVICES	1,458	1,670	14,200
Subtotal	101,003	121,470	199,446
Memphis City - 43% Factor	43,431	52,232	
Shelby County - 30% Factor			59,834
TOTAL	144,434	173,702	259,280
SF Per Student	181	145	130

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CONCLUSION

To determine square foot per student for comprehensive elementary, middle, and high schools, the space requirements must be based on curriculum and class size guidelines. Therefore, Based on comparisons of the Memphis City Schools and the Shelby County Schools program of requirements and application of best practices in facility planning, the following square foot per student guidelines are recommended. The guidelines attempt to encompass the educational programs of both school districts. However, a significant difference is that of the auditorium required by Memphis City Schools at the middle school level. The school districts may provide an educational and/or cost benefit evaluation for spaces which may go above and beyond those included in this report or are required as part of their respective board policy.

Elementary		Middle		High	
Enrollment	SF/Student	Enrollment	SF/Student	Enrollment	SF/Student
750	120	900	130	800	175
1000	115	1000	125	1200	160
		1200	115	2000	150

The reason smaller schools require more square foot per student is a result of space efficiencies. Although the sizes of core spaces, such as media centers and cafeterias are reduced, they are still necessary spaces. There may be alternative ways to lower the square feet per student in smaller schools. Reducing the number of special program areas or incorporating different educational pedagogies like multi-age, grouping, and project based learning rather than subject-based learning, could create more efficiency of space.

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COST PER SQUARE FOOT RECOMMENDATIONS

INTRODUCTION

Comparing cost per square foot of different school projects is never an exact science because of the many variables involved. These variables can be as diverse as the size of the buildings being compared, the types of materials and systems included, and the labor climate in which the construction takes place. It is equally difficult to establish a single, standard cost per square foot that is to be used for the funding of school projects.

The challenge of establishing cost guidelines was approached from two directions to determine baselines and common ground. The first approach established a relative cost per square foot based on a compilation of national data. The second approach examined the standards of the Memphis City School District and the Shelby County School District to determine commonalities and differences. This allowed comparison of the projects of each district and established a way to analyze the differences in costs. The findings of both approaches determined recommended cost per square foot guidelines.

NATIONAL DATA

A nationally recognized source of data for construction costs is maintained and published by the R. S. Means Company. The 2005 edition of their published data was used to compile this report.

The data is collected on thousands of projects from across the United States and Canada and is compiled by building use types [i.e. schools are not compared with office buildings or factories.] Because the data includes a large number of projects from a wide geographic area it incorporates buildings of many construction types and materials, and a great variance in size from small to very large. Site purchase costs, design fees, and project management fees are excluded from all calculations. The project construction costs are further divided for the 25th percentile of projects which generally does not include site development work or equipment. The 50th percentile projects generally include equipment but not site work and the 75th percentile projects generally include both equipment and site development work. The result is a broad based, cross section of costs that is recognized as a standard. The 75th percentile figure was used for this report because it more closely reflects the information available from both school districts. The national standards are as follows.

Elementary School	\$120 per square foot
Middle School	\$120 per square foot
High School	\$136 per square foot

Data is also compiled for material and labor costs by local regions. Adjustment factors are established from this information for modifying the broad based cost to customize it to a specific region. The factor for Memphis is 87.8% [96.6 % for material & 77.2 % for installation], which is the highest in a larger region [approx. 150 mile radius] surrounding the city and is the highest in Tennessee with Nashville at 87.1% [98.0% for material & 74.0% for installation.] The following table compares regional costs from nearby locations.

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Region	Cost Factor
Jackson, Tennessee	78.0% [98.5% for material & 53.3% for installation]
McKenzie, Tennessee	75.3% [96.5% for material & 49.7% for installation]
West Memphis, Arkansas	76.9% [95.1% for material & 55.0% for installation]
Jonesboro, Arkansas	77.1% [95.5% for material & 55.0% for installation]
Little Rock, Arkansas	81.2% [95.2% for material & 64.3% for installation]
Tupelo, Mississippi	70.6% [97.4% for material & 38.4% for installation]
Greenwood, Mississippi	68.7% [97.3% for material & 34.3% for installation]
Source: RS Means	

An additional factor that can be derived from this data is from a comparison of the material cost and installation or labor cost for each of the cities within the region. The material costs are similar across the region with less than a 2% variance. It is the labor portion of the equation that has the largest impact, and is the primary variable for the Memphis area cost. When this factor is applied the following standards can be established for the Memphis region.

