NEW JERSEY SCHOOLS CONSTRUCTION CORPORATION

One West State Street
Trenton, New Jersey 08625

21st Century Schools

Design Manual

SEPTEMBER 30, 2004

SUMMARY OF MAJOR CHANGES

The *21st Century Schools Design Manual* has been prepared and distributed for use in the design of all New Jersey pre-K through 12 public School Facilities Projects within the NJ Schools Construction Corporation (NJSCC) Program. The *Manual* brings together, in one comprehensive document, all the guidance developed by the NJSCC for designing its 21st century schools, including:

- A new set of Design Criteria to guide the design process toward the NJSCC's performance objectives while allowing Project Teams the creative flexibility to reach these objectives in their own ways.

- An updated and streamlined set of Design Performance Standards, establishing minimum requirements for all NJSCC School Facilities Projects. The Standards **replace and supercede** the NJSCC's *Design and Construction Guidelines, November 5, 2003*.

- An updated and streamlined list of Deliverables that **replaces and supercedes** the Submission Checklists currently contained in the *Procedures Manual for Design Consultants, Version 2001A, January 1, 2001*. The new list **eliminates** the 60% and 95% CD submissions required in the *Procedures Manual*.

- A new Reporting Process, centered on oral presentations at the conclusion of each major project phase to ensure that Project Teams are addressing the Design Criteria in their projects.

- An updated LEED Checklist for reporting anticipated or achieved LEED credits.

- School Safety, Security and Emergency Shelters are addressed as follows: Section 2 - Safety and Security and Section 3, Division 1, 1.2 - School Safety and 1.8 – Emergency Shelter.

All Design Consultants are expected to adhere to this *Design Manual* as a minimum.

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NJSCC Design Manual

Section One

Overview

EXECUTIVE SUMMARY

The *NJSCC 21st Century Schools Design Manual* has been prepared for and shall apply to public School Facilities Projects in the State of New Jersey that are executed by the New Jersey Schools Construction Corporation (NJSCC) as defined by the "Educational Facilities Construction and Financing Act".

Under Section C.18A: 7g-2d the Act states: *'While providing that the educational infrastructure meets the requirements of a thorough and efficient education, the State must also protect the interests of taxpayers who will bear the burden of this obligation. Design of school facilities should incorporate maximum operating efficiencies and new technologies to advance the energy efficiency of school facilities and the efficiency of other school building systems, construction should be in as efficient a manner as possible, and a mechanism to assure proper maintenance of new facilities should be established and implemented, in order to reduce the overall cost of the program and to preserve this infrastructure investment.*'

With the *Design Manual*, it is NJSCC's full intent to establish a uniform approach to School Facilities Project design such that we accomplish the following key goals:

- Establish a means for NJSCC managed School Facilities Projects to be built in an educationally appropriate, community focused, cost effective, sustainable, energy efficient, safe, secure, clean, and environmentally friendly manner.
- Establish a sustainable design approach as a cost effective and common sense means of constructing 21st Century Schools for New Jersey.

This *Design Manual* raises the bar and sets high goals for NJSCC's approach to School Facilities Project design. This approach will help in establishing a new design norm for pre-K through 12 school facilities, while simultaneously establishing NJSCC as the nation's foremost resource for knowledge relative to lessons learned in constructing School Facilities Projects for both urban and suburban areas.

This *Design Manual* is a living document that will be updated as NJSCC project teams learn more efficient and effective ways to design and construct School Facilities Projects for New Jersey, given the specific environmental and site challenges that exist within the NJSCC Program. The *Manual* is centered around NJSCC's commitment to build on the Best Practices from others throughout the nation who have implemented design of pre-K through 12 schools, from both the cutting edge of School Facilities Project design as well as proven standards that have met the test of time.

NJSCC has meshed both criteria together and developed a *Design Manual* that encourages design creativity while simultaneously providing guidance for uniformity in the overall design approach. By implementing the elements included within the *Design Manual*, the Project Team will be taking a significant step forward in creating the physical conditions in which the learning process can thrive. This, in essence, is what defines a 21st Century School for New Jersey.

CONTENTS AND ORGANIZATION

The *NJSCC Design Manual* was developed to help Design Consultants create – and Project Management Firms evaluate – 21st Century schools throughout the State of New Jersey. The *Manual* is organized into four main sections and two Appendices.

- **Section 1. Introduction**

  This section orients the user to the "what, why and how" of the *Design Manual*: what the *Manual* contains; why is has been developed; and how the *Design Manual* should be used over the course of a design/construction project.

- **Section 2. Design Criteria**

  The NJSCC has identified five performance objectives for all NJSCC-constructed School Facilities Projects in New Jersey. Such schools will be: healthy and productive; cost effective; educationally effective; sustainable; and community centered.

  To help Project Teams reach these objectives, the NJSCC has developed a set of 24 Design Criteria to guide and inform the design process:

Acoustic Comfort	Flexibility and Adaptability
Thermal Comfort	Information Technology
Visual Comfort	Efficient Building Shell
Daylighting	Renewable Energy
Indoor Air Quality	Efficient HVAC
Safety and Security	Efficient Electric Lighting
Energy Analysis	Environmentally Responsive Site Planning
Life Cycle Cost	Environmentally Preferable Material & Products
Commissioning	Water Efficiency
Learning Centered Design	Community Involvement
Stimulating Architecture	Community Use
Accessibility	Catalyst for Economic Development

  Section 2 contains individual goals on each of the 24 Criteria. Each sheet provides a brief introduction to key concepts concerning a particular Criteria and identifies specific resources that provide relevant additional information.

  Addressing the Criteria in their School Facilities Project designs is a core requirement for all Project Teams working for the NJSCC. The manner in which the Criteria are addressed is left up to the Teams, allowing them the flexibility to be responsive to their own local conditions and circumstances. However, all the Criteria must be considered and addressed at every phase of a project.

  The Project Progress Report (see Appendix A) delivered at each Project Review Meeting (see Section 4) is the mechanism by which the NJSCC will ensure compliance with this requirement.

- **Section 3. Design Performance Standards**

  This section of the *Design Manual* summarizes the design and construction standards established by the NJSCC for School Facilities Projects in New Jersey. Project Teams must comply with all the requirements described in Section 3 or explain, in detail, why a particular requirement does not apply to their situation. NJSCC written approval is required for all proposed exceptions to compliance with these standards.

  The information in this section is a revision and update of the NJSCC's *Design and Construction Guidelines, November 5, 2003*. The information herein **replaces and supercedes** the *Design and Construction Guidelines*.

- **Section 4. Deliverables**

  This section of the *Design Manual* details the deliverables required at each major phase of Work.

  The Deliverables Checklists in the *Design Manual* **replace and supercede** the "Submission Checklists" contained in the *Procedures Manual for Design Consultants, Volume 2001A*. Consultants are expected to provide all the Deliverables listed in the *Design Manual* and to conform with all other requirements in the *Procedures Manual*.

  Key changes embedded in the new Deliverables Checklist include the following:

  - The deliverables for the Design Development phase are more detailed in required content so that they can be used for more accurate cost estimating and for more detailed Department of Education review.
  - The 60% CD submission required in the *Procedures Manual* is **eliminated**.
  - The 95% CD submission required in the *Procedures Manual* is **eliminated**.
  - A new, 100% CD "Bid Documents" submission, containing, as required, revisions based on review comments, is required.
  - There is a requirement that the PMF's convene – and Design Consultants attend – at least one, formal Project Review Meeting during each major phase of design/construction. The purpose of these meetings will be to review all design/construction activities over the course of the phase, to ensure that all required activities have been accomplished and all deliverables submitted, and to evaluate Project Teams on their progress.
  - During the Review Meetings, Project Teams are required to present formal Project Progress Reports, explaining how they are addressing the 24 Design Criteria described in Section 2 of this Manual. Appendix A provides structured Guides to help Project Teams prepare these reports.

- **Appendix A. Project Progress Report Guides**

  This appendix provides guidance on how to prepare oral presentations using the six Project Progress Reports as an agenda for the oral presentations.

  The Appendix contains six individual Guides, one for each Project Progress Report oral presentation that Design Consultants must prepare. Each Guide is designed to help Design Consultants understand some of the key issues they are expected to address in their designs and explain in their presentations. The Guides will also be used by PMF and NJSCC personnel to structure and direct Project Review Meetings.

- **Appendix B. LEED™ Checklist**

  Design Consultants are required to submit Checklists at the end of each major design/construction phase indicating the LEED™ credits anticipated for the project as of that particular phase.

  A sample Checklist is included in this Appendix, together with instructions on how to complete it. The actual Checklist should be submitted electronically and is available on the NJSCC FTP website.

BACKGROUND AND RATIONALE

The New Jersey Schools Construction Corporation (NJSCC) is committed to creating a legacy of world class educational facilities and to meeting Governor McGreevey's requirement, under Executive Order 24, to create School Facilities Projects that are "…modern facilities of the 21st century, combining all of these features: the best possible learning environment, the most energy-efficient design, the most environmentally sustainable systems, and the highest community relevance…"

To help guide School Facilities Project design and construction in the State toward the goals embodied in the Governor's Executive Order, the NJSCC has:

- established **Performance Objectives** for all Project Teams;
- developed **Design Guidance** to help Teams meet these objectives; and
- implemented a management plan – based on updated **Deliverables** requirements - to ensure that the Guidance is followed and the Objectives are met.

The *NJSCC Design Manual* contains the Design Guidance and the updated list of Deliverables developed – together with relevant supporting materials - to meet the NJSCC's Performance Objectives.

The following briefly describes each of these key program components and their impacts on the School Facilities Project design process in New Jersey.

Performance Objectives

To help clarify the broad goals set by Executive Order 24, the NJSCC has established a set of five key performance objectives for all NJSCC-constructed School Facilities Projects in New Jersey. Such School Facilities Projects will be:

- *Healthy and Productive* - enabling students and teachers to achieve maximum potential by providing healthy, safe, and comfortable environments.
- *Cost Effective* - providing facilities that save money over time by being efficient to build, maintain and operate.
- *Educationally Effective* - providing a superior teaching and learning environment that accommodates present and future needs.
- *Sustainable* - minimizing environmental impacts and maximizing the use of non-polluting, renewable resources.
- *Community Centered* - creating School Facilities Projects that are integral parts of their communities.

Achieving these performance objectives in every NJSCC School Facilities Project is a core performance objective for all NJSCC Project Teams.

Design Guidance

To help Project Teams better understand these objectives and how to achieve them, the NJSCC has:

- committed to ensuring that all NJSCC projects achieve a minimum of 26 LEED™ points (plus all prerequisites), wherever possible.
- identified 24 School Facilities Project Design Criteria that every Project Team must address in their designs;
- developed definitions of these Criteria and identified additional sources of information;
- updated and streamlined its existing *Design and Construction Guidelines* into a comprehensive set of Design Performance Standards;

Deliverables

To help ensure that Project Teams meet its Performance Objectives the NJSCC has:

- updated and streamlined its existing Deliverable requirements
- implemented a flexible process whereby Project Teams will be given the freedom to pursue the Performance Objectives in their own fashion;
- implemented a process whereby Project Teams will regularly report on their progress in meeting the Performance Objectives.

Detailed discussions of the Design Criteria (Section 2), the Design Performance Standards (Section 3), the Deliverables (Section 4), the Progress Reports (Appendix A) and the LEED Points (Appendix B) form the basis of the *NJSCC Design Manual*

USING THE MANUAL

The *NJSCC Design Manual* is intended to accomplish two key goals:

1. To help NJSCC Project Teams understand and then design, 21st Century schools throughout New Jersey; and
2. To provide a structured framework that Project Teams can use to report on – and PMF/NJSCC personnel can use to evaluate – their progress in meeting the NJSCC's 21st century School Facilities Project objectives.

The *Manual* should therefore be used in distinct ways during design and the report out/evaluation period.

During Design

At the beginning of a School Facilities Project design project NJSCC Design Consultants should undertake the following steps:

- Read and familiarize themselves with the entire *NJSCC Design Manual.*
- Review each of the 24 Design Criteria in detail in Section 2: Design Criteria.
- As appropriate, access additional resources listed.
- Attempt to address and incorporate the Design Criteria at the earliest phases of the design process. Continue to incorporate the Criteria, on an ongoing basis, as the design process proceeds.
- Review the NJSCC Design Performance Standards (Section 3).
- Ensure that all Requirements are met – or that reasonable justifications for any non-compliance have been submitted and approved – prior to project completion.
- Review the LEED™ Checklist (Appendix B) and LEED™ Version 2.0.
- Attempt to incorporate as many LEED™ points as possible at the earliest phases of the design process. Ensure that at least 26 points, plus all prerequisites, are incorporated in the finished building, wherever possible.

During Project Report and Evaluation

In preparation for the Project Review Meeting required at the conclusion of each project phase, NJSCC Design Consultants should consult Section 4 of the *Design Manual* to review the Deliverables Summary for that phase. Consultants should then undertake the following steps:

- Prepare all required deliverables in accordance with Section 4, supplemented, as appropriate, with information from the *Procedures Manual for Design Consultants, Volume 2001A*.
- Prepare an oral presentation based on the Project Progress Report using the appropriate Progress Report Preparation Guide in Appendix B as a reference.
- Prepare, as appropriate, any requests for exceptions to the Design Performance Standards contained in Section 3.
- Complete the LEED™ Checklist for that phase of the project.
- Attend the Project Review Meeting for that phase of the project – review design/construction activities over the course of the phase; submit all required deliverables; deliver Project Progress Report (orally); and discuss requests for exceptions to the Design Performance Standards.

NJ Schools Construction Corporation

NJSCC Design Manual

Section Two

Design Criteria

INTRODUCTION

SCOPE AND INTENT

The NJSCC has identified five performance objectives for all NJSCC-constructed schools in New Jersey. Such schools will be:

- Healthy and Productive;
- Cost Effective;
- Educationally Effective;
- Sustainable; and
- Community Centered.

To help Project Teams reach these objectives, the NJSCC has developed a set of **24 Design Criteria** to guide and inform the design process:

Acoustic Comfort	Flexibility and Adaptability
Thermal Comfort	Information Technology
Visual Comfort	Building Shell
Daylighting	Renewable Energy
Indoor Air Quality	HVAC
Safety and Security	Electric Lighting
Energy Analysis	Environmentally Responsive Site Planning
Life Cycle Cost	Environmentally Preferable Material & Products
Commissioning	Water Efficiency
Learning Centered Design	Community Involvement
Stimulating Architecture	Community Use
Accessibility	Catalyst for Economic Development

Addressing the Criteria in their School Facilities Projects is a core requirement for all Project Teams working for the NJSCC. The manner in which the Criteria are addressed is left up to the Teams, allowing them the flexibility to be responsive to their own local conditions and circumstances. However, all the Criteria must be considered and addressed at every phase of a project.

The Project Progress Report (see Appendix A) delivered at each Project Review Meeting (see Chapter 4) is the mechanism by which the NJSCC will ensure compliance with this requirement and evaluate performance.

ORGANIZATION AND CONTENT

This section of the *Design Manual* contains Individual "fact sheets" on each of the 24 Criteria. Each fact sheet is organized into the following six short sections:

The What and Why…
A brief explanation of the Design Criteria.

Integrated Design Considerations
A discussion of how the Criteria interacts with other 21st Century criteria and systems.

Recommendations
A brief list of best practice recommendations for incorporating the Criteria into a 21st Century school.

Associated LEED Credits
A summary of applicable LEED credits associated with a particular Design Criteria.

Reference Standards and Guidelines
A list of reference standards and/or guidelines applicable to the Design Criteria.

Industry and Governmental Resources
Targeted references and resources that expand on the information in the fact sheet

The discussions are purposely short, and are only intended to provide an introduction to key issues and concepts, as well as highlight best practice recommendations for addressing a particular Criteria in the design of schools. Further information can be found by accessing the referenced documents and resources identified at the conclusion of each Design Criteria.

USING THIS SECTION OF THE *DESIGN MANUAL*

Project Teams should familiarize themselves with the information contained in this Section at the earliest stages of a School Facilities Project. Because the Design Criteria contained herein are intended to help guide and inform the design process, the Section – especially the referenced resources – should be consulted regularly over the course of a project.

In addition, the Section should be specifically referenced as Teams prepare the Project Progress Reports due at the end of each major phase of design and construction. Since these Reports must discuss how the Team is addressing each of the 24 Design Criteria, a good understanding of the Criteria will be important for preparing effective Reports. Appendix A provides a series of Guides – organized to follow the Design Criteria – to assist in preparing Progress Reports.

