



March 31, 2009

The Honorable Jon Corzine  
Office of the Governor  
PO Box 001  
State House  
Trenton, New Jersey 08625

RE: P.L. 2008, Ch. 39, approved July 9, 2008

Dear Governor Corzine:

In July 2008 the Legislature passed and you approved new funding legislation for the Schools Development Authority (SDA) for purposes of furthering our mission to replace or rebuild substandard schools across the state. This \$3.9 billion in funding, of which \$2.9 billion is specifically targeted toward SDA districts has enabled the 52 major projects outlined in the SDA's 2008 capital plan to continue or commence design and construction over the next several years.

In conjunction with the funding authorization, the Legislature charged SDA to conduct a study of several potential cost saving measures. Specifically SDA was asked to research the areas of standardized design, bulk supply agreements and the use of consistent preventive maintenance protocols to ensure maximum efficiency and lifespan of building components and systems.

SDA welcomed this directive, which enhanced our own attempts to identify program efficiencies and maximize cost savings. Several aspects of research and implementation were already in process at the time of this request and the urging of the Legislature helped to expedite many of our findings.

In general, you will find that the enclosed report outlines three specific action areas for each cost savings element; practices that are currently employed, initiatives we are in the midst of implementing and future improvements that we will continue to strive toward. It is our hope you will consider this document a step towards an ongoing journey to pursue cost savings wherever possible and we look forward to continuing the dialogue with you and members of the Legislature.

On behalf of the Schools Development Authority, I thank you for your leadership and advice in this endeavor and remain available to answer any questions that may arise from the consideration of this study.

Very truly yours,

Kris Kolluri  
Chief Executive Officer

CC The Honorable Richard J. Codey, Senate President  
The Honorable Joseph J. Roberts, Jr., Assembly Speaker  
Members of the Joint Budget Oversight Committee  
Lucille Davy, Commissioner DOE

## **Purpose**

The following report detailing potential cost savings in the school construction program is respectfully submitted pursuant to P.L. 2008, CHAPTER 39, approved July 9, 2008, Assembly Committee Substitute for Assembly, No. 2873, which provides:

“10. (New section) The development authority, in consultation with the commissioner and program stakeholders, shall conduct a study on the potential cost savings in the school construction program in SDA and other school districts that could be realized through the use of standardized design elements, components, and construction materials. The study shall include, but not be limited to, consideration of the opportunities to save design time, facilitate construction inspections, and ensure maintenance protocol ease through:

- a. utilization of standard building details including, but not limited to, gymnasias, media centers, and cafeterias;
- b. use of bulk supply agreements with original manufacturers; and,
- c. use of consistent preventive maintenance protocols to ensure maximum efficiency and lifespan of building components and systems.

The development authority shall submit the report on or before April 1, 2009 to the Governor, the Joint Budget Oversight Committee, the President of the Senate, the Speaker of the General Assembly, and the commissioner.”

## **Methodology**

The findings in this report derive from both SDA staff research as well as required deliverables to the SDA from agreements with the New Jersey Institute of Technology (NJIT); Rutgers-The State University of New Jersey, Department of Industrial Systems Engineering (Rutgers-DISE); and Shore Point Architecture, P.A.

To provide a cost benefit analysis pertaining to the use of standardized design components, in December 2008 the SDA procured the professional services of Shore Point Architecture, P.A., located in Ocean Grove, NJ.

Regarding analysis pertaining to the use of supplier agreements/bulk purchasing, in November 2008, the SDA executed a Memorandum of Agreement (MOA) with Rutgers-DISE.

Under a MOA with NJIT Center for Architecture and Building Science Research, initially executed in March 2008, one of the task assignments in that MOA was the development of an Operations and Maintenance (O&M) Guidance document and the development of metrics through the identification of key O&M functions.

The SDA conducted its own research through review and analysis of freely available documents and information including, but were not limited to, reports, audits and trade literature. In addition, the SDA accessed subscription-based documentation through the Rutgers University

Library and the New Jersey State Library. The SDA also acquired information through direct communication (email and phone) with other state construction agencies.

## **Synopsis**

### **Standardized Design Components**

In the past, because the SDA's predecessor agency, the Schools Construction Corporation (SCC), did not own architectural plans and designs, options for standardization were very limited. In addition, stakeholder opposition to the use of standardized designs limited program-wide initiatives.