Elementary	$\$120 / \text{sf} \times 87.8\% = \105.36
Middle School	$\$120 / \text{sf} \times 87.8\% = \105.36
High School	$\$136 / \text{sf} \times 87.8\% = \119.41

This first method of study establishes a base to be used for comparison. Its biggest weakness is that it applies to the entire Memphis area without a way to compare the cost variances between Shelby County and Memphis City.

DISTRICT COMPARISONS

Determining a cost per square foot for school construction to be applied to two adjacent school systems with different circumstances and standards is akin to identifying a common flavor in a bowl of fruit salad. To approach this task a level playing field was attempted for analysis and then the points of divergence were identified that caused the cost variance between work in the two districts.

The first step was to prepare a side by side list of the standards applied by each district to the many components of a construction project. The purpose was to establish items that are similar or identical versus those that are different. The similar items will not cause a cost variance and can be ignored while the differences must be examined as the likely cause. The following table compares systems and materials utilized by both districts for new construction. A further detailed analysis is available in the Appendix of this report beginning on page A-22.

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System/Material	Memphis City Schools	Shelby County Schools
Site	Similar	Similar
Exterior	Similar masonry construction	Similar masonry construction
Exterior doors	Require security system on selected doors with card reader, CCTV to office and remote release	Similar materials
Windows	Similar materials, require security screens	Similar materials
Roof	Preference for pitched roofs with metal covering	Specifies a low slope built-up roof
Roof drainage	Similar	Similar
Interior Const	Similar materials, contractor supplies and installs	Similar materials, purchases the carpet and contractor installs
Interior Doors	Specifies solid wood with a plastic laminate face and hollow metal frames.	Specifies painted hollow metal doors and frames.
HVAC	Specifies heating and cooling fan coil units above the ceiling of each room that are connected to a central plant via a 4 pipe system; this has recently been changed to a 2 pipe system. The central plant consists of a boiler and a chiller. Fresh air is ducted to the room units from a central heat recovery unit	Specifies self contained gas fired rooftop heating & cooling units per room and has recently changed their design to include a central supply for tempered outdoor air for each wing
HVAC Controls	Building wide energy management system; complete system specified	Building wide energy management system; buys the components for installation by the contractor
Electrical system	Similar	Similar, slightly higher cost to connect the individual, self contained HVAC units
Lighting	Similar	Similar
Intercom	Similar, requires a complete system	Similar, contractor installs empty conduit for a system installed by the district

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System/Material	Memphis City Schools	Shelby County Schools
Telephone	Similar	Similar
TV distribution	Similar	Similar
Sound systems	Similar, requires as part of contract	Similar, supplies separately
Gym Scoreboards	Similar, requires two as part of contract	Similar, supplies separately
Computer network [data wiring & equipment]	Similar, requires as part of contract	Similar, supplies separately
Isolated ground system [power to computers]	Required as part of contract	Not required or installed
Window treatment	Requires mini blinds as part of contract	Supplies separately
Lockers [student & athletic]	Similar, requires as part of contract	Similar, supplies separately
Folding bleachers	Similar, requires as part of contract, quantity required is greater	Similar, supplies separately
Food service equipment	Similar	Similar
Science Lab equipment	Similar, requires as part of contract	Similar, supplies separately
Library equipment	Similar, requires as part of contract	Similar, supplies separately

OBSERVATIONS

Shelby County Schools supplies many items directly to the project and are therefore not included in the contractors cost while the same items are provided by the contractor on Memphis City Schools projects and included in the bid cost. These costs must be added into the project to allow for comparison.

A second observation is that Memphis City Schools has established several standards that are more costly than Shelby County and have the major impact on the cost variance. The largest of these is the differences in environmental system design [Heating Ventilating and Air Conditioning]. The standard in Shelby County is a self contained roof mounted package unit per room while the standard in Memphis City is a more traditional central system with units above the ceiling of each room piped to a central plant for heated and chilled water and ducted to a central heat recovery fresh air supply. This accounts for nearly 60% of the current construction cost difference based upon the 2004 environmental design standard.

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Additional variations include roofing systems, security systems, and computer power supply systems. The preferred roofing system of Memphis City is a sloped, standing seam metal roof system versus the Shelby County standard of a low slope, built-up modified bituminous system. There is a series of security related issues that are standard in Memphis City Schools but not included in Shelby County Schools. These consist of security/safety screens on all windows, and entrance doors observed by CCTV cameras and magnetic locks controlled from a remote location. Finally, there is a more complex power supply system for the computers in the Memphis City system that is not specified for Shelby County. This is comprised of a separate power grid of room outlets, distribution panels with isolated grounds and a power source through a special transformer.