ACOUSTIC COMFORT

THE WHAT AND WHY…

Parents, students, teachers, and administrators across the country are increasingly concerned that classroom acoustics are inadequate for proper learning. Noise from outside the school (vehicular traffic, aircraft flyover, etc.), hallways (foot traffic and conversation), other classrooms (amplified sound systems and inadequate sound attenuation), mechanical equipment (compressors, boilers and ventilation systems), and even sound from within the classroom itself (reverberation) can all hamper students' concentration. The message has even reached the Access Board, the organization that supports implementation of the Americans with Disabilities Act, which has received complaints concerning the effects of bad acoustics on hearing-impaired students.

A 21st Century school should address these potential problems and ensure a superior acoustical environment by:

- Reducing sound reverberation time inside the classroom;
- Limiting transmission of noise from outside the classroom;
- Minimizing background noise from the building's heating, ventilating, and air conditioning system.

Trying to hear in a poor acoustical environment is like trying to read in a room with the lights off: stress increases, concentration decreases, and learning is impaired. This is especially true for younger students (the ability to sort meaningful signals from noise is not fully developed until children reach their teens), those for whom English is a second language, and those with hearing impairments. Although little consideration has historically been given to acoustic design in classrooms – as opposed to lighting and ventilation – this situation is beginning to change. The information and tools needed to design classrooms for high acoustical performance now exist. They can be used to ensure that any newly constructed classroom provides an acoustic environment that positively enhances the learning experience for students and teachers.

INTEGRATED DESIGN CONSIDERATIONS

When classroom ceilings are designed to optimize daylighting, suspended acoustical ceilings are often eliminated and the exposed surfaces are painted with highly reflective paint to throw daylight well into the classroom. The sound absorption value lost by the absence of the suspended ceiling must be replaced in other ways to prevent the classroom from becoming highly reverberant. In situations where roof monitors are used, parts of the acoustical ceiling are also removed. However, the open space under the skylights and monitors can also dampen reverberation and may compensate for the lost portions of the ceiling.

RECOMMENDATIONS

Reduce sound reverberation time in classrooms to 0.5 seconds in 500, 1000, 2000 and 4000 Hz Octave Bands

- Configure classrooms to damp rather than magnify sound reverberation.
- Specify sound absorbing materials (especially on exposed surfaces) to damp reverberation.

Limit transmission of noise from outside the classroom:

- Design high Sound Transmission Class (STC) walls between:
  - Classrooms adjacent to laboratories (STC-50)
  - Classrooms adjacent to music practice or mechanical equipment rooms (STC-55)
  - Design exterior walls, windows, and roofs such that noise transmission (except for intermittent noise such as airplane flyovers) is reduced to the same levels as background noise inside the classroom (i.e., RC 30 – 35)
- Minimize background noise from the building's heating, ventilating, and air conditioning system
- Design the system to achieve the following RC levels, based on the Room Criterion method explained in the ASHRAE 1999 Applications Handbook:
  - Ideal RC-25N
  - Acceptable RC-30N
  - Maximum RC-35N
- Avoid locating mechanical equipment rooms next to classrooms.
- Recognize that sound control is more difficult in unducted rooftop or through-the-wall units than in central air handling systems.
- If using ducted rooftop units, ensure that they are mounted on spring isolators.
- Consider using larger ducts with lower air flow speeds (1000 feet per minute maximum).
- Select diffusers with low noise ratings (NC-20 to NC-23).

ASSOCIATED LEED CREDITS

Required Pre-requisites:
EA Pr.1: Fundamental Building Systems Commissioning

Elective Credits:
EA Cr.3: Additional Commissioning

REFERENCE STANDARDS AND GUIDELINES

Acoustical Society of America ANSI/ASA S12.60-2002

ASHRAE 1999 Applications Handbook

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- Apfel, Robert E. *Deaf Architects & Blind Acousticians? A Guide to the Principles of Sound Design.* New Haven: Apple Enterprises Press, 1998.

- Acoustical Society of America. *ANSI/ASA S12.60-2002: American National Standard Acoustical Performance Criteria, Design Requirements and Guidelines for Schools.* Melville, NY: ASA, 2002. (http://asa.aip.org/classrooms/acoustics-booklet.htm)

- American Society of Heating, Refrigerating and Air Conditioning Engineers. *1999 Applications Handbook*, Atlanta, GA: ASHRAE 2003. (www.ashrae.org)

- Sleeper, Ramsey. The American Institute of Architects. *Architectural Graphic Standards, Tenth Edition*. Washington, DC: John Wiley & Sons. Pages 63-70.

Online Resources

- American Speech-Hearing-Language Association. www.asha.org/index.htm. (1 Aug, 2004). Online course available.

- The Classroom Acoustics Coalition. *Guidelines for Classroom Acoustics in New Construction.* www.nonoise.org/quietnet/qc/workshop/dec97shp/guide.htm (1 Aug. 2002).

- Institute of Noise Control Engineering. www.inceusa.org. (1 Sept. 2004).

- National Council of Acoustical Consultants. www.ncac.com. (1 Aug. 2004).

- National Clearinghouse for Educational Facilities. www.edfacilities.org/rl/acoustics.cfm. (1 Aug. 2004).

- Noise Pollution Clearinghouse. www.nonoise.org/quietnet/qc. (1 Sept. 2004).

- Quiet Classrooms. *Classroom Design for Good Hearing.* http://quietclassrooms.org. (1 Sept. 2004).

- Quiet Classrooms. *Listening for Learning.* http://quietclassrooms.org. (1 Sept. 2004).

- U. S. Access Board. *Acoustics Fact sheet*. www.access-board.gov/ publications/acoustic-factsheet.htm. (1 Aug. 2004).

THERMAL COMFORT

THE WHAT AND WHY…

Thermal comfort is a function of the temperature and relative humidity in a room. While the building code requires minimum levels of temperature and humidity in occupied spaces, it does not specify how these levels are to be achieved, leaving open the possibility that individual areas within a room may be too hot or too cold. Further, code levels are only minimums – the optimal levels for specific applications may be quite different. A 21st Century school should ensure that rooms and HVAC systems are designed to allow temperature and humidity levels to remain within the 'comfort zone' at all points in an occupied space.

Thermal comfort is an important variable in student and teacher performance. Hot, stuffy rooms – and cold, drafty ones – reduce attention spans and limit productivity. They also waste energy, adding unnecessary cost to a school's bottom line. Excessively high humidity levels can also contribute to mold and mildew.

INTEGRATED DESIGN CONSIDERATIONS

Thermal comfort is strongly influenced by how a specific room is designed (How much heat do its walls and roof gain or lose? How much sunlight do its windows let in? Can the windows be opened? etc.) and by how effectively the HVAC system meets the specific needs of that room. Balancing these two components – room design and HVAC system design – is a back-and-forth process that continues throughout all stages of new facility development.

In a 21st Century school, the process results in an optimal blend of both components: rooms configured for high student and teacher productivity served by an energy efficient HVAC system. The system is designed, sized, and controlled to maintain thermal comfort under all conditions.

RECOMMENDATIONS

- Comply with American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Standard 55-1992 (with 1995 Addenda) Thermal Environmental Conditions for Human Occupancy.
- When a design incorporates natural ventilation (e.g., opening windows to provide direct outdoor air during temperate times of the year), consider adjusting the requirements of ASHRAE Standard 55-1992 to account for the impact.
- Analyze room configurations and HVAC distribution layouts to ensure that all parts of a room are receiving adequate ventilation.
- Analyze placement of windows and skylights and provide adequate, controllable shading to avoid 'hot spots' caused by direct sunlight.
- Consider providing a temperature and humidity monitoring system to ensure optimal thermal comfort performance.
- Evaluate the inclusion of temperature and humidity monitoring as part of the building's overall energy management system.
- Consider providing controls in each room to offer teachers more direct control over thermal comfort.
- Evaluate the potential impact of such controls on the overall efficiency of the HVAC system.

ASSOCIATED LEED CREDITS

Elective Credits:
IEQ Cr.7: Thermal Comfort

REFERENCE STANDARDS AND GUIDELINES

USGBC LEED *Rating System v2.0*

ASHRAE *Standard 55-1992* (with 1995 Addenda)

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE). *2003 Applications Handbook.* Atlanta, GA: ASHRAE 2003. (www.ashrae.org)

- American Society of Heating, Refrigerating and Air Conditioning Engineers, *2000 HVAC System and Equipment Handbook.* Atlanta, GA: ASHRAE, 2003. (www.ashrae.org)

Online Resources

- Energy Efficiency and Renewable Energy Network. www.eere.energy.gov/EE/buildings_specific.html (1 Aug, 2004).

- Efficient Window Collaborative. www.efficientwindows.org (1 Aug, 2004).

- Energy Design Resources. *Design for Your Climate.* http://216.98.139.76/resource/27. (1 Sept, 2004).

VISUAL COMFORT

THE WHAT AND WHY…

For both students and teachers, performing visual tasks is a central component of the learning process. A 21st Century school should provide a rich visual environment – one that enhances, rather than hinders, learning and teaching. These environments are achieved by carefully integrating natural and artificial lighting strategies, by balancing the quantity and quality of light in each room, and by controlling or eliminating glare.

Students spend much of their day engaged in visual tasks – writing, reading printed material, reading from visual display terminals, or reading from blackboards, whiteboards, and overheads. Further, they must constantly adjust their vision from 'heads up' to 'heads down' positions and back again. Inadequate lighting and/or glare in these situations can seriously impact a student's ability to learn. On the other hand, a comfortable, productive visual environment – one that takes into account more than simply the amount of light hitting the desk top – will enhance the learning experience for both students and teachers.

INTEGRATED DESIGN CONSIDERATIONS

Visual comfort results from a well-designed, well-integrated combination of natural and artificial lighting systems. Any strategy for enhancing the visual environment will therefore strongly impact the size and configuration of both of these systems (e.g., number, type, and placement of windows; number, type, and placement of light fixtures; etc.). The final configurations will, in turn, impact a school's heating and cooling systems.

An optimized overall design will provide a high quality luminous environment and will use daylight effectively to reduce the need for artificial lighting. Less artificial lighting means lower electricity bills and less waste heat which, in turn, reduces the demand for cooling and lowers overall HVAC operating expenses.

RECOMMENDATIONS

Integrate Natural and Artificial Lighting Strategies:

- Take the amount of daylight entering a room into account when designing and sizing the artificial lighting system for that room.
- Provide controls that turn off lights when sufficient daylight exists.
  - Consider dimming controls that continuously adjust lighting levels to respond to daylight conditions.

Balance the Quantity and Quality of Light in Each Room:

- Avoid excessively high horizontal light levels.
  - Use the newly revised 9th edition of the Illuminating Engineering Society of North America's *Lighting Handbook: Design and Application* as a guide
- Design for 'uniformity with flexibility':
  - Illuminate spaces as uniformly as possible, avoiding shadows or sharp distinctions between dark and light
  - As appropriate, provide task or accent lighting to meet specific needs (e.g., display areas, white boards, team areas, etc.)
  - Develop individual lighting strategies for individual rooms or room types (e.g., classrooms, hallways, cafeteria, library, etc.). Avoid 'one size fits all' approaches

Control or Eliminate Glare:

- Consider how light sources in a room will impact work surfaces. Design to avoid:
  - Direct glare from sources in front or to the side of a work area
  - Overhead glare from sources above the work area
  - Reflected glare from highly reflective surfaces, including glossy paper and computer terminals
- As methods of control, consider increasing the brightness of surrounding surfaces, decreasing the brightness of light sources, or both.
- Consider interior (shades, louvers, blinds) or exterior (overhangs, trees) strategies for filtering daylight and controlling glare from sunlight.

ASSOCIATED LEED CREDITS

None

REFERENCE STANDARDS AND GUIDELINES

Illumination Society of North America (IESNA). *IESNA Lighting Handbook 9th Edition.*

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- Illumination Society of North America (IESNA). *IESNA Lighting Handbook 9th Edition*. New York: IESNA, 2000. (www.iesna.org).

- Illuminating Engineering Society of North America, *IESNA RP-3-00: Lighting for Educational Facilities.* New York: IESNA, 2000. (https://www.iesna.org/shop/item-detail.cfm?ID=RP-3-00&storeid=1)

- New Buildings Institute. *Advanced Lighting Guidelines 2003 Edition.* White Salmon, WA: NBI, 2003. (www.newbuildings.org/lighting.htm#guide)

Online Resources

- Design lights Consortium. www.designlights.org. (1 Sept, 2004).

- Electric Power Research Institute. *Controls: Patterns for Design*. www.epri.com. (1 Sept, 2004).

- Energy Star Program. www.energystar.gov. (1 Aug, 2004).

- Lighting Research Center, Rensselaer Polytechnic Inst. *Case Studies.* www.lrc.rpi.edu. (1 Aug, 2004)

DAYLIGHTING

THE WHAT AND WHY…

Daylighting is the controlled admission of natural light into a space through windows, skylights, or roof monitors. A 21st Century school should use as much natural daylight as possible (especially in classrooms) while avoiding excessive heat loss, heat gain, and glare.

Access to natural light may be one of the most important attributes of a 21st Century school. Daylight is the highest quality light source for visual tasks, as it enhances the color and appearance of objects. Studies clearly indicate that daylighting can enhance student performance (see resources). Views from windows also provide a connection with the natural world and promote healthy vision by allowing frequent changes in focal distance.

Daylighting can also save a school money. Properly designed systems can substantially reduce the need for electric lighting, which can account for 35 to 50 percent of a school's electrical energy consumption. An added benefit: waste heat from the lighting system is also reduced, which in turn reduces demand on the school's cooling equipment. These savings can be as much as 10 to 20 percent of a school's cooling energy usage. It's also worth noting that daylight provides these savings during the day, when demand for electric power is at its peak and rates are at their highest.

INTEGRATED DESIGN CONSIDERATIONS

Daylighting strategies should interact strongly with a school's lighting and HVAC systems. Properly designed daylighting systems will reduce the need for electric light, thus lowering overall electricity usage. Less electric light also means less waste heat from the lighting system, reducing the need for cooling. Both of these strategies improve the school's bottom line by substantially reducing overall energy costs. Operable windows and skylights can also be opened to provide natural ventilation when outdoor conditions permit.

RECOMMENDATIONS

- Use a daylighting analysis tool to help guide the design process.
- Design windows to allow daylight to penetrate as far as possible into a room. Consider using light shelves (solid horizontal elements placed above eye level, but below the top of the window) to reflect daylight deep into a room.
- Design for diffuse, uniform daylight deep into a room.
- Consider skylights (horizontal glazing), light from two sides, and/or clerestory windows.
- Avoid direct-beam sunlight.
- Avoid glare.
- Consider interior (shades, louvers, or blinds) and exterior (overhangs, trees) strategies to control glare and filter daylight.
- Design room layouts that take advantage of daylight. Consider sloped ceilings and/or light colored ceiling surfaces to help reflect daylight within the room.
- Integrate daylighting with the electric lighting system. Provide controls that turn off lights when sufficient daylight exists. Consider dimming controls that continuously adjust lighting levels in response to daylight conditions.

ASSOCIATED LEED CREDITS

Elective Credits:
IEQ Cr.8.1: Daylight & Views
IEQ Cr.8.2: Daylight & Views

REFERENCE STANDARDS AND GUIDELINES

None

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- New Buildings Institute. *The Advanced Lighting Guidelines 2001*. White Salmon, WA: 2001. (http://www.newbuildings.org/lighting.htm#guide).

- Heschong Mahone Group, Pacific Gas and Electric Company on behalf of the California Board for Energy Efficiency Third Party Program. *Daylighting in Schools.* August 1999. (http://www.pge.com).

- Ernest Orlando Lawrence Berkely National Laboratory. Tips for Daylighting with Windows: The Integrated Approach. University of California, Berkeley, 1997.

Online Resources

Daylighting Collaborative.*Cool Daylighting Design Approach Workbook Volume 2: Schools*, 1999. http://www.daylighting.org/pubs/v2schools.pdf. (1, Sept, 2004).

- Energy Design Resources California Public Utilities Commission. *Skylighting & Daylighting Guidelines.* www.energydesignresources.com/resource/140/. (1, Sept, 2004).

- New Buildings Institute. *Daylighting in Schools: Additional Analysis*. February 2001. www.pge.com. (1, Sept, 2004).

- Nicklas, M. and G. Bailey. *Analysis of the Performance of Students in Daylit Schools, Proceedings of the 1997 Annual Conference*. American Solar Energy Society. www.ases.org. (1 Sept, 2004).

- Plympton, P., Conway, S. and Epstein, K. *Daylighting in Schools: Improving Student Performance and Health at a Price Schools Can Afford*. Presented at the American Solar Energy Society Conference, Madison, Wisconsin, 2000. www.deptplanetearth.com/nrel_student_performance.htm. (1, Sept, 2004).

- Rensselaer Polytechnic Inst.Lighting Research Center. www.lrc.rpi.edu. (1, Sept, 2004).