SDA is presently analyzing internal and external research on how standardized design components may best be utilized within the authority's construction projects. SDA consultant, Shore Point Architecture, found there may be potential design and construction cost savings opportunities in the use of standardized design components. In addition, the firm identified other benefits such as "facility parity", which could ensure greater uniformity and consistency among facilities constructed.

The SDA has determined that several aspects of its construction could benefit from the utilization of standardized design principals. A hybrid approach, using "kit of parts" and "standardized construction components" principals would facilitate speed of design and construction inspections. Adopting a modular design approach in specific aspects of construction; cafeterias, gymnasiums, science labs and/or media centers; would assist SDA and districts in the expeditious delivery of school projects.

The SDA will work toward development of several modular components and the creation of an architectural agreement utilizing those components by the end of 2009. Procurement of a design utilizing such components would then be possible for an appropriate project in early 2010.

**Supplier Agreements/Bulk Purchasing**

The SDA, in accordance with direction provided by the Legislature, has for some time engaged in unique and successful supplier agreements for the purchase and installation of furniture, fixtures, equipment, and information technology components. The SDA's experience in procuring these items through supplier agreements has been extremely positive. Cost and time efficiencies have been identified and realized without supply-chain impact.

The SDA is moving to begin procuring certain moveable casework through supplier agreements . Through this method, the SDA can facilitate appropriate uniformity, reduce administrative costs and provide superior manufacturers' warranties to the local districts. Movable casework can provide space adaptable for both current and future needs, and such furniture and equipment can more effectively withstand usage by young people over time.

The SDA will explore opportunities for other potential use of supplier agreements. Rutgers-DISE found potential for cost savings in the use of supplier agreements for construction components in its cost benefit analysis. SDA will determine the applicability to the program of procuring common building materials such as flooring, lighting, doors, hardware, lockers and ceiling tiles. The SDA views this as an ongoing effort to achieve greater efficiencies through supplier agreements.

### **Preventive Maintenance**

The SDA has actively promoted the use of consistent preventive maintenance protocols to ensure maximum efficiency and lifespan of building components and systems through adherence to established Department of Education (DOE) regulations, design requirements of the revised SDA 21<sup>st</sup> Century Schools Design Manual, commissioning protocols and an established close-out process. The SDA is currently developing a maintenance manual that includes the identification of, and specific protocols for, preventive maintenance.

Historically, for school facility projects that the SDA has managed, the SDA has adhered to DOE requirements to provide preventive maintenance information to the school district staff regarding facility components. This information includes manufacturer's warranties, owner's manuals, required maintenance and testing instructions, and a summary report of the warranties, manuals and instructions.

The SDA also mandates the execution of a Maintenance Agreement with school facility owners that describe responsibilities for both the SDA and the facility owners.

With the revision of its 21<sup>st</sup> Century Schools Design Manual in 2007, the SDA incorporated requirements for Life Cycle Cost Analysis and Service Life Planning processes that determine, outline and implement optimal preventive maintenance parameters for both cost savings and ease of use.

The SDA has also implemented plans for comprehensive commissioning and close-out activities.

SDA is working to implement many measures to improve preventative maintenance as outlined in the NJIT's "Operations and Maintenance Guidance Study Report" including; creating better data related protocols; providing more operationally-oriented comprehensive maintenance plans; and optimizing expenditures under preventive maintenance. Independent of NJIT's report, the SDA has emphasized the critical importance of comprehensive maintenance planning that involves all stakeholders; the collection, assessment and analysis of data; and compliance, which includes accountability.

The new school facilities being delivered to the SDA districts are very distinct from the buildings they are replacing and the maintenance of these new facilities requires an entirely different set of skills and practices than those employed historically. Many new systems introduced and the controls that regulate them are often unfamiliar to the school operators. While SDA facilities are not fundamentally different from a conventional new school facility they are dramatically different from the turn of the century facility they are likely replacing and require new skills and methods to manage such facilities.

SDA will consider the utilization of service agreements or preventive maintenance plan agreements for higher technology systems in lieu of local maintenance staff. There may be potential cost savings in systemizing the servicing of certain major maintenance equipment such as HVAC systems and security systems.