After the material/system variables were determined, a cost comparison was established. A standard sized building for each grade grouping was created by determining the average of the square footage allowed by each district for that building type [resolution of the differences in square footage is addressed previously in this report]. These averages were then multiplied by the target enrollment by school type that has been established by each district. This was used primarily to calculate cost per square foot factors for items that are typically stated as unit prices.

The costs published by Shelby County [\$85/sf for elementary and middle schools, and \$110/sf for high school] were used as a base to establish cost differentials. To this base, costs for identified items as required to establish a cost per square foot that reflected the entire project for each system was added. This included items identified in the base contract by one system and purchased separately by the other to “level the playing field,” as well as the incrementally higher costs for standards established by Memphis City.

The totals for each school type [grade alignment] established the relative base costs for each system before considering the impact of mandatory wage rates and benefit packages. Neither the wage rates nor the benefits package is required by Shelby County. A mandatory wage rate and benefits package, commonly called Prevailing Wage, is required by Memphis City government for all city funded projects within the city. The Memphis City Schools has adopted this policy as well. Experience has shown an additional cost factor as high as 15% for applying these factors to construction costs. The 11% factor determined in a study by the University of Memphis was used for this study. Following is the resulting cost per square foot comparison.

	Shelby County	Memphis [Before wage rates]	Memphis [with wage rates]
Elementary	\$91	\$106	\$118
Middle School	\$94	\$108	\$122
High School	\$117	\$132	\$148

To analyze this, the elementary school cost difference of \$14.90 per square foot before the impact of wage rates was considered. This cost difference is from the revised base cost for the Shelby County elementary school prototype of \$91 per square foot to include the items supplied to the project separate from the contractors' costs.

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The HVAC system added	\$ 9.00
The Roof system added	\$ 4.00
Security provisions added	\$ 1.30
Technology power added	<u>\$.60</u>
Difference in "Standards" cost	\$14.90

The comparisons for the other school types are similar and show that even if the design standards were to be made the same, a similar building would probably cost more in the City of Memphis than it would in Shelby County due to the impact of prevailing wage rates. Furthermore, research indicates that prevailing wage rates have a greater impact on renovation projects versus new construction.

CONCLUSION

A single fixed cost per square foot cannot be established for construction cost because of the many variables involved, not all of which are design decisions. It is recommended that the most equitable solution would be to establish a median construction cost per square foot with an acceptable range as indicated below. Please note the following figures are based on current costs for the 2005 year, application of these numbers in future years should be adjusted on an annual basis.

Grade Level	Cost per Square Foot
Elementary	\$97 - \$107
Middle School	\$99 - \$109
High School	\$122 - \$134

The above standards would encompass the total construction cost of Shelby County School projects and require Memphis City School to value engineer out at least half of the current differential by methods of their choosing. Shelby County School would still have the option of purchasing items with separate funds and dropping below the above benchmark, and Memphis City School would have the option of applying separate funds to exceed the benchmark as long as the capital funding stays within the allowance.

The above costs include construction costs and standard site development only. Land acquisition and development of athletic facilities are not included. Furthermore, the school districts may provide a cost benefit evaluation for building components which may go above and beyond those included in this report or are required as part of their respective board policy.

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APPLICATION OF RECOMMENDED SF/STUDENT & COST/SF of NEW CONSTRUCTION

The purpose of the following chart is to illustrate construction costs based on the proposed recommended square foot per student and cost per square foot previously discussed in this report. The new school construction projections submitted by the Memphis City Schools and Shelby County Schools are reflected below. These estimated costs do not include land acquisition or athletic fields.

School Name	Type	Capacity	Prototype Total SF	Recommended SF/Student	Adjusted Total SF	Recommended Const. Cost/SF	Total Const. Cost
SE Unincorporated Area	ES	1000	106,976	115	115,000	\$102	\$11,730,000
SE Area HS	HS	2000	259,280	150	300,000	\$128	\$38,400,000
SE Unincorporated Area	MS	1000	100,218	125	125,000	\$104	\$13,000,000
East Cordova	ES	1000	106,976	115	115,000	\$102	\$11,730,000
SW Collierville	MS	1000	100,218	125	125,000	\$104	\$13,000,000
Elmore Park Replacement	MS	1000	100,218	125	125,000	\$104	\$13,000,000
South Cordova	ES	750	82,866	120	90,000	\$102	\$9,180,000
Countrywood-Berryhill	MS	900	129,548	130	117,000	\$104	\$12,168,000
NW Bartlett Area	MS	1000	100,218	125	125,000	\$104	\$13,000,000
Arlington/Lakeland Area	ES	1000	106,976	115	115,000	\$102	\$11,730,000
Arlington/Lakeland Area	MS	1000	100,218	125	125,000	\$104	\$13,000,000
South Collierville Area	HS	2000	259,280	150	300,000	\$128	\$38,400,000
TOTALS			1,552,992		1,777,000		\$198,338,000