INDOOR AIR QUALITY

THE WHAT AND WHY…

The quality of the air inside a school is critical to the health and performance of children, teachers, and staff. A 21st Century school should provide superior indoor air quality by: controlling the sources of contamination, providing adequate ventilation, preventing unwanted moisture accumulation, and implementing effective operations and maintenance procedures.

According to the U.S. Environmental Protection Agency, the concentration of pollutants inside a building may be two to five times higher than outside levels. Children are particularly vulnerable to such pollutants because their breathing and metabolic rates are high relative to their size – much higher than for adults. Maintaining a high level of indoor air quality is therefore a critical issue for schools to address. According to the EPA, failure to do so may:

- Negatively impact student and teacher performance;
- Increase the potential for long- and short-term health problems for students and staff;
- Increase absenteeism;
- Accelerate deterioration and reduce efficiency of the school's physical plant;
- Create negative publicity that could damage a school's image;
- Create potential liability problems.

'Designing in' superior indoor air quality from the beginning is the most cost-effective way to avoid these negative outcomes and ensure a healthy and productive indoor environment.

INTEGRATED DESIGN CONSIDERATIONS

Increasing ventilation to improve indoor air quality will have an impact on the size and operation of the overall HVAC system. The entire system should be "right sized" and make use of appropriate technology to provide the optimum level of ventilation air in the most energy and cost effective manner possible.

RECOMMENDATIONS

Control Sources of Contamination:

- Test the site for sources of contamination: radon, hazardous waste, fumes from nearby industrial or agricultural uses.
- Locate sources of exhaust fumes (e.g. from buses, cars, or trucks) away from air intake vents.
- Consider recessed grates, 'walk off' mats, and other techniques to reduce the amount of dirt entering the building.
- Specify materials and furnishings that are low emitters of indoor air contaminants. Consider:
  - Adhesives and sealants with low levels of volatile organic compounds (VOCs);
  - Paints and coatings that meet or exceed the VOC and chemical component limits of the Green Seal requirements;
  - Carpet systems that meet or exceed the Carpet and Rug Institute's Green Label Indoor Air Quality Test Program;
  - Composite wood or agrifiber products containing no added urea-formaldehyde resins.
- Allow adequate time for all installed materials and furnishings to 'outgas' before the school is occupied. Assist the process by running the HVAC system continuously at the highest possible outdoor air supply setting for at least 72 hours after all materials and furnishings have been installed in order to 'flush out' the facility.

Provide Adequate Ventilation:

- Design the ventilation system to provide a minimum of 15 cubic feet per minute per person of filtered outdoor air to all occupied spaces (consider 20 cubic feet per minute).
- Ensure that ventilation air is effectively delivered to and distributed through the school rooms.
- Provide local exhaust for restrooms, kitchens, science labs, janitor's closets, copy rooms, and vocational/ industrial shop rooms.

Prevent Unwanted Moisture Accumulation:

- Avoid ventilation air that is too moist; design the ventilation system to maintain the indoor relative humidity between 30% and 50%.
- Design to minimize water vapor condensation, especially on walls and the underside of roof decks, and around pipes or ducts.
- Design to keep precipitation out of the building: off the roof and away from the walls.

Operate and Maintain the Building Effectively:

- Regularly inspect and maintain the ventilation system so that it continues to operate as designed.
- Install CO2 sensors in large assembly areas (auditorium, gym) to provide real-time monitoring of air quality.
- Design cleaning and maintenance programs to minimize the use of toxic materials.

ASSOCIATED LEED CREDITS

Required Pre-requisites:
IEQ Pr.1: Minimum IAQ Performance
IEQ Pr.2: Environmental Tobacco Smoke (ETS) Control

Elective Credits:
IEQ Cr.1: Carbon Dioxide (CO_2) Monitoring
IEQ Cr.2: Increase Ventilation Effectiveness

IEQ Cr.3: Construction IAQ Management Plan
IEQ Cr.4: Low-Emitting Materials
IEQ Cr.5: Indoor Chemical & Pollutant Source Control
IEQ Cr.6: Controllability of Systems

REFERENCE STANDARDS AND GUIDELINES

ASHRAE Standard 62-2001, Ventilation for Acceptable Indoor Air Quality, Association of Heating, Refrigerating and Air Conditioning Engineers (www.ashrae.org)

ASTM D 6245-1998: Standard Guide for Using Indoor Carbon Dioxide Concentrations to Evaluate Indoor Air Quality and Ventilation

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- American Society for Testing and Materials. *ASTM D 6245-1998: Standard Guide for Using Indoor Carbon Dioxide Concentrations to Evaluate Indoor Air Quality and Ventilation*. Washington, DC: ASTM, 1998. (www.astm.org)

- U.S. Environmental Protection Agency. *Indoor Air Quality Tools for Schools and Indoor Air Quality Tools for New Schools.* Washington, DC: EPA, 2002. (www.epa.gov/iaq)

Online Resources

- IAQ Design Tools for Schools, U.S. Environmental Protection Agency http://www.epa.gov/iaq/schooldesign/ (1 Aug, 2004)

- National Clearinghouse for Educational Facilities. Indoor Air Quality in Schools. www.edfacilities.org/rl/iaq.cfm (1 Aug, 2004)

- Washington State Dept of Health. *School Indoor Air Quality Best Management Practices.* www.doh.wa.gov/ehp/ts/IAQ/schooliaqbmp.pdf (1 Aug, 2004)

SAFETY AND SECURITY

THE WHAT AND WHY…

Safety and security have become critical concerns for students, teachers, and parents across the country. A 21st Century school should create a safe and secure environment by design. Opportunities for natural surveillance should be optimized, a sense of territoriality should be reinforced, access should be controlled, and technology should be used to complement and enhance, rather than substitute for, a facility's security-focused design features.

Crime and vandalism – and the fear they foster – are problems facing school populations throughout the United States. While better buildings cannot solve these problems alone, they can be powerful factors in helping reduce crime and other antisocial behavior. Thoughtful design that builds on Crime Prevention through Environmental Design (CPTED) principles is crucial to this process.

(Note: The design impacts of terrorism and other homeland security concerns are currently under development.)

RECOMMENDATIONS

Control Access to the Building and the Ground:

- Consider decorative fencing to control access to school grounds.
- Limit the number of entries to the building.
- Allow visual surveillance of all entries from inside the school.
- Provide the ability to 'lock down' parts of the school when the facility is used for after-hours activities.

Integrate Security Technology:

- Consider incorporating interior and exterior surveillance cameras.
- Ensure that all high-risk areas (office, cafeteria, shops, labs, etc.) are protected by high security locks.
- Consider metal detectors and other security technologies, as appropriate.

Increase Opportunities for Natural Surveillance:

- Design landscaping to minimize places that are hidden from view.
- Ensure that key areas – parking, bicycle storage, drop-off points, play equipment, entries – are easily observable from inside the building.
- Design exterior lighting to facilitate nighttime surveillance.
- Consider providing views (using glazed doors or windows) from classrooms into circulation corridors.
- Design to minimize areas within the building that are hidden from view.

Reinforce a Sense of Territoriality:

- Foster a sense of 'ownership' of the school by students and teachers.
- Clearly define borders – what is part of the school and what is not.
- Consider decorative fencing and special paving treatments to delineate the boundaries of the school grounds.
- Consider designing common areas – particularly corridors – that are less institutional and more 'room like.'
- Consider materials and finishes that are graffiti resistant.

ASSOCIATED LEED CREDITS

None

REFERENCE STANDARDS AND GUIDELINES

None

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- The Aegis Protection Group, Inc. *The Complete School Safety and Security Manual*. Goshen, KN: ACPI, 2001. (http://www.aegisprotect.com/acpi/school%20manual.htm)
- Crowe, Timothy D. *Crime Prevention through Environmental Design.* Boston: Butterworth-Heinemann, January 2000. (http://books.elsevier.com)
- National Crime Prevention Council. *Designing Safer Communities: A Crime Prevention through Environmental Design Handbook.* Washington, DC: NCPC, 1997 (http://www.ncpc.org/ncpc/ncpc/?pg=5882-2006-2486)
- Newman, Oscar. *Defensible Space*. New York: Macmillan, 1972. (http://www.defensiblespace.com/book.htm)

Online Resources

- American Society of Industrial Security. www.asisonline.org. (1 Aug, 2004)
- FEMA 428. *Primer to Design Safe School Projects in Case of Terrorist Attacks.* www.fema.gov/pdf/fima/428/fema428.pdf (1 Aug, 2004)
- Keep Schools Safe. www.keepschoolssafe.org. (1 Aug, 2004)
- National Resource Center for Safe Schools. www.safetyzone.org. (1 Aug, 2004)

ENERGY ANALYSIS

THE WHAT AND WHY…

Energy Analysis Tools are computer programs designed to predict a building's annual (and in some cases, even hourly) energy consumption. They can be used to evaluate the energy impacts of various low-energy strategies (e.g., higher insulation levels, better glazing, increased thermal mass, etc.) in terms of their influence on overall building performance. Combined with accurate cost estimates, energy analysis programs can help create a 21st Century school that is optimized in terms of its overall energy performance.

The design team for a 21st Century school should begin using an energy analysis tool(s) at the outset of the design process (ideally during pre-design, when sustainable building strategies can be integrated at lowest possible cost) and continue through the bidding/negotiation phase. Reducing energy consumption in a cost-effective manner is good for both the environment and the school district's bottom line. Doing so requires the ability to quickly compare and contrast a variety of alternate design strategies so that the optimal approach can be selected. Fast, accurate estimates of building energy performance – which the current generation of energy analysis tools can provide – are critical to this process.

INTEGRATED DESIGN CONSIDERATIONS

Energy analysis tools allow interactions between all of a school's key systems (building shell, windows, lighting, space conditioning) to be analyzed, compared, and optimized for energy performance. This can save a school money on initial construction costs as well as on long-term operating expenses.

For example, a school that combines daylighting strategies and highly efficient electric lighting in its classrooms will require less electricity to illuminate those classrooms – a long-term operating savings. In addition, because the rooms take advantage of daylight and use high efficiency lamps, fewer overall light fixtures may be needed in order to achieve a high quality visual environment. This results in an immediate savings on initial costs. Finally, highly efficient lighting – and, potentially, fewer light fixtures – will result in less waste heat in each classroom. This, in turn, allows the cooling system for the classrooms to be smaller, yielding additional up-front savings.

RECOMMENDATIONS

A wide number of energy analysis tools are currently available, some appropriate for the early stages of a project, others developed with the later phases in mind. The following, contains a sampling of tools for both time periods. Sources of additional tools can be found in the "Industry and Government Resources" section below.

Architectural Design Tools – to be used primarily during early development:

- *ENERGY-10*, Sustainable Buildings Industry Council (www.sbicouncil.org)
- Building Design Advisor, Lawrence Berkeley National Laboratory (http://gundog.lbl.gov)
- Energy Scheming, Iris Communications (www.oikos.com/esb/37/scheming.html)

Load Calculation and HVAC Sizing – to be used primarily during later development:

- HAP, Carrier Corporation (www.carrier.com)
- TRACE, Trane Corporation (www.trane.com)
- DOE-2, Lawrence Berkeley National Laboratory (http://gundog.lbl.gov)
- BLAST, University of Illinois (www.bso.uiuc.edu)
- VisualDOE, Eley Associates (www.eley.com)
- EnergyPlus, Lawrence Berkeley National Laboratory (http://gundog.lbl.gov)

ASSOCIATED LEED CREDITS

Required Pre-requisite:
EA Pr.2: Minimum Energy Performance

Elective Credit:
EA Cr.1: Optimize Energy Performance

REFERENCE STANDARDS AND GUIDELINES

None

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- American Society of Heating, Refrigerating and Air Conditioning Engineers. *ASHRAE Standard 90.1-1999, Energy Standard for Buildings Except Low-Rise Residential Buildings*. Atlanta, GA: ASHRAE 2003. (www.ashrae.org)

Online Resources

- Sustainable Buildings Industry Council. *ENERGY-10*. www.sbicouncil.org/store/index.php#Software (1 Sept, 2004)

- Lawrence Berkeley National Laboratory. *Building Design Advisor*. http://gundog.lbl.gov. (1 Sept, 2004).

- Iris Communications. *Energy Scheming.* www.oikos.com/esb/37/scheming.html. (1 Sept, 2004).

- U.S. Department of Energy. *Energy Analysis Tools Directory*. Office of Building Technology, State & Community Programs. www.eren.doe.gov/buildings/tools_directory (1 Aug, 2004)

- U.S. Environmental Protection Agency. *Energy Star Benchmarking Tool.* www.energystar.gov/benchmark. (1 Aug, 2004)

LIFE CYCLE COST

THE WHAT AND WHY…

The true cost of a school is much more than the price to design and build it. The long-term costs of operating and maintaining the facility must also be included. Only by evaluating all three of these parameters can a community understand how much a new school really "costs."

And only by looking at all three parameters simultaneously can the impacts of alternative design approaches be evaluated. 21st Century classroom glazing, for example, may cost more upfront, but may result in energy savings that pay for the glazing upgrade in a few years and then continue to save money for years to come. Life cycle cost analysis is the key to making these kinds of comparisons and to creating new schools with the lowest long-term costs of ownership.

Special Note: One of the key impediments to optimizing school facilities from a life cycle perspective is the standard separation, common in school districts across the U.S., of capital and operating budgets. In such situations, there is little incentive to make capital spending decisions based on their potential for operational or maintenance savings. This approach often yields new schools that meet their budgetary constraints, but may be suboptimal from a total facility cost perspective. The only way to ensure that operation and maintenance costs become part of the capital cost decision-making process is to make life cycle cost analysis an integral part of the design process. The result will be schools that represent better long-term investments of a community's short-term capital funds.

INTEGRATED DESIGN CONSIDERATIONS

Life cycle cost analysis impacts virtually every system in a school. When used properly, such analyses can optimize the integrated performance of all these systems and reduce a school's total cost to the community.

RECOMMENDATIONS

A variety of life cycle cost analysis tools are currently available. Some are appropriate for the early stages of a project when rough cost estimates are all that is required, and others can be used in the later phases when detailed product and material 'take offs' are possible (see "Industry and Government Resources" below). One or a combination of these tools should be used to assess design alternatives at least once during each of the following design phases:

- Programming
- Schematic Design
- Design Development
- Construction Documents
- Bidding and Negotiation

ASSOCIATED LEED CREDITS

None

REFERENCE STANDARDS AND GUIDELINES

None

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- R.S. Means. *Building & Renovating Schools***.** (http://www.rsmeans.com/bookstore/detail.asp?sku=67342)

- Whitestone Research. *Building Maintenance and Repair Cost Reference 2003,* (Eighth Ed.). (http://www.whitestoneresearch.com/cost.html)

Online Resources

- Fuller, Sieglinde. *Whole Building Design Guide.* National Institute of Standards and Technology (NIST) www.wbdg.org/design/resource.php?cn=0&cx=0&rp=6 (1 Aug, 2004).

- Energy Smart Schools. www.rebuild.org/sectors/ess/index.asp. (1 Aug, 2004). Online video available.

- National Institute of Standards and Technology. *BEES (Building for Environmental and Economic Sustainability*. www.bfrl.nist.gov. (1 Aug, 2004).

- U.S. Department of Energy. *Life Cycle Cost Analysis Tools* www.eere.energy.gov/buildings/tools_directory. (1 Aug, 2004).

- U.S. Cost. www.uscost.com. (1 Aug, 2004).

COMMISSIONING

THE WHAT AND WHY…

Building commissioning is the systematic process of ensuring and documenting that all building systems perform in accordance with design intent, and that they meet the owner's operational needs. The key components of a 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. Properly implemented, such a plan will ensure that a new school starts its life cycle at the highest performance level possible.

A 21st Century school's key systems should be designed to function interactively in ways that create a healthy, productive, environmentally efficient, and cost-effective environment for teaching and learning. A robust commissioning process will ensure that these systems actually function as designed and that they meet the goals of the school's students, teachers, and administrators.

In many ways, commissioning is similar to a 'test run' or 'systems check'. It tests, verifies, and fine tunes the performance of key building systems, so that the highest levels of performance are achieved. Correctly implemented, commissioning should improve the building delivery process, increase systems reliability, improve energy performance, ensure good indoor environmental quality, and improve facility operations and maintenance.

INTEGRATED DESIGN CONSIDERATIONS

Commissioning strongly influences the final design and size of a school's HVAC, electrical, and control systems. Properly implemented, commissioning helps ensure that these systems are 'right sized' and that they function at the optimal levels of efficiency and cost effectiveness.