## **Narrative**

### **Standardized Design Components**

In general, Standardized Design Components are defined within the context of the following four terms: stock plans, prototype designs, kit or catalogue of parts, and standardized construction elements (or modular design).

**“Stock plans”** are designed, typically, by one professional for reuse by another.

**“Prototype designs”** arise generally within the context as applicable to development and reuse, with minimal modification, of a standardized design developed by and adapted/reused by a single design professional, typically within a single school district. It is this particular distinction that is found evident in practice within larger, growing school districts in which a higher degree of programmatic consistency and standards are in place, and in which land remains readily available and inexpensive (and, typically, flat). Clark County, Nevada and Orange County Public Schools, Florida are most closely identified with the use of prototypical design.

**“Kit or catalogue of parts”** arises generally within the context of a developed and applied set of standardized building elements (classroom wings and such core elements as gymnasias, food services, assembly, and administration) intended for reassembly in various configurations to accommodate variations in site conditions. A parts kit, for example, includes plans for a set of modules, auditoria, cafeterias, school rooms, storage areas and labs, that can fit together as needed to create a fairly standardized, yet still site-specific, school design.

Again, this distinction applies typically to an approach taken at the district level and involves the engagement of a single design consultant for the development and reuse of the kit or catalogue of parts. The Philadelphia School District's "Little School House" project and a series of elementary schools completed by the Perth Amboy Public School District best illustrate this distinction.

**"Standardized construction components"** arises generally within the context of developed construction modules (in contrast to plans or building elements) derived from and for a group of manufacturers. Such a distinction can be seen in the development and applied use of standardized construction components in California's School Construction Systems Development (SCSD) effort in the 1960s.

Currently, the SDA does not employ any standardized design tools in its construction program. Historically, the SDA's options to implement standardized design were pre-empted, since its predecessor agency (the SCC) did not own the designs of the architects procured to provide design services. In April 2005, the State of New Jersey Office of the Inspector General in its Initial Findings Report wrote that "according to language in the standard SCC contracts with architects, the corporation does not own the resultant plans and designs and thus cannot re-use them elsewhere." In addition to this limitation, the SDA, following the experience as found in other state school construction agencies, did not pursue standardization in their programming. In 2007, The Delaware School Construction Committee issued a report, obtained by the SDA, entitled *Stock Floor Plans for Delaware Public School Facilities*. In it, the Committee comments that "[it] weighed the reported successes of stock plan use within various districts across the

United States, noting within this context, the failures and absence of any state-managed program of stock plan usage.”

In November 2008, NJIT delivered a report to the SDA entitled “A Study of New Jersey Early Childhood Centers Delivered through the New Jersey School Development Authority.” The purpose of the study was “to provide educational program and school design information to assist in the development of prototype programs and building types for future New Jersey early childhood centers.” The study analyzed 12 stand-alone early childhood centers (ECC) and stated that “variation in the areas, or square feet per child suggests that particularized district program needs that require additional program space increases the overall school gross square feet area and subsequently the square feet area per child.” The study provided an analysis of program characteristics and identified commonalities in both program and design. Notably, such designs were determined to be easily scaled to adapt to the particular size of a district’s program.

In December 2008, the SDA procured a professional services contract to conduct a cost benefit analysis in the use of standardized design components. In its report to the SDA, Shore Point Architecture highlighted that “Facilities constructed from standardized components would bring facilities parity to all those districts for which the Schools Development Authority performs the construction,” which could, over time, accelerate school design and construction, resulting in “faster design time, faster permitting, and simpler inspections.”

With regard to its findings related to other school construction programs, Shore Point wrote that “those districts that utilize standardized components, the New York City Public Schools and the Los Angeles Unified School District, don’t possess any comparative cost data versus typical

design and construction methodologies as they don't have any current experience with conventional methodologies. They use their standardized system for school facility delivery exclusively."

The SDA, in its own research was unable to find substantiated cost analysis data relative to the use of standardized design components in any other state school construction agency.

Additionally, SDA found that, on the whole, stock plans, prototype designs, kit or catalogue of parts and standardized construction components have been used in discrete, district-specific initiatives only. School districts in large, rapidly growing areas such as Clark County of Nevada, Loudoun County of Virginia, and Orange County of Florida, for example, use prototype designs to better accommodate condensed timeframes.