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CAPITAL NEEDS

As part of the Needs Assessment Committee meeting in April, a questionnaire focused on capital planning was used as an impetus to obtain input and build consensus regarding the varying district priorities. The following summarizes results from both individual and group questionnaires. Please refer to the Appendix of this report, page A-26, for all tabulations and comments.

- Participants indicated that there should not be a common set of priorities for both Memphis City Schools and Shelby County Schools.
- Those that ranked categories for Memphis City Schools most often ranked Immediate Needs [emergency projects to maintain a “safe, dry, & healthy” environment] as the highest priority. The next priorities were fairly evenly ranked between Building Renovations, Building Replacements, and School Closures & Mergers. Clearly Growth was indicated as the lowest priority in Memphis City Schools.
- Those that ranked categories for Shelby County Schools most often ranked Growth [includes new construction and additions] as the highest priority. This was followed by Immediate Needs, Building Renovations, Building Replacement, and School Closures & Mergers respectfully.
- Participants indicated that all categories should be funded, however it was unclear how this might be accomplished.
- Most participants estimated that between \$500 million and \$1.0 billion would be necessary over multiple years, perhaps 3-5 years, to address the school facility needs in MCS and SCS.

It is not surprising that the priorities for each district are different. This is a result of two primary factors, average age of infrastructure and demographics. Memphis City Schools maintains older facilities and is therefore concerned with immediate needs and renovations. Shelby County Schools has had large influxes of population and housing development and is therefore concerned with providing enough space to support a growing student population.

The chart on the following page combines the capital funding requests from both districts and provides an annual sub-total. ADA compliance and deferred maintenance have been allocated over three years per their proposed phasing; also, environmental condition improvements were dispersed.

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Project	District	Completion Date	Funding Requested
New SE HS	SCS	2006 [2008]	\$50,000,000
New SE MS	SCS	2006 [2007]	\$12,000,000
New SE Elem	SCS	2006 [2007]	\$12,000,000
Chimneyrock Roof	SCS	2005	\$1,000,000
ADA compl, Group 1	MCS	2006	\$27,497,000
Defered Maint, Group 1	MCS	2006	\$51,540,000
Enviro Cond Improv	MCS	2006	\$33,200,000
Demo abandoned	MCS	2005	\$1,200,000
Demo merged	MCS	2005	\$2,200,000
Rivercrest ES addn	SCS	2007	\$2,000,000
New ES E Cordova	SCS	2007	\$12,000,000
New MS SW Collierville	SCS	2007	\$12,000,000
New S Cordova ES	MCS	2007	\$15,000,000
New Countrywood MS	MCS	2007	\$25,000,000
Treadwell HS renov	MCS	2007	\$10,084,000
Trezevant HS renov	MCS	2007	\$16,069,000
W Station HS renov	MCS	2007	\$19,045,000
Sub-Total			\$301,835,000
Collierville MS renov	SCS	2008	\$6,000,000
Elmore Park Replacement	SCS	2008	\$12,000,000
Shadowtown MS renov	SCS	2008	\$6,000,000
ADA compl, Group 2	MCS	2007	\$8,013,000
Defered Maint, Group 2	MCS	2007	\$41,200,000
Enviro Cond Improv	MCS	2007	\$33,200,000
Sub-Total			\$106,413,000
New MS NE Bartlett	SCS	2009	\$12,000,000
New ES Arlington/Lake	SCS	2009	\$12,000,000
Farmington revov	SCS	2009	\$3,000,000
Dogwood renov	SCS	2009	\$3,000,000
Germantown ES renov	SCS	2009	\$4,000,000
New HS S Collierville	SCS	2010	\$50,000,000
ADA compl, Group 3	MCS	2008	\$5,100,000
Defered Maint, Group 3	MCS	2008	\$17,500,000
Enviro Cond Improv	MCS	2008	\$33,200,000
Sub-Total			\$139,800,000
New MS Arlington/Lake	SCS	2010	\$12,000,000
Harold ES Addn/renov	SCS	2010	\$6,000,000
Sub-Total			\$18,000,000
TOTAL			\$566,048,000