RECOMMENDATIONS

Building Commissioning can be carried out in three basic ways:

- Whole Building (Electrical, HVAC and Control systems)
- HVAC and Automated Controls Only Systems
- Electrical Systems Only

The following recommendations should be implemented for any of the above Building Commissioning approaches:

- Engage a commissioning agent at or before the design phase of the project
- Collect and review design intend documentation
- Ensure that commissioning requirements are included in the construction documents
- Develop and utilize a written commissioning plan
- Test and verify installation and functional performance of systems
- Document results and develop a commissioning report

Required Pre-requisites:
EA Pr.1: Fundamental Building Systems Commissioning

Elective Credits:
EA Cr.3: Additional Commissioning

REFERENCE STANDARDS AND GUIDELINES

ASHRAE Guideline 1-1996, *The HVAC Commissioning Process.* (www.ashrae.org)

USGBC *LEED Reference Guide version 2.0* (www.usgbc.org)

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- ASHRAE Guideline 4-1993: *Preparation of Operations & Maintenance Documentation for Building Systems* (www.ashrae.org)

- ASHRAE Guideline 1-1996: *The HVAC Commissioning Process* (http://resourcecenter.ashrae.org/store/ashrae/newstore.cgi)

- Heinz, J.A & R.B. Casault. *Building Commissioning Handbook, 2nd Edition*. Association of Higher Education Facilities Officers. Alexandra, VA: APPA, 2004. (www.appa.org/applications/publications/index.cfm)

Online Resources

- Building Commissioning Association.www.bcxa.org/. (1 Aug, 2004).

- Federal Energy Management (FEMA) Program. Building Commissioning Guide.www.eere.energy.gov/femp/pdfs/ccg03_ch1.pdf (1 Aug, 2004)

- Model Commissioning Guide. National Institute of Health. http://des.od.nih.gov/eWeb/research/farhad2/Commissioning/nih_cx_guide/Guide/hh_start.htm. (1 Aug, 2004)

LEARNING CENTERED DESIGN

THE WHAT AND WHY…

As society transitions from the industrial to the information age (and beyond), our understanding of the learning process continues to evolve. Educational strategies and the facilities within which these strategies are implemented are also evolving. A key aspect of this evolution is that the facility is no longer viewed as merely a passive shell for the delivery of education. Rather, the facility is increasingly seen as an active variable in the educational process – one that can, if properly designed, assist and inspire learning.

While there does not appear to be one key trend – or family of trends – dominating this educational evolution, several developments are emerging which should be taken into account when designing K-12 schools:

Learning-Centered Environments

Student needs are a primary focus for the educational process and should be reflected in the design of the learning environment. Education is evolving from a "teacher as leader" to a "teacher as coach" model.

Multiple Teaching and Learning Styles

Multiple forms of intelligence – and multiple ways and speeds of learning – exist within any student body. A School Facilities Project should strive to accommodate the needs of all learners. This includes the need for individualized instruction, self-directed learning, collaborative learning, and activity-based/project-based learning.

Variety

Learning can and does occur in a wide variety of settings. A School Facilities Project should incorporate a range of different spaces and "places," including formal and informal gathering and instructional areas. To the extent feasible, spaces should be able to be reconfigured to accommodate multiple types of learning activities.

Personalization

Personalization of space is an important factor in any individual's development. A School Facilities Project should help foster such personalization by students and teachers. To the extent possible, a design should also foster a personal sense of ownership/stewardship of the facility and its many "places" among students and teachers.

Link to Outdoors

A strong connection to the outdoors can have beneficial impacts on both students and teachers. A School Facilities Project should facilitate such connections. In addition, outdoor elements, including roofs, should be designed to optimize their potential use as learning environments. A school should incorporate as many such "outdoor learning environments" as possible.

INTEGRATED DESIGN CONSIDERATIONS

Planning an educational facility to accommodate multiple forms of learning requires coordination with many systems in the building. Classrooms designed to accommodate students working in small groups or individuals working at their own pace will need lighting and HVAC systems that are equally flexible. If areas such as the roof, present the opportunity to be used for curricular purposes, then the location of mechanical equipment, exhaust vents, skylights, and the like should be carefully coordinated to optimize the available space.

RECOMMENDATIONS

Attempting to design facilities within a constantly evolving educational environment can be tricky at best. The following should therefore be treated as preliminary considerations that should inform, but not drive, the design process. Special attention should be paid to the role that stakeholders can play in defining their particular educational objectives and needs - perhaps the most straightforward way to design user-responsive, learning-centered facilities.

- Include teachers, administrators, and students early and continuously in the planning and design process. Attempt to learn the approach(es) to teaching and learning currently being practiced, and any new directions the school intends to pursue in the future. To the extent feasible, develop a program that is responsive to – and a design that accommodates - this input.

- Wherever feasible and in accordance with life safety codes, use circulation areas for more than circulation. Consider integrating informal gathering areas into circulation spaces and consider the extent to which circulation areas can function as active learning spaces.

- Consider the ceiling as an armature for securely hanging more than lighting and HVAC components. To what extent can the ceiling – and appendages suspended from it - be used to define and, perhaps, reconfigure the space in a room?
- Consider furniture/furnishings and their role in defining and reconfiguring the space in a room: movable desks with portable drawers; media carts; adjustable chairs; adjustable tables; computer workstation clusters; ample storage.

- Consider clustering classrooms around common shared areas. Consider providing one or more "student commons" as gathering points for socializing and/or instructional use.

- Provide every learner with a personalizable area – a "home base" that is uniquely theirs. Provide ample areas for the display of student work.

- Provide every teacher with the same type of personalizable area. Also provide teachers with spaces where they can collaborate. Explore distributing such areas strategically throughout the school, so that each area serves a limited number of teachers.

- Consider providing areas for instructional resources that can be shared among several teachers.

- Provide adequate teacher workspace, including: classroom-based workspace; office-based workspace; and teacher collaboration areas (see above).

- Consider the extent to which the facility itself can be used as a teaching tool or "3-D textbook."

- Consider the school grounds – pathways, play structure areas, gardens, sandy spaces, aquatic areas, seating areas, ball fields, dramatic play areas, wooded areas, covered pavilions or porches and, as appropriate, the roof - as potential "outdoor learning environments" and design them as such.

- A School Facilities Project should facilitate a strong connection to the outdoors. Spaces adjacent to major landscape features should, to the extent feasible, be oriented toward them. Consider using the transitional spaces between indoors and outdoors as additional learning, gathering and/or socializing environments.

- Consider the extent to which single-purpose spaces are needed/desirable versus spaces that can accommodate a variety of different functions.

- Consider how community facilities outside the school grounds. Y's, museums, health centers, etc. can be used to extend the "learning environment."

- Consider how the facility can be designed to accommodate adult learners and/or community users.

ASSOCIATED LEED CREDITS

None

REFERENCE STANDARDS AND GUIDELINES

None

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- Iltus, Selim & Renee Steinhagen. *Where Do Children Play? The Importance and Design of Schoolyards*. Newark, NJ: New Jersey Appleseed Public Interest Law Center, 2003. (www.njappleseed.org/)

- Chan, Dr. Tak-Cheung & Petrie, Dr. Garth. *A Well Designed School Environment Facilitates Brain Learning*. Scottsdale, AZ: Council for Educational Facility Planners, 2000. (www.cefpi.org/) V35-3.

Online Resources

- National Clearinghouse for Educational Facilities:
  - *Do School Facilities Affect Academic Outcomes?*
  - *Ten Educational Trends Shaping School Planning and Design*
  - *Teacher Workspaces*
  - Student Commons
  - Planning School Grounds for Outdoor Learning Classrooms

  www.edfacilites.org. (1 Aug, 2004)

STIMULATING ARCHITECTURE

THE WHAT AND WHY…

A key component of any 21st Century School – one that transcends notions of efficiency and functionalism - is the overall design of the building itself. After the needs and aspirations for the building are defined, it is up to the architect, drawing on a long history of exemplary school architecture from around the world, to provide a cohesive vision for the design and construction of the facility. Students, faculty, and the community will benefit from- and be inspired by – this vision and by well-designed, stimulating spaces that convey a sense of place. By making good design a key goal, school stakeholders can harness the architects' highly developed problem-solving skills to create schools that are civic landmarks - schools that achieve 21st Century goals while, at the same time, giving architectural expression to a community's hopes and ideals.

INTEGRATED DESIGN CONSIDERATIONS

Architectural design impacts every design criteria in a 21st Century school. The key is finding ways to accommodate the architect's vision for the facility, and at the same time constructing a building that is economical, efficient and functional. An interactive, iterative process that incorporates high performance components, systems and strategies into a cohesive design vision is critical to creating high quality "schools for the 21st century."

RECOMMENDATIONS

Respect the architect's vision for the school, and understand that it is the architect's role to question and think "outside of the box". At the same time, ensure that this vision is applied in the service of 21st Century goals, specifically those articulated in the other design criteria contained in this Design Manual.

ASSOCIATED LEED CREDITS

Elective Credit:
ID Cr.1: Innovation in Design

REFERENCE STANDARDS AND GUIDELINES

None

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- Perkins, Bradford. *Elementary and Secondary Schools*. New York: John Wiley and Sons, 2001. Comprehensive Source for National Case Study Schools.

- Dudek, Mark. *Architecture of schools: the New Learning Environments*. Boston: Architectural Press, 2000. Comprehensive Source for International Case Study Schools.

Online Resources

- AIA Committee on Architecture for Education (CAE) www.aia.org/pia/gateway/PIA_Home_pages/cae.asp#about. (1 Aug, 2004)

- Duke, D. & Sara Trauvetter. *Reducing the Negative Effects of Large Schools.* National Clearinghouse for Educational Facilities. www.edfacilities.org. (1 Aug, 2004)

ACCESSIBILITY

THE WHAT AND WHY…

Several decades of regulations have firmly established the concept of "free and appropriate education for all students with disabilities in the least restrictive environment" in the public consciousness. Laws such as the Individuals with Disabilities Education Act (IDEA) have further reinforced inclusive education for children with disabilities as both a philosophical imperative and a legal right.

The principle of inclusive education maintains that children with disabilities should, to every extent possible, be educated in the same schools as, and along side of, their peers who are not disabled. Successful inclusive education depends upon several mutually reinforcing structures: a strong philosophical commitment, creative and appropriate teaching strategies, dedicated and effectively trained personnel, and a school facility that provides the proper environmental supports for students and their curricula.

As inclusive education and "mainstreaming" programs are enacted across the U.S., increasing numbers of children with disabilities, who were historically educated in special schools, are now being integrated into regular school systems. Since this trend will continue, schools that are currently being constructed will educate a continually expanding population of students with special needs. Because disability among school age children is both prevalent and highly diverse, providing an inclusive school environment for these students offers unique opportunities and challenges to planners, architects, administrators, and teachers.

A particular challenge is creating environments that support students with cognitive – as opposed to physical – disabilities. While the ADA, through its guidelines and standards, has provided guidance on designing to accommodate those with physical, especially orthopedic, disabilities, relatively little is known about designing to accommodate students with cognitive disabilities such as attention deficit disorder or autism. Unfortunately, the majority of special needs students in or entering the public school system appears to suffer from cognitive rather than physical disabilities. A report by the National Research Council indicates that of the five million K-12 students nationwide with disabilities that require special education, "more than 90 percent fall into one of just four categories of disability: speech or language impairment, serious emotional disturbance, mental retardation, and specific learning disability" and that "specific learning disabilities account for more than half of all eligible students" (McDonnell, McLaughlin, and Morison, 1997).

While students with physical disabilities must still be accommodated, it is becoming clear that School Facilities Projects must also address students with other forms of disability: learning deficits, sensory impairments, intellectual limitations, emotional problems, and/or some combination of all of the above. Designing a school environment that meets these highly diverse needs, as well as the needs of the teachers and "typical" students, presents significant challenges.

INTEGRATED DESIGN CONSIDERATIONS

Accessible and inclusive design reinforces the objectives of a number of other 21st Century School Facilities Project criteria:

- Controlling glare impacts the lighting, daylighting strategies, and visual comfort that may impact energy performance.
- Controlling noise interacts directly with designing for acoustic comfort.
- Designing to prevent uncontrolled egress from the school impacts security design.
- Planning classrooms to accommodate students with disabilities impacts learning centered design, flexibility and adaptability, and information technology configurations

RECOMMENDATIONS

- Involve special education specialists and school health care personnel at all stages of the design process.
- Provide variety in the classroom environment.
  - Consider strategies – alcoves, small adjacent rooms - to provide visual and acoustical separation between activities to reduce distractions.
  - Consider the need to accommodate, at various times, teachers plus other adults (special teachers, personal aides, et al.) in the space.
  - Consider varied ceiling heights as a way to create variation and define more intimate, "time out" areas.
  - Consider designing areas in the hallway that can be used for "time out" areas and individual consultations.
- Integrate accessible areas into the facility.
  - Avoid separate "accessible" labs, project rooms, etc. Instead, integrate accessible workstations into these rooms.
  - Avoid isolating accessible seating in auditoriums, cafeterias, libraries, etc. Instead, spread/integrate such seating throughout these rooms.
- Provide for expanded services in the health suite.
  - Consider providing larger spaces.
  - Consider the need for a lift.
  - Consider the need for a private examination room or area.
  - Consider providing a one-way mirror in examination or therapy rooms.
  - Consider providing a separate physical therapy and/or occupational therapy suite.
- Minimize travel distances.
  - Locate key services – food services, bathrooms, and, especially, elevators – centrally
- Integrate special needs and general education.
  - Avoid clustering special education spaces in one location. Spread them throughout the facility.
  - Within the classroom, avoid clustering services – electric outlets, data ports – in special areas or solely along the perimeter of the room. Attempt to provide as many access points as possible across the room.

- Consider how parents of special needs students will use the facility.
  - Consider one or more rooms or areas parents can use.
  - Consider special parking areas for visiting parents.
- Outdoors
  - Consider how the outdoor play areas (pathways, playground surfaces, etc.) can be designed to accommodate students with a variety of disabilities.
  - Consider how outdoor learning environments can be designed so that students with disabilities can access and participate in these environments.
- Furnishings
  - Consider furniture with rounded edges.
  - Ensure that desks and tables are accessible to students in wheelchairs (no aprons or legs that block access).
  - Provide height-adjustable desks and chairs.
  - Provide accessible lockers at the end of locker rows.
- Bathrooms/Toilets
  - Consider placing toilets near classrooms.
  - Ensure some or all toilets have accessible stalls. (If only some, then make sure they are centrally located.)
  - Consider accessible stalls with sinks in them, so that students with special toileting needs can use the equipment in private.
- Pay special attention to glare. Design lighting and surfaces to reduce glare as much as possible.
- Revisit building security considerations from the perspective of keeping students with certain disabilities safely within the facility.

ASSOCIATED LEED CREDITS

None

REFERENCE STANDARDS AND GUIDELINES

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FLEXIBILITY AND ADAPTABILITY

THE WHAT AND WHY…

School facilities have always needed to adapt to change. Enrollments rise and fall; teaching and learning methods shift, and new programs emerge; the connection between the community and the school continues to evolve; and technology advances in ways that cannot be anticipated. This process shows no sign of abating. On the contrary, the pace of change in education, particularly technology-driven change, appears to be accelerating.

Creating a facility that is expected to last for more than one generation and to respond effectively to accelerating change is one of the critical challenges facing all those involved in the design, construction and renovation of schools. Responding to this challenge requires the creation of facilities that are flexible in the near term and adaptable over the long term.

A flexible facility is one that facilitates short-term rearrangements of the learning environment to suit different activities and programs. Flexibility can most easily be achieved through furnishings that are easy to move and reconfigure. The concept also extends to creating spaces that can support multiple functions, including activities by user-groups outside the school. Movable components, especially movable partitions and walls, can also be employed to enhance flexibility.

An adaptable facility is one that can accommodate more substantial and systemic change over time. Such changes may include reconfiguring spaces within a facility (not just the furnishings within those spaces); adapting/modifying spaces for substantially different uses; enlarging a facility to accommodate increased enrollment; converting one large facility into two or more "small schools;" adapting a facility to year-round and/or 24-7 operation; and relocating or substantially reconfiguring a building's systems, especially its information technology systems.

INTEGRATED DESIGN CONSIDERATIONS

The design team needs to consider a multitude of factors to accommodate this criteria for the design of the facility. Building in flexibility for classroom spaces is particularly important. Impacts on other systems need to be understood early so that all consultants can work together toward a common goal and avoid future conflicts. HVAC, lighting and furniture systems all need to be adaptable and designed with change in mind. The building's infrastructure should also be designed so as to not preclude future facility expansion.

DESIGN & CONSTRUCTION GUIDELINES REQUIREMENTS

None

RECOMMENDATIONS

While flexibility and adaptability are relatively straightforward as concepts, designing a facility to accommodate them can be complicated. To the extent possible, flexibility should be accomplished with elements like furniture, fixtures, and equipment (FF&E), and specifically to items with relatively short life expectancies. History has shown that "bricks and mortar" solutions to providing flexibility quickly become obsolete no matter how well they embody a current – but soon outdated – theory of flexible space planning.