With regard to the "potential cost savings associated with the use of standardized design components," Shore Point wrote "[it] is more difficult to predict but certainly, based upon the cost matrix, would be lower than for prototypes; something in the order of magnitude of 2% per building over conventional design-bid-build on an individual building basis. These savings would have to be weighed against the cost of developing the standardized design components and maintaining them over time."

Shore Point suggested that "the critical unknown is the cost of developing the library of standardized design components and the cost of maintaining them over time. If this cost were to be lower than the potential cost savings, then the use of standardized design components might

very well have merit. If these costs were equal to the cost savings, then the additional benefits outlined above might, in themselves, be sufficient to justify this endeavor.”

The SDA has determined that several aspects of its construction could benefit from the utilization of standardized design principals. A hybrid approach, using “kit of parts” and “standardized construction components” principals would facilitate speed of design and construction inspections. Adopting a modular design approach in specific aspects of construction; cafeterias, gymnasiums, science labs and/or media centers; would assist SDA and districts in the expeditious delivery of school projects.

The SDA plans to fully analyze the costs & benefits of utilizing standardized design and identify the best use of such design tools within the scope of the Authority’s projects. The SDA will work toward development of several modular components and the creation of an architectural agreement utilizing those components by the end of 2009. Procurement of a design utilizing such components would then be possible for an appropriate project in early 2010.

### **Supplier Agreements/Bulk Purchasing**

The terms “supplier agreement” and “bulk purchasing” are used, generally, within the context of an action to procure goods and services. Supplier agreements act to better manage the acquisition of products from suppliers, while bulk purchasing acts to leverage volume to reduce costs.

Supplier agreements tend toward wider engagements and longer durations, with fixed costs. Bulk purchasing can involve a single purchase based solely on unit costs per volume, a transaction that typically brings with it significant logistical hurdles that include storage, insurance, delivery and delay claims. At this point, due in large part to these potential costs, the SDA engages in supplier agreement activities only.

The SDA currently engages in wide, beneficial and successful supplier agreements for the purchase and installation of furniture, fixtures, equipment and technology through its Furniture, Fixtures, Equipment and Technology Logistics (FFE&T) department. The FFE&T purchases items including, but not limited to, desks, chairs, computers, tables, and bookcases.

Moving forward, the SDA plans to procure directly certain moveable furniture through supplier agreements in lieu of the current procedure, which uses general contractors/subcontractors as the primary procuring agent of traditionally fixed casework furniture. These movable casework items include early childhood coat storage, cubbies, bookcases, storage cabinets, file cabinets, library discharge desks and reception counters. Other wall-mounted casework and sink counters will remain in the general contractor’s contract.

In providing equivalent moveable casework items through supplier agreements, the SDA can facilitate appropriate uniformity, reduce administrative costs and provide superior manufacturers' warranties to the local districts. Movable casework can make space adaptable for both current and future needs, and such furniture and equipment can more effectively withstand usage by young people over time.

Current and future educational programming models involve both discussion and hands-on activities that require changing equipment and furniture arrangements, often during a single class period. A flexible combination of moveable furniture, room and space can better accommodate this educational programming. In contrast, fixed casework is less accommodating, as it remains stationary for the life of the building, making rearrangement of casework costly and difficult, if not impossible. Moveable furniture can create endless possibilities for a space and its rearrangement at no cost and immediate result.

The warranty period for fixed casework is typically one year while moveable metal furniture is often warranted between 10 years to a lifetime. Such an extended period of warranty provides school owners a realistic and effective insurance plan against breakage and repairs under warranty by the manufacturer.

Movable casework also provides and promotes better and easier classroom maintenance while also providing easier access to utilities, maximizing space above and below work surfaces.

The SDA has undertaken two initiatives to realize cost savings using supplier agreements. The first, implemented several years ago, enabled direct procurement of furniture and fixtures from manufacturers. Currently, there are a total of 29 supplier agreements with manufacturers for furniture and fixtures such as desks and chairs, effective for four years (expiring in 2011), with an option to renew for an additional year.

The second subsequent initiative relates to end-user technologies, which include computers and carts, for both students and faculty. The FFE&T department uses the end-user technologies supplier agreements provided by and accessed through the Western States Contracting Alliance (WSCA) and The State of New Jersey's Division of Purchase and Property (DPP), within the Department of the Treasury.