Designing for adaptability is different and requires close attention to the size, capacity and configuration of the building's basic systems. What is the anticipated useful lifespan of the respective systems? Can the structure accommodate expansion, upward or outward? Can the MEP and IT systems be easily reconfigured to serve spaces whose size and use have changed? Can partitions be torn down or moved with minimal impacts on lighting, flooring, and/or ceiling systems?

While such considerations should not drive the design process, they should be taken into account in some way. School facilities are renovated, updated and "adapted" all the time in a process that is complex, time consuming and often expensive. Designing for adaptability can help reduce this complexity and, hopefully, save the school time and money in the process.

Additional considerations concerning flexibility and adaptability include the following:

- To the extent possible, avoid fixed (non-movable) stations for equipment such as computers and other forms of information technology.
- Design spaces that can accommodate numerous furniture layouts.
- Design spaces that can accommodate multiple functions.
- Consider the appropriateness of raised floors in terms of both flexibility and adaptability with ever-changing technology.
- Consider the potential for subdividing the facility into two or more "small schools."

ASSOCIATED LEED CREDITS

Elective Credit:
ID Cr.1: Innovation in Design

REFERENCE STANDARDS AND GUIDELINES

None

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(1 Aug, 2004).

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INFORMATION TECHNOLOGY

THE WHAT AND WHY…

There is no question that technology is transforming education at all levels in the United States. A simple statistic indicates the recent, explosive growth in information technology in schools: in 1998 the ratio of public school students to instructional computers with internet access was 12.1 to 1; in 2002 the same ratio was 4.8 to 1. (from the National Center for Education Statistics report, "Internet Access in U.S. Public Schools and Classrooms: 1994-2002.") The technology revolution that has transformed business and industry in the U.S. is clearly impacting education as well.

What this means for the educational process is still emerging. It is clear that technology is beginning, and will continue, to impact K-12 curricula and instructional methods in significant and unpredictable ways. It is also clear that, whatever technologies emerge over time and however they may impact the curriculum or instructional methods, they will become outdated and replaced far more quickly than the facility that houses them.

INTEGRATED DESIGN CONSIDERATIONS

Technology design interacts with and impacts other systems in a facility in two distinct ways. Technology infrastructure, especially low voltage cabling, interacts with other basic infrastructure systems (wiring, plumbing, HVAC, and building structure). Technology applications (projection areas, computer screens, white boards) interact strongly with lighting and daylighting systems. Technology configurations and layouts should acknowledge the lighting/daylighting design in a space. The lighting/daylighting design strategy should consider the types of technology to be used in the space. The plug loads, heating loads of technology, and equipment should be considered in the thermal and energy analyses conducted for a space and for the facility as a whole. Special attention should be paid to potential changes (and increases) in plug and heating loads over time as more and different forms of technology (especially more computers) are added.

RECOMMENDATIONS

Designing educational facilities to accommodate rapidly evolving technologies is complicated and challenging, requiring close cooperation between designers, technology consultants and district personnel. The following general issues should be considered as the detailed technology plan for a facility is developed.

- Consider whether/how a school's technology plan facilitates interaction/integration with other schools in the district and with the district's overall technology plan.
- Consider the impacts of multiple forms of technology (white boards, projectors and projection surfaces, "wired" furnishings, etc.) not only computers and telecom.
- Consider the potential for 1-to-1 computing (one computer for every learner, if only on a intermittent basis) to become a reality in the near future.
- Provide "technology-enabled" infrastructure to support both wired and wireless applications. Configure the infrastructure to meet current demands, but "design in" the capacity to easily reconfigure the infrastructure to meet future needs.
- Design to integrate technology throughout a school, rather than in isolated pockets.
- As necessary and to the extent possible, facilitate the E-Rate application process.
- Design learning environments that facilitate cooperation between technology and instruction. Avoid letting technology considerations dominate a learning environment design strategy.

ASSOCIATED LEED CREDITS

None

REFERENCE STANDARDS AND GUIDELINES

None

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

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Online Resources

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    - *Wireless Wide Area Networks for School Districts*
    - *The Role of Wireless Computing Technology in the Design of Schools* www.edfacilities.org. (1 Aug, 2004).

BUILDING SHELL

THE WHAT AND WHY…

The building shell (walls, roofs, floors, and windows) of a 21st Century school should enhance energy efficiency without compromising durability, maintainability, or acoustic, thermal or visual comfort. An energy efficient building shell is one that integrates and optimizes insulation levels, glazing, shading, thermal mass, air leakage control, and light-colored exterior surfaces.

An energy-efficient building shell will reduce a school's overall operating expenses while easing the strain on the environment. Many of the techniques employed – high performance glazing, shading devices, light-colored surfaces – are easily accessible to students and can be used as instructional aids.

INTEGRATED DESIGN CONSIDERATIONS

The building shell strongly impacts the performance of a school's HVAC and lighting systems. The amount of heat the building shell lets in or out determines how much heating or cooling the HVAC system must provide. The more efficient the building shell, the less the HVAC system will have to work and the smaller (and less expensive) it can be.

Likewise, if the window system is designed to maximize natural daylight, less electric light will be needed. This will reduce the school's electricity costs. In addition, the school's need for cooling will decrease. This is because electric lights generate heat. In schools where less electric light is used, less waste heat will be created, resulting in a reduced demand for cooling and even more HVAC system savings.

RECOMMENDATIONS

The key to optimizing the building shell is an integrated approach to design. It considers how all the components of the shell interact with one another and with the building's lighting and heating/ventilating/air conditioning (HVAC) systems. Tools to analyze these interactions are readily available and can be used to create the optimal building shell based on total system performance.

As part of an integrated approach, the following actions, specific to the building shell, should be considered:

- Specify glazing that represents the best combination of insulating value, daylight transmittance, and solar heat gain coefficient for its specific application and local climatic conditions.
- Consider exterior shading devices to reduce solar heat gain and minimize glare.
- Use the building's thermal mass to store heat and temper heat transfer.
- Consider adding thermal mass to increase the storage capacity and energy efficiency of the school.
- Consider air retarder systems (also referred to as 'air infiltration barriers') as a means of improving energy performance and reducing potential water damage in walls and roofs.
- Consider using light-colored materials for walls and roofs in order to reflect, rather than absorb, solar energy.

ASSOCIATED LEED CREDITS

Required Pre-requisites:
EA Pr.2: Minimum Energy Performance

Elective Credits:
EA Cr.5: Measurement & Verification

REFERENCE STANDARDS AND GUIDELINES

None

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

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Online Resources

- EPA Energy Star Program. www.energystar.gov. (1 Aug, 2004).
- Federal Energy Management Program. www.eere.energy.gov/femp. (1 Aug, 2004).
- U.S. Department of Energy. *Energy Design Guidelines for High Performance Schools.* www.eere.energy.gov. (1 Aug, 2004).
- Sustainable Buildings Industry Council. www.sbicouncil.org. (1 Aug, 2004). Online Video Training Available.
- Whole Building Design Guide. www.wbdg.org. (1 Aug, 2004). Product Information by CSI Format Available.

RENEWABLE ENERGY

THE WHAT AND WHY…

Renewable energy (particularly solar and wind energy) is a free resource, which, if effectively captured and used, can significantly reduce a school's operating costs. A 21st Century school should maximize the cost-effective use of renewable systems to meet its energy needs. The school district should also consider purchasing 'green power.'

Renewable energy systems reduce a school's overall operating expenses and play a significant role in preserving the environment. Many of the techniques employed (for example, daylighting and natural ventilation) also contribute to a high quality learning environment. Other strategies, particularly solar thermal, wind, and photovoltaic applications, are exciting technologies that can be used to teach students about science, ecology, and the environment.

INTEGRATED DESIGN CONSIDERATIONS

Renewable energy systems closely interact with the heating/ventilating/air conditioning (HVAC), hot water and electric power systems in a building. Passive solar and solar thermal systems provide heat, which reduces demand on the HVAC system. Daylighting reduces the need for electric lighting, while natural ventilation reduces the need for mechanical venting. Solar hot water replaces mechanically heated water, and geothermal heat pumps replace conventional heating/air conditioning equipment. Wind and photovoltaics provide electricity, thus reducing the need for utility-provided power.

RECOMMENDATIONS

During the design process, the developers of a 21st Century school should systematically evaluate and consider integrating one or more of the following renewable energy systems into the building:

- Daylighting – maximize the amount of natural light throughout the school.
- Passive Solar Heating – to meet some of the school's heating needs, capture the sun's energy through south-facing windows.
- Solar Hot Water – capture the sun's energy in ground- or roof-mounted systems that provide some or all of a school's hot water needs.
- Solar Thermal – capture the sun's energy in ground- or roof- mounted systems to help heat the school or, using an absorption system, to help cool it.
- Geothermal Heat Pump – transfer heat to and from the earth to generate energy efficient heating and cooling.
- Natural Ventilation – design to facilitate the circulation of 'non-conditioned' outside air through the building and to take advantage of prevailing breezes.
- Wind – use wind energy to generate on-site electricity.
- Photovoltaics – use ground-mounted, roof-mounted, or building-integrated systems to transform sunlight into electricity.
- Green Power – purchase power from producers who generate electricity from renewable sources.

ASSOCIATED LEED CREDITS

Elective Credits:
EA Cr.2: Renewable Energy
EA Cr.6: Green Power

REFERENCE STANDARDS AND GUIDELINES

None

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

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HVAC

THE WHAT AND WHY…

A school's HVAC system provides the heating, ventilating, and air conditioning necessary for the comfort and well being of students, teachers, administrators, and visitors. To ensure peak operating efficiency, the HVAC system in a 21st Century school should:

- Use high efficiency equipment
- Be 'right-sized' for the estimated demands of the facility
- Include controls that boost system performance

The HVAC system is one of the largest energy consumers in a school. Even modest improvements in system efficiency can yield relatively large savings in a school's operating budget. With the highly efficient systems available today (and the sophisticated analysis tools that can be used to select and size them), every school HVAC system can be designed to the highest levels of performance.

Various parts of the HVAC system (especially controls placed inside the classroom) can be used as instructional aids.

INTEGRATED DESIGN CONSIDERATIONS

In a 21st Century school, the HVAC system offers a range of cost saving opportunities. If accurate energy use estimates have been calculated the HVAC system can be 'right sized' to meet these estimates. This approach invariably saves money over rule-of-thumb approaches that tend to oversize equipment. These savings can, in turn, be used to draw down the costs of other energy efficiency measures. Daylighting, for example, will not only reduce the need for electric lights, it will also reduce the heat these lights create. This reduction may be sufficient to allow for a smaller, less expensive air conditioning unit to be specified.

RECOMMENDATIONS

The key to optimizing HVAC system performance is an integrated approach to design that considers the building as a interactive whole, rather than as an assembly of individual systems. For example, the benefits of an energy efficient building shell may be wasted if the HVAC equipment is not sized to take advantage of it. Based on rule-of-thumb sizing calculations, an oversized system will not only cost more, it will be too large to run at peak efficiency and will, in effect, waste energy every time it turns on. An integrated approach, one based on an accurate estimate of the impact of the high efficiency building shell, will allow the HVAC system to be sized for optimum performance. The resulting system will cost less to purchase, will use less energy, and will run more efficiently over time. As part of an integrated approach, the following actions (specific to HVAC systems) should be considered.

USE HIGH EFFICIENCY EQUIPMENT:

- Specify non-CFC (chlorofluorocarbon) – based refrigerants for systems using large chillers.
- Specify equipment that meets or exceeds the U.S. Department of Energy's *Energy Conservation Voluntary Performance Standards for New Buildings.*
- Use ENERGY STAR®-approved products.
- Consider recovery systems that pre-heat or pre-cool incoming ventilation air.
- Consider 'economizer cycles' for small, packaged systems.
- Investigate the potential for on-site cogeneration.

'Right-Size' the System:

- Consider standard HVAC sizing safety factors as upper limits.
- Apply any safety factors to a reasonable base condition for the building (i.e., not the hottest or coldest day of the year with maximum attendance; not the most temperate day of the year with the school half full).
- Select systems that operate well under part-load conditions.

Incorporate Controls that will Boost System Performance

- Consider integrated building management systems that control HVAC, lighting, outside air ventilation, water heating, and building security.
- Consider individual HVAC controls for each classroom.

ASSOCIATED LEED CREDITS

Required Pre-requisites:
EA Pr.1: CFC Reduction in HVAC&R Equipment

Elective Credit:
EA Cr.4: Ozone Depletion

REFERENCE STANDARDS AND GUIDELINES

U.S. Department of Energy's *Energy Conservation Voluntary Performance Standards for New Building*. (www.eere.energy.gov/femp/technologies/sustainable_fedrequire.cfm**).**

Energy Star Approved Products. (www.energystar.gov/index.cfm?fuseaction=find_a_product).

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

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Online Resources

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ELECTRIC LIGHTING

THE WHAT AND WHY…

The quality of a school's electric lighting system has an enormous impact on the productivity of students, teachers, and staff, and on the facility's operating budget. A 21st Century school should provide superior electric lighting by optimizing 'watts per square foot' while retaining visual quality. This can be accomplished by: specifying high efficiency lamps and ballasts, optimizing the number and type of luminaires (light fixtures) for each application, incorporating controls to ensure peak system performance, and integrating complementary electric lighting and daylighting design strategies.

Electric lighting can account for 30 to 50 percent of a school's electric power consumption. Even modest efficiency improvements can mean substantial bottom line savings. This is especially true in locations subject to extra 'demand charges' during times of peak energy use. Since these charges usually occur during daytime hours when schools are in full operation, any efforts to reduce the demand for power during these times will reap additional savings. An added benefit: more efficient lighting produces less waste heat, thus reducing the need for cooling and further reducing operating costs. These savings are achievable now in any school by using readily available equipment and controls.

INTEGRATED DESIGN CONSIDERATIONS

Electric lighting systems interact strongly with a school's daylighting and HVAC systems. Daylighting strategies that are well-integrated with lighting equipment and controls will reduce the demand for electric light. If addressed by a combination of high efficiency electric lighting equipment and controls, this reduced demand can substantially lower a school's electricity usage. In addition, less electric lighting means less waste heat and, therefore, less demand for cooling. Cooling equipment can be downsized, resulting in first cost and operating cost savings to the school. Note: Using suspended fixtures in classrooms will require ceiling heights of at least 9'6".

RECOMMENDATIONS

Design for High Efficiency and Visual Comfort:

- Develop individual lighting designs for individual rooms or room types (e.g., classrooms, hallways, cafeteria, library, etc.).
- Consider a mix of direct and indirect light sources for each design.
- Optimize each design so that overall lighting levels (watts per square foot) are as low as possible while still providing optimal illumination for the tasks at hand.
- Avoid overlighting any space.
- Analyze the impact of the lighting system on the HVAC system, and resize as appropriate.
- Design systems to facilitate cleaning and lamp replacement.

Specify High Efficiency Lamps and Ballasts:

- Use T-5 or T-8 fluorescent lamps with electronic ballasts for most general lighting applications (classrooms, offices, multipurpose rooms, cafeterias).
- Consider dimmable ballasts, especially in rooms that are daylit.

Optimize the Number and Type of Luminaires (lighting fixtures):

- Use suspended indirect or direct/indirect luminaires in classrooms to provide soft uniform illumination throughout the room.
- Consider incorporating additional accent and directional task lighting for specific uses (display areas, white boards, team areas, etc.)
- Consider the potential for using a smaller number of higher efficiency luminaires to light spaces, resulting in fewer fixtures to purchase, install, maintain, and clean.

Incorporate Controls to Ensure Peak System Performance:

- Use occupancy sensors with manual overrides to control lighting (on-off) in intermittently occupied spaces. Consider scheduled time clocks in other rooms.
- Consider incorporating lighting controls into the facility's overall energy management system, as appropriate.

Integrate Electric Lighting and Daylighting Strategies:

- Treat the electric lighting system as a *supplement* to natural light; i.e., design for daylighting first and use the electric system to add light as needed during the day while providing sufficient illumination at night.
- Install controls that dim or turn lights off at times when daylight is sufficient.
- Consider controls that provide continuous, rather than stepped, dimming.

ASSOCIATED LEED CREDITS

None

REFERENCE STANDARDS AND GUIDELINES

None

INDUSTRY AND GOVERNMENTAL RESOURCES

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ENVIRONMENTALLY RESPONSIVE SITE PLANNING

THE WHAT AND WHY…

A 21st Century school should be located on a 21st Century site; one that helps the school function at peak efficiency, minimizes adverse impacts on the local environment, and serves as an amenity for the surrounding community. A 21st Century site should be planned to conserve existing natural areas and restore damaged ones, minimize stormwater runoff and control erosion, enhance the school's 21st Century features, reduce 'heat islands', and minimize light pollution.

A 21st Century site is good for the local and regional environment. It can also help reduce a school's operating costs by enhancing, rather than inhibiting, the 21st Century features of a facility (e.g., energy conservation, water conservation, renewable energy, safety and security, etc.).

A well-planned, 21st Century site can also be an exciting natural laboratory for students.

INTEGRATED DESIGN CONSIDERATIONS

Site conditions impact virtually every system in a building. A well-integrated design and site planning process will ensure that the site reinforces the building (and vice versa) and that both components operate at peak levels of performance.

RECOMMENDATIONS

Conserve Existing Natural Areas and Restore Damaged Ones:

- Preserve local vegetation in place, especially mature trees.
- Reduce parking and building 'footprints.'
- Landscape with indigenous plants to restore damaged areas of the site.

Minimize Stormwater Runoff and Control Erosion:

- Design so that at a minimum, there is no net increase in stormwater runoff from the site after the school is built.
- Reduce impervious surfaces (such as parking lots, paved paths, etc.) that contribute to runoff.
- Maximize on-site stormwater infiltration.
- Consider providing for on-site stormwater retention.
- Use vegetation to keep soil in place.
- Consider anti-erosion grading and stabilization techniques.
- Minimize stormwater runoff during construction.

Use the Site to Enhance the School's 21st Century Features:

- Orient the building on the site to take advantage of the sun: (usually along an east-west access to maximize southern exposure), the prevailing breezes, shade trees and any landforms that might reduce the building's energy use; increase its access to natural daylight; enhance its acoustical environment; and/or improve its security.

Reduce Heat Islands:

- Reduce developed areas, such as parking lots, that are much hotter than surrounding, undeveloped areas
- Use landscape elements (preferably existing trees and vegetation) to shade roads, walkways, and parking lots.
- Consider using light colored materials for the school's roof to reflect, rather than absorb, sunlight.

Reduce Light Pollution:

- Design site lighting so as to minimize contribution to nighttime skyglow.
- Consider outdoor lights with covered tops so that the light shines down, rather than up into the nighttime sky.

ASSOCIATED LEED CREDITS

Required Pre-requisites:
SS Pr.1: Erosion & Sédimentation Control

Elective Credits:
SS Cr.1: Site Selection
SS Cr.2: Urban Redevelopment
SS Cr.3: Brownfield Development
SS Cr.4: Alternative Transportation
SS Cr.5: Reduced Site Disturbance
SS Cr.6: Stormwater Management
SS Cr.7: Landscape & Exterior Design to Reduce Heat Islands
SS Cr.8: Light Pollution Reduction

REFERENCE STANDARDS AND GUIDELINES

None

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- Barnett, Dianna L. & William D. Browning. *A Primer on Sustainable Building, 2nd edition.* Snowmass, CO: Rocky Mountain Institute, 1999. (http://www.rmi.org/store/pid960.php)

Online Resources

- Center of Excellence for Sustainable Development, U.S. Department of Energy. www.sustainable.doe.gov. (1 Aug, 2004).
- Energy Star Roof Products, U.S. Environmental Protection Agency. www.energystar.gov/index.cfm?c=roof_prods.pr_roof_products. (1 Aug, 2004).
- Lawrence Berkeley National Laboratory. *Cool Roofing Materials Database*. www.eetd.lbl.gov/CoolRoofs. (1 Aug, 2004). Material Database Available.
- Sustainable Site Design, National Park Service. www.nps.gov/dsc/d_publications/d_1_gpsd_5_ch5.htm. (1 Aug, 2004).)

ENVIRONMENTALLY PREFERABLE MATERIALS AND PRODUCTS

THE WHAT AND WHY…

Building materials can have a significant impact on the environment and on human health. To the maximum extent possible, a 21st Century school should be constructed of durable, non-toxic materials that are high in recycled content and are themselves easily recycled. Preference should be given to locally manufactured materials and those derived from sustainable-yield processes. The school itself should be designed to facilitate recycling to the extent possible. In addition, waste should be minimized during construction.

Some building materials contain toxic substances that can harm workers during construction, and may also be harmful to students and teachers after occupancy. In addition, the mining, harvesting, and production of certain building materials can pollute our air and water. They also destroy habitats and deplete natural resources. Transporting building products long distances also contributes to pollution and energy waste.

Careful selection of materials can reduce or eliminate these problems, resulting in a school that not only helps the environment, but also contributes to the health and well-being of its occupants. Many of the materials selected – particularly those with recycled content – can serve as the basis for lessons on ecology and the environment, as can areas within the building designed for on-site recycling.

INTEGRATED DESIGN CONSIDERATIONS

Building products and materials will impact the indoor air, acoustic, and visual quality of a school. They can also affect operation and maintenance procedures. When new materials are used, new procedures may be required for their maintenance and upkeep. These new procedures should not be more complicated, costly, or time consuming than those associated with standard products, but they will be new, and so maintenance staff will require some training to implement them effectively.

RECOMMENDATIONS

Design to Facilitate Recycling:

- 'Design in' an area within the building dedicated to separating, collecting, and storing materials for recycling, including paper, glass, plastics, and metals.
- Consider where and how materials will be collected and brought to the central area, and allow space for easy collection and transport.

Reduce the Amount of Construction Waste that Goes to Landfill:

- During construction, develop and implement a management plan for sorting and recycling construction waste.
- Consider a goal of recycling or salvaging 50% (by weight)

Specify Materials and Products that are Environmentally Efficient:

- Specify materials, especially timber, harvested on a sustainable-yield basis.
- Consider a goal of having 50% of the school's wood-based materials certified in accordance with the Forest Stewardship Guidelines for wood building components.
- Give preference to locally manufactured materials and products, which stimulate the local economy and reduce transport distances.
- Consider specifying salvaged or refurbished materials, as appropriate.

Maximize Recycled Content of All New Materials:

- Use EPA-designated recycled content products to the maximum practicable extent.
- Within an acceptable category of product, use materials and assemblies with the highest available percentage of post-consumer or post-industrial recycled content.
- Consider a goal of having 25% of the school's building materials contain a weighted average of 20% post-consumer or 40% post-industrial recycled content.

Eliminate Materials that Pollute or are Toxic During Manufacture, Use or Reuse:

- Within an acceptable category of product, use materials or assemblies with the lowest levels of volatile organic compounds (VOCs).
- Eliminate the use of chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) as refrigerants in all HVAC systems.
- Evaluate the potential impact of specified materials on the indoor air quality of the school

ASSOCIATED LEED CREDITS

Required Pre-requisites:
MR Pr.1: Storage and Collection of Recyclables
EA Pr.3: CFC Reduction in HVAC&R Equipment

Elective Credits
MR Cr.1: Building Reuse
MR Cr.2: Construction Waste Management
MR Cr.3: Resource Reuse
MR Cr.4: Recycled Content
MR Cr.5: Local/Regional Materials
MR Cr.6: Rapidly Renewable Materials
MR Cr.7: Certified Wood

REFERENCE STANDARDS AND GUIDELINES

Forest Stewardship Council. *Structure and content of Forest Stewardship Standards* (www.fsc.org).

Environmental Protection Agency. *Comprehensive Procurement Guidelines.* (www.epa.gov/cpg/products.htm).

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- American Institute of Architects (AIA).The *Environmental Resource Guide.* Washington, DC: John Wiley & Sons, 1992. (www.wiley.com)
- The Architectural Machine. *The Green Building Resource Guide.* (www.greenguide.com)
- California EPA. *Designing with Vision: A Technical Manual for Material Choices in Sustainable Construction.* Sacramento, CA: Integrated Waste management Board, 2000. (www.ciwmb.ca.gov/ConDemo/Pubs.htm)
- Wilson, Alex, Malin N., Wiechers, T. and L. Strain. The GreenSpec® Directory: Product Directory with Guideline Specification, 3rd Edition. Building Green, Inc, 2003.
- Mendler, Sandra and Odell William. *HOK Guidebook to sustainable design.* Hoboken, NJ: John Wiley & Sons, 2000. (www.wiley.com)

Online Resources

- California Environmental Protection Agency. *Designing with Vision: A Technical Manual for Material Choices in Sustainable Construction.* Sacramento, CA: Integrated Waste Management Board, 2000. www.ciwmb.ca.gov/ConDemo/Pubs.htm. (1 Aug, 2004).
- California Integrated Waste Management Board. Construction and Demolition Waste Recycling Information.www.ciwmb.ca.gov. (1 Aug, 2004).
- California Integrated Waste Management Board. Recycled Content Product Database.www.ciwmb.ca.gov/rcp. (1 Aug, 2004).
- Center for Resourceful Building Technology. www.crbt.org. (1 Aug, 2004).
- Certified Forest Products Council. www.certifiedwood.org. (1 Aug, 2004).
- Environmental Building News. www.buildinggreen.com. (1 Aug, 2004).
- Forest Stewardship Council. www.fsc.org. (1 Aug, 2004).
- Green Seal. www.greenseal.org. (1 Aug, 2004).
- GSA Environmental Strategies and Safety Division. *Construction Waste Management Database.* www.wbdg.org/ccbref/cwm.php. (1Sept, 2004). Online Database of Recyclers Available.
- International Dark Sky Association. www.darksky.org. (1 Aug, 2004).
- Rainforest Alliance. www.rainforest-alliance.org. (1 Aug, 2004).
- Scientific Certification Systems.www.scscertified.com. (1 Aug, 2004).
- Sustainable Building Sourcebook.www.greenbuilder.com/sourcebook. (1 Aug, 2004).
- US EPA. EPA Comprehensive Guide for Procurement of Products Containing Recovered Materials. www.epa.gov/epaoswer/non-hw/procure/index.htm. (1 Aug, 2004).
- US EPA. *Comprehensive Procurement Guidelines*. www.epa.gov/epaoswwer/non-hw/procure/products/carpet.htm. (1 Aug, 2004).

WATER EFFICIENT

THE WHAT AND WHY…

In many parts of the country, fresh water is an increasingly scarce resource. A 21st Century school should reduce and control water runoff from its site, consume fresh water as efficiently as possible, and recover and reuse graywater to the extent feasible.

Basic efficiency measures can reduce a school's water usage by 30% or more. These reductions help the environment, locally and regionally. They also lower a school's operating expenses. While the cost savings may be modest now, since water is relatively inexpensive in most areas of the country, there is a strong potential that the value of these savings will rise over time, especially in areas of the country where water is scarce and becoming more expensive.

The technologies and techniques used to conserve water – especially landscaping, water treatment and recycling strategies – can be used to help instruct students about ecology and the environment.

INTEGRATED DESIGN CONSIDERATIONS

Using less hot water will reduce energy costs. This reduction should be factored in to all life cycle cost analyses performed for the facility.

RECOMMENDATIONS

Water Efficient Landscaping:

- Specify hardy, native vegetation.
- Consider using an irrigation system for athletic fields only, not for plantings near buildings or in parking lots.
- Use high efficiency irrigation technology (e.g., drip irrigation in lieu of sprinklers).
- Use captured rain or recycled site water for irrigation. "Design in" cisterns for capturing rain water.

Water Use Reduction:

- Set water use goals for the school. Recommendation: 20% less than the baseline calculated for the building (not including irrigation) after meeting the Energy Policy Act of 1992 fixture performance requirements.
- Specify water conserving plumbing fixtures that exceed Energy Policy Act of 1992 requirements.
- Specify high efficiency equipment (dishwashers, laundry, cooling towers).
- Consider single temperature fittings for student toilets/locker rooms.
- Consider automatic lavatory faucet shut-off controls.
- Consider low-flow showerheads with pause control.
- Consider using recycled or rain water for HVAC/process make-up water.

Innovative Wastewater Treatment:

- Decrease use of potable water for sewage conveyance by using gray and or black water systems. Opportunities include toilet flushing, landscape irrigation, etc.
- Consider on-site wastewater treatment, including full or partial "solar aquatics" systems.

ASSOCIATED LEED CREDITS

Elective Credits:
WE Cr.1: Water Efficient Landscaping
WE Cr.2: Innovative Wastewater Technologies
WE Cr.3: Water Use Reduction

REFERENCE STANDARDS AND GUIDELINES

None

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- Vickers, Amy. *Handbook of water use and conservation.* Amherst, MA: Waterplow Press, 2002.(www.waterplowpress.com/index.html)

Online Resources

- American Rainwater Catchment Association. www.arcsa-usa.org. (1 Aug, 2004
- Innovative Design. *Raincatcher Design Tool.* www.innovativedesign.net/raincatcher_a.htm. (1Sept, 2004). Specialized Software Available.
- National Park Service. *Guiding Principles of Sustainable Design: Chapter 8.* www.nps.gov/dsc/dsgncnstr/gpsd. (1 Aug, 2004).
- National Clearinghouse for Educational Facilities. www.edfacilities.org. (1 Aug, 2004). Specialized Software Available.
- NY City Department of Design and Construction. *High Performance Building Guidelines*. www.nyc.gov/html/ddc/html/ddcgreen/highperf.html. (1 Aug, 2004).
- Water Alliance for Voluntary Efficiency (WAVE) http://es.epa.gov/partners/wave/wave.html. (1 Aug, 2004). Searchable database available.

COMMUNITY INVOLVEMENT

THE WHAT AND WHY…

A School Facilities Project process that involves the community shapes each school facility as a positive, inclusive, and vital presence for the neighborhood. Community stakeholders that should be included in the design process include parents, students, educators, and community organizations. Businesses and government agencies who wish to partner with the school board and district administration to create more effective schools and healthier neighborhoods should also be included.

Authentic community engagement "leads to school facilities that are central to the life and learning of the entire community and that embody community values. It establishes the connection between schools and communities, creating more effective schools and healthier neighborhoods."

The US Department of Education's planning guide *Schools as Centers of Community* notes that "involving educators, parents and other stakeholders in the process of designing schools can help ensure that schools support student learning and address community needs in the best ways possible. Such involvement also can strengthen community support for education. Ownership comes from shared problem-solving and decision-making that leads to the creation of a common vision and purpose that binds divergent parts of the community together."

INTEGRATED DESIGN CONSIDERATIONS

In order to design a school that is central to the life and learning of a community, the design team must incorporate into its process the widespread, fully informed, critical participation of stakeholder groups. A commitment to community engagement in designing learning environments demands that adequate time and resources be allocated to this phase of the design process.

"Facilities needs can be wide-ranging. They can encompass issues as simple as air conditioning in every classroom and as ambitious as elementary schools with no more than 400 students. The critical factor in this phase of the planning process is to ensure that identified needs are clearly aligned with beliefs. If, for instance, the committee believes that students need opportunities to engage in project-based learning and work in teams, then spaces other than 900-square-foot lecture-type classrooms will be required. If the committee believes that the most effective schools embody a strong culture of personalization, then smaller, more intimate configurations will have to be designed. If the committee believes that parent involvement on school campuses is important, then spaces in schools for parents to park their cars, hang their coats, and do their work will be necessary. If the committee believes that schools should be centers of learning for the whole community, then other needs, and solutions, will come into view."

RECOMMENDATIONS

Model community engagement involves "large groups of participants representing a broad cross-section of community constituents [who] assemble at regular intervals to review data, investigate options, and make firm recommendations" to the design team. While this collaborative format may be perceived as time-consuming, an open dialogue leads to more a thorough evaluation and broader acceptance of decisions that might otherwise generate conflict or protracted debate. Another benefit from broad-based community engagement is that "recommendations can often be more systemic, incorporating a broad range of the community's physical, cultural, social, economic, organizational, and educational issues into more elegant, cohesive, and efficient solutions."

The U.S. Department of Education's publication "Putting the Pieces Together"
offers tips for communicating with the larger community over the course of the planning and design process:

- Develop good written communication, such as a low-cost newsletter widely distributed throughout the community.
- Reach out to your critics by inviting them to see a new program, listening to their concerns, and providing opportunities for them to contribute.
- Keep participants and local leaders well informed by hosting an open house or site visits.
- Share the bottom line to show that collaborative programs are cost effective and get results.

ASSOCIATED LEED CREDITS

None

REFERENCE STANDARDS AND GUIDELINES

U.S. Department of Education's publication.*Putting the Pieces Together*.
www.ncrel.org/sdrs/areas/issues/envrnmnt/css/ppt/putting.htm

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- Jeffers, G. & *Olebe, M.* Community Education Journal, Vo. XXI, No 3, Spring 1994, pp4-7*One Stop Family Service Center: The Community School.* (www.ncea.com/reading_room/documents/onestop.doc.)

Online Resources

- Spector, Stephen. *Creating Schools and Strenghtening Communities through Adaptive Reuse.* National Clearinghouse for Educational Facilities. www.edfacilities.org. (1 Aug, 2004).
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- New Jersey School Construction Corporation. *Schools as Centers of Community.* www.njscc.com/specialprograms/SchoolsAsCenterOfCommunit_booklet.asp. (1 Aug, 2004).