The New Jersey Department of the Treasury Division of Purchase and Property, Cooperative Purchasing Program, through its Western States Contracting Alliance (WSCA) Computer Contract (M0483) provides authorization and access for the SDA's purchase of technology components. WSCA provides a means for states to leverage cooperative multi-State contracting. Through this WSCA contract, the SDA can participate as an authorized governmental entity.

The New Jersey Department of the Treasury Division of Purchase and Property, Cooperative Purchasing Program, established by legislation is the program through which the State extends specific State contracts to eligible local buying units. The Cooperative Purchasing Program provides procurement benefits in pricing, product quality and contract process efficiencies for public purchasing entities throughout the State of New Jersey.

Through this WSCA contract, the SDA procures technology from Dell, HP, Compaq, MPC (formerly Gateway), Apple, IBM, Lenovo, Sun Microsystems and Howard Industries. Items purchased include computer hardware and peripherals, desktop computers and desktop bundles, laptop computers, including notebooks, tablets and convertible tablets, supplies and consumables for computers, printers, scanners and multi-function machines.

The realized cost savings in the use of supplier agreements for FFE&T include those from volume discounts, reduced administrative costs and superior manufacturers' warranties.

The SDA will explore opportunities for other potential use of supplier agreements. Specifically, SDA will determine the applicability to the program of procuring common building materials such as flooring, lighting, doors, hardware, lockers and ceiling tiles. The SDA views this as an ongoing effort to achieve greater efficiencies through supplier agreements.

### **Preventive Maintenance**

Preventive maintenance consists of performing scheduled equipment inspection, testing, and repair services. Activities are performed on a scheduled basis annually, or more frequently, to identify additional maintenance or required systems testing.

The SDA currently implements the use of consistent preventive maintenance protocols to ensure maximum efficiency and lifespan of building components and systems, through, among other means, adherence to established DOE regulation, design requirements of its revised Design Manual (May 2007), its commissioning protocols, an established close-out process. The SDA is currently developing a maintenance manual that includes the identification of and specific protocols for, preventive maintenance.

The SDA adheres to the requirements established by the NJDOE (N.J.A.C. 6A:26A-3.3) to provide a maintenance package for newly completed school facilities projects, which requires, in part:

that as a condition for completion of a school facilities project, the architect or engineer provides the district with a certification that the contractor for the school facilities project has provided a maintenance package containing: manufacturer's warranties; owner's manuals; required maintenance and testing instructions; and a summary report [of the warranties, manuals and instructions]. The maintenance package, which covers the useful life of the school facilities project, is to be incorporated into the district's comprehensive maintenance plan.

Second, the SDA's 21<sup>st</sup> Century School Design Manual, published May 2007, outlines design requirements and includes a set of design criteria that guides the design team in reducing operating costs. Cost effectiveness is one of the chief elements outlined in the Design Manual,

and requires school design provide for a facility that saves money over time through efficiencies in building, maintenance and operation by employing, in its design, life cycle cost and commissioning. The Design Manual's "Integrated Design Considerations" address specific elements to reduce the need for preventive maintenance.

The SDA Design Manual requires that operation and maintenance costs become part of the capital cost decision-making process, making life cycle cost analysis an integral part of the design process. In addition, the manual requires designs that estimate all maintenance and repair costs. The SDA has developed and implemented a Maintenance Agreement for each school facility owner.

The design requirement for a Life Cycle Cost Analysis (LCCA) documents anticipated performance of selected HVAC, lighting, and renewable energy systems using referenced methods and data. This helps to assess the true cost of ownership for systems under consideration over their expected service life. The requirement for Service Life Planning Analysis considers not only the operational costs in relation to capital costs but provides an objective means by which to evaluate what is commonly referred to as durability (Service Life). Such analysis evaluates the relative value of materials and equipment under consideration to inform future revisions to the District Maintenance Plan and development of the System (Operational) Manuals associated with the Commissioning Process. Thus, the SDA ensures preventive maintenance ease through established design protocols.