- North Central Regional Education Library. *Putting the Pieces Together.*1999. www.ncrel.org. (1 Aug, 2004).

- DeKanter, A., Ginsburg, A.L., Pederson, J., Peterson, T.K., and Rich, D. *A compact for learning: An action handbook for family-school-community partnerships.*1997 www.ed.gov/pubs/Compact/. (1 Aug, 2004).

COMMUNITY USE

THE WHAT AND WHY…

A community school can be defined as a public school that combines the rigorous academics of a quality education with a wide range of in-house, non-educational services that support and promote learning for all segments of the community.

Shared uses in schools allow a community to identify with its educational facilities, to develop skills that directly improve the community, and to improve the quality of educational services offered to students of all ages. Additionally, community schools involve families in their children's education, and also help families address issues that are barriers to learning.

Ideally, community schools are planned by and for the community, and offer programs that enrich children and adults of all ages. It is not unusual for community-based agencies, parents, business leaders, and other community and school partners to be invited by the district to plan the design and the programming aspects of the school. These partnerships help leverage private resources and make public programs accountable to community members.

Most importantly, community schools have been shown to improve student learning, promote family engagement with students and school, help schools function more effectively, and enhance community building and vitality.

INTEGRATED DESIGN CONSIDERATIONS

There are a number of planning and design considerations for community or joint-use schools that must be considered early in the design process. Opening school space to the public involves important safety issues. Spaces should be designed to restrict the public from wandering school hallways and compromising school safety regulations. The designer might consider creating separate entrances and planning for restricted public access during school hours. From a planning standpoint, it is important to determine who will be responsible for ensuring the security of the building during non-school hours.

Other crucial planning issues include funding and maintenance. Developing a funding plan for components of the facility that may be ineligible for state funding may require a phasing plan for design and construction. It is also necessary to address maintenance and operational issues associated with community design features and facilities operated outside of school hours: Who is responsible? What are the costs? Who will pay?

Above all, designers should approach the programming of community facilities and services with an open mind. For example, in some cases it may be more advantageous to locate school programs at existing or planned community facilities, rather than locating community facilities at the school.

RECOMMENDATIONS

A needs assessment process should consider the needs of all community members in the development of a community school. Stakeholder representatives such as community and business leaders, school board members, and district representatives should work closely with the design teams to assess community needs, and also determine what services and facilities might be incorporated into the school.

Health clinics, recreational facilities, technology centers, auditoriums, etc. are all tangible community assets and should be planned and implemented with assistance from the community. Likewise, a careful inventory of community facilities and assets may reveal opportunities to locate school and community functions in ways that support educational and community objectives.

ASSOCIATED LEED CREDITS

None

REFERENCE STANDARDS AND GUIDELINES

NJSCC Schools as Centers of Community,
(www.njscc.com/specialprograms/SchoolsAsCenterOfCommunity_Booklet.asp)
NJSCC Community Schools (www.njscc.com/specialprograms/CommunitySchools.asp)

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- MacKenzie, D. & Rogers, V. *The Full Service School: A Management and Organizational Structure for 21st Century Schools.* Community Education Journal, Vol. XXV, No. 3 & 4, Spring/Summer 1997, pp 9 –11. (www.ncea.com/reading_room/documents/fullserv.doc).

Online Resources

- Coalition for Community Schools. www.communityschools.org. (1 Aug, 2004).
- Comprehensive Procurement Guidelines. www.epa.gov/epaoswer/non-hw/procure/index.htm. (1 Aug, 2004).
- KnowledgeWorks Foundation. www.kwfdn.org. (1 Aug, 2004).
- New Schools Better Neighborhoods. www.nsbn.org. (1 Aug, 2004).
- Sullivan, Kevin J. *Catching the Age Wave: Building Schools with Senior Citizens in Mind.* National Clearinghouse for Educational Facilities. www.edfacilities.org. (1 Aug, 2004).

CATALYST FOR ECONOMIC DEVELOPMENT

THE WHAT AND WHY…

The planning, design, construction, and operation of new and substantially renovated school facilities provides an unusual opportunity to encourage reinvestment in neighborhoods surrounding schools. Such reinvestment can bring about compatible infill development, promote civic engagement in issues and sites important to the neighborhood residents, and help enhance and preserve the State's multi-million dollar investment in school facilities. Coordinated planning and investment can also provide financial savings through coordinated design, demolition and construction of both facilities and infrastructure.

School facility construction is the first significant investment – public or private – in many neighborhoods in years, and as such must provide a catalyst for the community to develop and advance plans to tackle related issues such as housing, services, jobs, public safety, recreation and open space as well as environmental cleanup. Revitalization of surrounding areas assists a school in providing a safer and a more effective educational environment. Appropriate economic development provides a stronger sense of community, encourages parents to keep their children within the local school, creates pride within the community and enhances property values and the creation of new ratable.

INTEGRATED DESIGN CONSIDERATIONS

Substantial opportunities exist to use school facilities as direct stimuli for development. For example, designing school eating facilities to serve the community after hours can result in a locally operated, and even student managed, neighborhood restaurant. Similar arrangements can be made with physical education facilities that can become neighborhood health clubs. Storefronts for neighborhood and student operation can be designed within or adjacent to the school facility. Housing, office, and commercial uses should be considered as part of the site, or even the building, wherever feasible. All these considerations will significantly impact the planning and design of the school facility itself.

RECOMMENDATIONS

- Ensure that the community planning and engagement process includes: representatives from the municipality's planning and redevelopment offices; relevant county and state planning and redevelopment officials; housing, economic, and community development offices; and non profit organizations. Public and private developers should also be consulted.

- Ensure that the needs assessment discussed in Design Criteria 23 examines: housing, employment, community service, and facility needs.

- Recognize that enhanced economic development may not (and need not) occur simultaneously with school construction. Planning for desired and needed uses is important, even if market or financing conditions are not currently conducive to development.

- Systematically review all available local, state, federal, and private funding sources, including grants, loans, equity investments and tax credits.

ASSOCIATED LEED CREDITS

Elective Credits:
MR Cr.5: Local/Regional Materials

REFERENCE STANDARDS AND GUIDELINES

NJSCC Schools as Centers of Community,
(www.njscc.com/specialprograms/SchoolsAsCenterOfCommunity_Booklet.asp)

NJSCC Community Schools (www.njscc.com/specialprograms/CommunitySchools.asp)

INDUSTRY AND GOVERNMENTAL RESOURCES

Publications

- Chung, C. *Using Public Schools as Community-Development Tools: Strategies for Community-Based Developers*. Cambridge, MA: JCHS Harvard University, 2002.

Online Resources

- Coalition for Community Schools. www.communityschools.org/. (1 Aug, 2004).

NJ Schools Construction Corporation

NJSCC Design Manual

Section Three

Design Performance Standards

SCOPE AND INTENT

This section of the *Design Manual* summarizes the design and construction standards established by the NJSCC for School Facilities Projects in New Jersey. Project Teams must comply with all the requirements described herein or explain, in detail, why a particular requirement does not apply to their situation. NJSCC approval is required for all proposed exceptions to compliance with these standards.

The information in this section is a revision and update of the NJSCC's *Design and Construction Guidelines, November 5, 2003*. The information herein **replaces and supercedes** the *Design and Construction Guidelines*.

ORGANIZATION AND CONTENT

The section is organized by CSI division. See the *Design Manual* Table of Contents to determine the page numbers for individual divisions.

USING THIS SECTION OF THE DESIGN MANUAL

Project Teams should familiarize themselves with all the requirements described herein. Teams are expected to comply with all requirements unless there is a compelling reason to make one or more exceptions. In such cases, Project Teams are required to explain, in writing, why one or more requirements do not apply to their situation and to request, again in writing, exceptions to those particular requirements.

Project Teams should review this section at least once during each phase of a project. Any requests for exceptions identified during a particular phase should be presented for approval– in writing – to the NJSCC during that phase. Otherwise, the NJSCC will assume that all the requirements contained herein are being, or will be, met.

DIVISION 1: GENERAL DATA

1.1 STANDARDS

A. Where a project involves renovation or addition to an existing facility, the Design Consultant (DC) is responsible for verification of all existing conditions. Foundation design shall be based on a New Jersey licensed professional engineer's report for site-specific conditions. Structural design involving other than conventional foundation and building framing for any School Facilities Project must be reviewed and approved by NJSCC. Documents from previous Health & Safety projects and the Long Range Facilities Plan shall be provided by the PMF with input from the school district that accurately identifies current deficiencies to the Design Consultant if applicable.

B. School Facility Planning: N.J.A.C. 6A: 26 and NJAC 5:23-3.11A Public Schools, Plan Review Procedures, Facility Planning Standards, and UCC Enhancements apply to all projects.

C. These Guidelines shall apply to all work conducted under the Educational Facilities Construction and Financing Act and all applicable Executive Orders, especially E.O. 24. This shall include, but not be limited to, the following:

1. New School Facilities Projects
2. Renovations to existing school buildings
3. Additions to existing school buildings
4. Conversions of existing buildings for school use
5. Prefabricated buildings for use as School Facilities Projects
6. All New Jersey school construction shall comply with the applicable current construction codes and standards.

1.2 SCHOOL SAFETY

A. Overview

1. Preventing crime within our schools through a safety plan designed by a school safety team consisting of school administrators; a student and teacher based committee as prospective users of the building, and law enforcement officials (including representatives of local police, fire, EMS, and emergency management agencies) with significant experience in dealing with school safety issues is an essential component to school safety.

B. Suggested Physical Security Enhancements:

1. Equip interior doors with key locks that lock and unlock doors from both the inside and outside of room (where permitted).
2. Ensure that both interior and exterior window placement, location and type of window help to deter would-be vandals or intruders and minimize damage from breakage.

3. Bushes and shrubs should be maintained low to the ground, and trees should have their lower branches removed. Trees should be placed no less than 10 ft from the school building and not obstruct the view of the building or common areas.

4. Parking lots should be easily monitored and designed to provide minimal risk to students and pedestrians or interfere with bus traffic. The parking lot should not have large straight roadways that encourage speeding or racing.

5. Fences, retaining walls, and other obstacles should be used to separate the playing fields from parking areas or street access while not obstructing visual observation.

6. Lavatories should be designed to keep them from being used as a social gathering place. Consider using a maze-entry, no door system to keep aural monitoring possible.

7. An institutional appearance should be avoided at all times if possible with the most emphasis on creating a school that instills a sense of belonging and community amongst the students.

8. During school hours, one controlled point of entry should be used for all persons entering the school. This entry point should be made very obvious and clear to any visitor, how ever should not face a public street.

9. Locate air intakes above ground and out of reach.

10. Avoid low canopies and similar architectural elements that would allow access to upper floor windows or roof.

11. All stairways shall have closed access beneath the run of stairs at all floors.

C. Suggested Technological Security Enhancements

1. Surveillance and communication.

   a. Two-way communication between the staff, security, and administration is essential. Ensure that there is a means of communicating from every point in the school. Also, hallways should not have blind corridors or places where students could gather without supervision. Clear sight lines should be maintained to as much of the school as possible.

2. Schools should pursue a lights-out policy after hours, with an intrusion system that will turn lights on and notify authorities if an intruder is detected.

3. Design the school's IT system to prevent 'Cyber Crime'.

1.3 PROPRIETARY SPECIFICATIONS

A. A statement on use of proprietary specifications is included in NJSCC's *Procedures Manual for Design Consultants*. Due to its importance, it is restated here:

B. The use of proprietary specifications is prohibited; therefore, whenever a "brand name" item is specified, the Design Consultant must list by name at least three (3) comparable manufacturers followed by the words "or equal." If these comparable "equal" manufacturers are not available, NJSCC must approve the specifications.

C. To ensure that the word "equal" cannot be misinterpreted in the course of bidding, the Design Consultant must thoroughly describe in the technical specifications all essential performance and/or physical features which must be incorporated into the specified item or system to meet its minimum functional needs and space limitations. Minor features of the preferred products that do not have an impact upon the product performance for this use shall not be specified as required criteria for bidding.

D. Exception to this requirement may be granted, including restricting bids to certain select manufacturers, subject to the following stipulations:

E. No known readily available products, other than the specified, are capable of providing the salient physical, functional, and/or other characteristics, including cost, essential to the minimal needs of the Client School District.

F. Where existing systems are being extended (fire alarm, etc.) and single-system integrity can only be preserved or compatibility assured by resorting to the designated products. This applies to new construction, additions to existing buildings and when major renovations to an existing building are planned, if the School District has a 'District-Wide' system where the single system integrity would be lost by adding an incompatible generic system. Focus for an exception to the requirement of a non-proprietary system should be prioritized by importance. Importance factors (from highest): Fire/Life Safety systems, Occupant Safety and Security, followed by long-term ease of building Operations and Maintenance.

G. Authorization

1. The Design Consultant must request in writing to the PMF, authorization to use a proprietary specification at least thirty (30) days before inclusion in the Contract Documents. This request shall include a draft version of the proposed specification sections, and the relevant justification for this action.

2. Within ten (10) days of receipt, the request will be reviewed, and if approved, the NJSCC Project Officer (PO) will grant authorization in writing to proceed. Upon receipt of authorization, the Design Consultant shall include in the Construction Documents the name of the desired manufacturer to be used by the contractor in its base bid.

1.4 NJDEP PERMIT GUIDANCE

A. NJDEP One-stop permitting Guidance document

B. NJDEP EO-215 School Construction Process Guidance for EA/EIS submittals

1.5 RADON MITIGATION

A. In all School Facilities Projects involving new construction, and additions, the Design Consultant shall incorporate into its design and construction administration services radon mitigation construction techniques consistent with the Radon Hazard Sub code of the New Jersey Uniform Construction Code, N.J.A.C. 5:23-10. This includes a complete passive system, designed for conversion to active system if the minimum level of radon is detected. Test system at Project Close Out phase. This requirement shall apply to all School Facilities Projects, regardless of whether the project is located in a Tier 1 municipality, as defined in N.J.A.C. 5:23-10 (Appendix 10-A).

B. A complete passive radon system that can be converted to an active system shall be installed in all new buildings throughout the entire State, regardless of zone. All buildings shall be tested for radon, including existing buildings. If radon levels exceed allowable limits, system shall be converted to an active system. If no system exists in an existing building and radon levels are detected and exceed allowable limits, a new system shall be installed.

1.6 LEED™

A. Design Consultants shall apply sustainable design development concepts in the planning, design, construction, environmental management, and operation of Projects in the New Jersey Schools program. The criteria of US Green Building Council (USGBC) and LEED™, version 2.0, shall be used as a guide to achieve a minimum of 26 points based on the LEED™ 2.0 rating scale, wherever possible. The funding for USGBC LEED™ building certification is not included for any New Jersey NJSCC funded Project. If any School District chooses to pursue LEED™ 2.0 Certification for any specific building(s) in their District, any additional costs shall be the responsibility of that School District. LEED™ 2.0 building certification is not mandatory.

B. See LEED Reporting requirements in Appendix B – Sample LEED Report. The LEED reporting form is available on the NJSCC FTP website to PMF and Design Consultant for completion at each designated project phase.

1.7 E-RATE PROGRAM

A. The Design Consultant shall ensure that the School Facilities Project is designed and constructed to maximize its telecommunications connectivity through, but not limited to, the E-Rate Program instituted in accordance with the provisions of the Federal Telecommunications Act of 1996, Pub. L. 104-104, set forth at 47 U.S.C.A. § 253, and administered by the Schools and Libraries Division (SLD) of the Universal Service Administrative Company at the direction of the Federal Communications Commission. The Design Consultant shall assist the NJSCC designated district representative in the application for any rebates and shall ensure that any resulting installation discounts or reimbursements are forwarded to the NJSCC, as directed by the NJSCC Project Officer.

B. See PMF and Consultants Agreement and bulletins for further description of responsibilities.

1.8 EMERGENCY SHELTER

A. Specific areas of a proposed School Facilities Project may be designated as an Emergency Shelter. This decision and designation must be made collectively by the following: Client School District, City or Municipality, regional emergency management representatives, FEMA, and the New Jersey Chapter of the Red Cross. These are shelters for natural disasters and are not designed as 'target hardened' spaces from adversaries or terrorist threats.

Such Emergency Shelter areas must be identified immediately after the DOE and NJSCC approves the proposed School Facilities Project. Since there are both site and cost implications, shelter area identification shall be made during the Program Phase of the project to avoid the possibility of adversely affecting schedule and cost.

NOTE: Additional costs of design and construction associated with Emergency Shelter criteria are not eligible for funding by the NJSCC. A Letter of Commitment from the School District /

City or Municipality agreeing to pay for any additional cost must be accompany the Emergency Shelter designation request.