The SDA Design Manual requires commissioning for school facilities. Commissioning ensures that all building systems perform in accordance with design intent and meet the owner's operational needs. The SDA commissioning efforts include continuous, integrated design and construction review of the entire building, including all its systems. The key components of SDA's comprehensive building commissioning plan include: documenting the design intent and operation protocols for all building systems; verifying in-place system performance through well-documented testing and measurement; preparing comprehensive operation and maintenance manuals, coupled with appropriate training of building operations staff; and monitoring system performance on an ongoing basis. The goals of commissioning are to improve systems reliability, energy performance and facility operations and maintenance. The process requires that the school's facilities staff be properly trained, with accurate as-built documents, along with operation and maintenance manuals delivered at project substantial completion.

Two examples of the SDA's current commissioning activities include the successful commissioning of East Orange Mildred B Garvin and the commissioning currently under contract for the East Orange Elementary School. The SDA will soon contract with other commissioning authorities for additional schools. In addition, the SDA plans to implement Owner Project Requirements (OPR) Workshops, facilitated by a commissioning agent, intended as the first opportunity for the stakeholder team to collectively discuss and document all the requirements and goals applicable to the project.

The SDA Maintenance Agreement describes the responsibilities of both the SDA and the District. The SDA assumes responsibility for the procurement of Operations and Maintenance

Manuals and warranties, start-up procedures documentation, training of district staff, and commissioning. The district assumes the responsibility for routine and required maintenance from the time of “substantial completion” and conducts activities as delineated by the comprehensive maintenance plan.

The SDA recently implemented its newly-developed, comprehensive school construction close-out process, which provides additional opportunities to transfer documentation and educate facility owners.

As one of the one of eight tasks outlined in a MOA with the SDA, NJIT provided a report entitled “Operations and Maintenance Guidance Study Report” in March 2009. In this report, NJIT identified “procedures, protocols and policies (particularly at the state level) that were being used to effectively guide and optimize the operations and maintenance of K-12 schools, at both the individual school and at the district level.”

In an attempt to determine “how current practice within the state compared with best practice approaches during both the design/construction and the operational phases of a school facility project,” NJIT reported findings and recommendations to the SDA.

Of its findings, NJIT writes “the SDA, and its predecessor the SCC, have been reasonably diligent in their collection and delivery to the districts of the O&M data needed to successfully operate and maintain a school facility.” NJIT identifies, however, that the “scope of the data is not as comprehensive as it could be (i.e., going beyond HVAC) and that the data

collection/training process as a whole is somewhat ad hoc, relying on the individual project team to determine the format and scope of the O&M data delivered and the content and depth of the training provided.”

NJIT further found that because each district develops its own comprehensive maintenance plan (CMP) and that the “DOE’s O&M reporting requirements for the districts are primarily budgetary, rather than operational...districts report on what they have spent (or intend to spend), but not how these expenditures fit into – and optimize – an effective comprehensive maintenance plan.” This results in a lack of both data and accountability.

NJIT provided three recommendations in its report:

- Create a uniform protocol for the collection and documentation of O&M Data for each school facilities project and for associated training.
- Ensure that all districts have Comprehensive Maintenance Plans that can adequately incorporate and act upon the O&M Data collected during the design/construction phase.
- Optimize the expenditure of state O&M funds through a more systematic understanding of district-level O&M plans and expenditures.

SDA is working to implement many measures to improve preventative maintenance as outlined in the NJIT’s “Operations and Maintenance Guidance Study Report” including; creating better data related protocols; providing more operationally-oriented comprehensive maintenance plans; and optimizing expenditures under preventive maintenance.

The SDA, through its own research, found an abundance of O&M preventive maintenance

manuals (many state-specific), protocols, and advisements on how to better plan and manage a preventive maintenance program. In all, the findings reflect the critical importance of comprehensive preventive maintenance planning that involves all stakeholders, the collection and analysis of data, and O&M compliance, which includes accountability.

The new school facilities being delivered to the SDA districts are very distinct from the buildings they are replacing and the maintenance of these new facilities requires an entirely different set of skills and practices than those employed historically. Many new systems introduced and the controls that regulate them are often unfamiliar to the school operators. While SDA facilities are not fundamentally different from a conventional new school facility they are dramatically different from the turn of the century facility they are likely replacing and require new skills and methods to manage such facilities.

SDA will evaluate the utilization of service agreements or preventive maintenance plan agreements for higher technology systems in lieu of local maintenance staff. There may be potential cost savings in systemizing the servicing of certain major maintenance equipment such as HVAC systems and security systems.