B. Specific core spaces may be designated as the emergency shelter. These should be limited to high volume areas including cafeterias, cafetoriums, gymnasiums and auditoriums. Spaces that can not be used for emergency shelter include mechanical / electrical rooms or closets, store rooms, open corridors or lobbies, kitchens, science rooms, shop areas and computer rooms.

C. When specific spaces in a School Facilities Project have been designated as Emergency Shelter space, the following additional minimum conditions shall be met for those spaces.

1. An emergency route from the space in the building must be provided. This can be incorporated in the site plan using planned roads and parking.

2. Provide signage identifying the shelter area.

3. Shelter capacity shall be limited to 20 sq. ft. per person.

4. One toilet and one sink must be available for every 40 people.

5. Provide counter tops for food service if possible.

6. Identify a space that could be used as a temporary manager's office.

7. Provide emergency roof overflows such as scuppers or roof drains (code required).

8. Provide a separate public address system on emergency power for the emergency shelter area.

9. Provide emergency power in accordance with NFPA 70 for emergency lights, exit lights, fire alarm and other life safety systems; ventilation air, PA system, general lighting for a minimum of 10 foot-candles of light per sq. ft.

10. Meet seismic criteria required by the applicable codes for 'Emergency Preparedness Centers'. In addition, design the building structural system so that if any key structural component were removed or destroyed, the building would not collapse.

11. Emergency Generator size must be adjusted for new loads.

12. Other operational criteria as required.

1.9 FULL BUILDING COMMISSIONING

A. See Deliverables Section 4 for Requirements.

1.10 CONTROLLED TESTING

A. The testing requirements shall be defined in the contract documents and other scope documents on a project specific basis by the Design Consultant and managed by the PMF. The certified testing results shall be submitted to the Design Consultant for review and approval.

1.11 CHARRETTE

A. See Deliverables Section 4 for Requirements.

1.12 EASE OF OPERATION & MAINTENANCE / EXTENDED WARRANTEES

A. The Design Consultant shall develop the School Facilities Project design for ease of Operation and Maintenance. The DC shall work with the school facilities staff concerning Operation and Maintenance. Extended warranties should be considered where deemed appropriate. These warranties should be discussed with the entire team with first cost and life cycle costs being considered.

1.13 MATERIAL STORAGE

A. Storage of all material is critical. This includes storage at the manufacturer or supplier's facility, the method of product delivery to the site, storage on site, handling/protection during installation, and protection of installed components through the substantial completion phase of a School Facilities Project. Through all these phases, the construction material or product must be protected from adverse environmental conditions such as temperature, sunlight, changes, moisture and water. This includes keeping elements such as brick, CMU, insulation, finish materials, ductwork and mechanical components, etc. covered and dry from the time of their manufacture through their installation and final acceptance of the building.

1.14 LONG LEAD EQUIPMENT/PRE-PURCHASE

A. The Design Consultant in consultation with the PMF shall identify and prepare a list of long lead items at the completion of the Design Development sub-phase. The PMF shall make a recommendation to the NJSCC PO for possible action.

1.15 ACOUSTICS

A. All instructional spaces (including classrooms, labs, etc) shall comply with ANSI/ASA S12.60-2002 Acoustical Performance Criteria/Design Requirements Guidelines for School Facilities Projects. Good acoustics are fundamental to good academic performance. The Architectural and Transportation Barriers Compliance Board notes "Research indicates that high levels of background noise, much of it from heating and cooling systems, adversely affect learning environments, particularly for young children." ANSI/ASA S12.60-2002 Acoustical Performance Criteria for School Facilities Projects sets 35 decibels as a background-noise maximum, with a maximum of .6 to .7 seconds reverberation for unoccupied classrooms. A variance may be granted upon written appeal to the PMF at the discretion of the NJSCC for additions and partial renovation projects.

1.16 UTILITY REBATE 'SMART START' PROGRAM

A. The Design Consultant shall become familiar with any and all applicable utility rebate programs and or their sucessors, specifically including the NJ Smart Start Buildings Program. The DC in consultation with the PMF shall apply for all applicable incentives associated with the project. All incentives, rebates, grants, etc. shall be awarded directly to NJSCC for appropriate distribution. Such program(s) often offer technical assistance and funding for design in addition to incremental equipment costs.

1.17 RECYCLING DURING CONSTRUCTION

A. The Design Consultant, in the specifications, shall designate the Contractor and all Sub-Contractors to follow material recycling criteria during demolition and construction in accordance with requirements set forth by the responsible local authority. At a minimum 50% of all construction waste including demolition waste and land clearing waste should be recycled/reused. This can include reuse of the recycled asphalt, recycled concrete and waste brick as clean fill onsite in accordance with the beneficial reuse regulations at NJAC 7:26-1.7 in appropriate areas not as structural fill or within a segregated recycling system for offsite use.

B. Comply with SMACNA Construction Air Quality Controls.

END OF DIVISION 1

DIVISION 2: SITE CONSTRUCTION

1.1 GUIDELINES – GENERAL

A. The siting of the school facility and associated structures/amenities shall be determined by, and shall include where possible or permitted, the following minimum considerations;

1. Planned expansion of the school building to its maximum capacity.

2. Placement of all other structures such as storage buildings, school bus maintenance buildings or garages and any other structures above and/or below ground.

3. Physical Education, Recreation Fields, Play Spaces, and other outdoor spaces in support of the curriculum.

4. Walkways and roadways on which people and vehicles travel the site; public and service access roads onto the site; one-way school bus roads; school bus drop off areas; posted fire lanes for fire apparatus.

5. Access around the entire building for emergency vehicle access as required by building and municipal code requirements, site logistics, and District criteria.

6. Any provision for the building to be set back with buffer zones as required by local, State, and Federal codes or Ordinances.

7. Consideration should be given to building orientation to maximize solar orientation for passive solar systems, photovoltaic installations and natural day lighting, without sacrificing safety of students due to vehicular traffic on and off site.

8. Sites subject to including but not limited to NJDEP wetlands, pinelands green acres/open space, historic preservation, threaten and endanger species or waterfront development acts, shall be planned in accordance with respective requirements and one stop permitting guidance

9. Setting of building finish floor elevation in relationship; to other criteria including flood plain thru use of FEMA and Federal flood maps to confirm elevation. Use the same datum.

10. Construction should be planned to minimize site disturbance.

11. Economy of means shall be a consideration in all site improvements such as pavements, walks, utility distances, drainage and other elements affected by layout and location.

12. Design consideration shall be given to neighborhood scale, visual impact, aesthetics of proportion and color, good drainage, the safety and comfort of the students, and the satisfaction of parents and constituents of the school district. In addition, design consideration given to location of traffic, industrial sites, noise source such as airports and EMF power lines.

13. Service drives shall accommodate typical delivery and waste disposal trucks, including turning radii, as established by the PMF in consultation with the client school district.

Parking for two service vehicles and recycling areas near or at the loading dock are suggested. Trash compactors are prohibited.

14. Site illumination should be designed to a code minimum, while still providing adequate security. Design to Illuminating Engineering Society of North America (ISENA) foot-candle level requirements as stated in the Recommended Practices Manual: Lighting for Exterior Environments. Provide 5 foot candles for high security areas. All site lighting shall be controlled on a timer and photocell, with manual override. All lighting shall be focused on site and shall be non-polluting.

15. Preliminary Site Investigation and Remediation Plans, developed for acquisition and other purposes, when required, will be fully defined in the specific Project Scope of Work. As the investigation / remediation work is very project specific, only general reference is made in this Document.

16. Buildings with under floor crawl spaces shall have the ground contoured to allow for natural drainage from crawl spaces. If crawl spaces or basements require a sump pump then the pump shall be directly tied into a storm drain or other location that will not overflow onto pedestrian or vehicular traffic areas. If moisture is a problem in crawl spaces, consider ventilating crawl spaces in excess of code requirements.

1.2 SURFACING

A. Impervious coverage shall be minimized. To conserve land available for green areas, recreational space, and future expansion, consolidate driveways, parking, and service drives.

B. Hard surface outdoor play area shall be asphalt. The asphalt shall be an open grid or pervious pavement design, where feasible and consideration should be given to the use of light colored/high albedo material (reflectance of at least 0.3) in these areas.

C. Consideration shall be given to the use of light colored/high albedo material (reflectance of at least 0.3) for surfaces, such as 'Whitetopping" as defined by the American Concrete Paving Association (ACPA), Whitetopping, State of the Practice. Publication EB210P, available from the ACPA, at http://www.pavement.com/.

D. Paved play areas at School Facilities Project sites shall not adjoin vehicular traffic areas. If close proximity is necessary, provide an adequate barrier.

E. When natural drainage is interrupted by drives or paved areas other than walks, water should be diverted by swale, re-grading, or piped drainage as determined by cost comparison, value and analysis. A licensed civil engineer shall determine sizing of piping, flow velocities of swales, or adequacy of re-grading in all site work. Grass swales with a 2% slope or less shall have a 2"-4" wide underdrain. An open grid pavement system or a pervious system should be considered

F. Pedestrian and vehicular circulation patterns should be simple and non-confusing. Entrances and exits into parking areas should be located so as not to create a traffic hazard. Bus and/or car queues shall not crisscross or overlap on school property or public way.

G. Trash, fire truck and other service routes shall have appropriate "truck" pavement sections. Other parking areas shall have standard parking pavement sections. Pavement designs shall be

based on recommendations of the soils engineering report. Reinforced concrete driveway aprons at street transitions shall be provided.

H. In paved areas, top elevations of manhole covers and cleanouts shall be flush with surface finishes. Manhole covers and cleanouts shall be avoided in mowed grass areas

I. Where permitted at street unloading zones, provide continuous concrete sidewalk and curb to permit stepping directly from an auto to an all weather surface.

J. Provisions for barrier free access are required, including those for drop-off and unobstructed entry into the building from parking areas or points of drop-off.

1.3 SITE FURNISHINGS

A. Flag pole(s) should be located near and assist in identifying the principal building entrance. Tapered, ground set, aluminum poles for manual operation are acceptable. Single flagpoles should be furnished with one rope, but with two sets of clips to facilitate flying both the US and New Jersey flags at once. All rope ends shall be in a lockbox on the pole. Ground for lightning protection.

1.4 LANDSCAPING

A. The Design Consultant shall initially define scope of the landscaping during the Schematic Design Phase. Scope of the landscaping shall be finalized during the Design Development Phase and shall be included in all detailed cost estimates. The Scope of the landscaping should include indigenous plant and zero-water tolerance plantings to reduce or eliminate irrigation. If irrigation is needed for landscaping or sports fields, consideration should be given to high efficiency irrigation or a gray water system (captured rain or recycled water). Where appropriate, landscaping shall be designed to reduce the heat island effect by providing shade for non-roof (paved) areas.

B. Enclosed courtyards require a drainage analysis, and shall have primary and overflow drainage. Whenever possible, flood cresting due to clogged drains shall be below top of interior slabs.

C. Environmental and health conscious landscaping designs are encouraged. Use of noninvasive indigenous species, reductions in mowed grass areas, low water consumption design, and avoidance of high pollen generating male planting shall be considered.

1.5 STANDARD OPERATING PROCEDURES WHEN ENVIRONMENTAL CONDITIONS AND/OR CONTAMINATION IS ENCOUNTERED DURING CONSTRUCTION.

A. All work shall comply with EO-45 and 215.

B. During the course of any construction or demolition project, it is not uncommon to encounter environmental contaminants in soil, groundwater or the building materials of structures slated for demolition or renovation. The following Standard Operating Procedures (SOPs) have been developed for field personnel so that the Contractor engages the appropriate environmental contractor. The NJSCC Remediation Project Officer can evaluate project needs, review and approve the environmental scope of work and provide oversight during the course of the remediation.

1. Possible Types of Environmental Conditions: Site conditions vary from property to property based on the age, historical use, and most recent use prior to construction activities. The types of environmental issues that may arise during excavation, earth moving, grading or demolition include but are not limited to:

    a. Underground Storage Tanks (UST's): may be empty, filled and abandoned in-place, or may contain product such as gasoline, diesel fuel, heating oil or some other regulated material.
    b. Contaminated Soil: may be stained or discolored as a result of a leaking underground storage tank or from previous spills or discharges on-site. The soil would also possess a petroleum-like odor.
    c. Impacts to Groundwater: a noticeable sheen, discoloration or odor would be present.
    d. Asbestos Containing Materials (ACM): were used in many building materials until 1980, such as spray-on fireproofing, boiler insulation, pipe insulation, floor tile, 'transite' panels, as well as exterior shingles and roofing materials. The presence of asbestos can only be confirmed through sample collection and laboratory analysis.
    e. Drums or Storage Containers: may be empty or partially full and include 55-gallon drums or smaller 5-gallon pails, 1-gallon cans, or even small lab jars. The contents would most likely be "unknown", but some containers may be labeled and specify the contents such as paints, paint thinners, acids, solvents, etc.
    f. Landfilled Areas: pockets or "cells" of trash, refuse, industrial waste, drums, various containers or other debris may have been buried on-site at one time.
    g. PCB Equipment or Transformers: includes pad mounted or pole mounted transformers that could be owned by the utility company or the property owner. Older buildings may also have PCB containing light ballasts.
    h. Aboveground Storage Tanks (AST's): may be empty or partially full and contain waste oil, heating oil, diesel fuel, waste antifreeze or some other regulated material.
    i. Former Septic Systems and Dry Wells: may have received industrial or chemical waste from floor drains or manufacturing operations at one time. Discolored soil and chemical odors should be present.

2. Federal and State Environmental Regulations: All chemicals, spills, discharges, hazardous waste disposal and environmental contamination discovered in the soil, water and air are regulated by either the federal government, state and city agencies, county health departments and in some cases local building and fire departments. Provided below are a list of some of the federal and state environmental laws and regulations that are designed to protect human health and the environment that have been promulgated by the USEPA, OSHA and the NJDEP:

    a. Occupational Safety and Health Act (OSHA): Designed to ensure safety and protect workers during construction (29CFR.1926) and hazardous waste operations (29CFR 1910.120).
    b. Resource Conservation and Recovery Act (RCRA): Regulates the disposal of hazardous waste.
    c. Toxic Substance Control Act (TSCA): Primarily regulates PCB containing equipment and the disposal of PCB contaminated materials, but also dioxin.
    d. Asbestos Hazard Emergency Response Act (AHERA): Provides rules and regulations for asbestos containing materials in school settings.
    e. NJ Department of Community Affairs (Subchapter 8): Regulates the abatement of ACM in schools.

f. NJ Bureau of Underground Storage Tanks: Regulates UST's based on their size and contents.
g. NJ Spill Compensation and Control Act: Requires immediate notification to the NJDEP for a known or suspected spill, release or discharge to the surface, soil or groundwater.

3. Use of Qualified and Certified Resources: The environmental industry requires specific training and certification for on-site personnel and licensing for companies engaged in remediation of regulated materials. The types of individual training may include OSHA 40-hour health and safety for hazardous waste operations, confined space entry, asbestos abatement worker or supervisor and others. Certifications may include asbestos inspector, management planner, project designer, lead-based paint inspector and risk assessor, and underground storage tank subsurface evaluator.

   a. Companies performing the work must be licensed in the state of New Jersey to remove underground storage tanks, abate asbestos containing materials and remove lead-based paint. Finally, transporters and haulers of hazardous waste must adhere to state and federal DOT regulations.

4. Communication and Notification Procedures: Thee following notification procedures should be implemented immediately and documented upon the knowledge or discovery of an environmental incident:

   a. Construction Worker and/or Equipment Operator notifies the on-site Construction Superintendent;
   b. Construction Superintendent notifies the PMF;
   c. The PMF notifies the NJSCC Remediation Project Officer and the D&C Project Officer;
   d. The Remediation PO contacts the NJDEP Case Manager to discuss appropriate remedial options and works with the Contractor so that the appropriate environmental contractor is retained. The environmental contractor develops the scope of work and cost estimate and submits it to Contractor and the NJSCC Remediation PO for review and approval; and
   e. The Remediation PO provides oversight and monitors project in concert with the Contractor for the duration of the remedial effort.

5. Reporting and Documentation: In addition to the remedial services provided by the environmental contractor (i.e. tank removal, soil excavation, asbestos abatement), it is expected that the environmental contractor will submit necessary reports and relevant documentation to the NJSCC, such as:

   a. Disposal documentation and hazardous waste manifests for all materials shipped off-site;
   b. Laboratory reports and certificates of analysis for all environmental samples including post excavation soil samples, asbestos bulk samples and waste classification samples.
   c. Certificates of “clean fill” for any soil brought on-site as a result of the remedial effort;
   d. All documentation related to underground storage tank removals including disposal of any residual product within the tank, post excavation soil sample results, the disposition of the actual tank and associated piping, UST closure reports, signed

authorizations from local building departments and fire marshals prior to backfilling, etc;

e. All documentation related to asbestos abatement projects including bulk sample results, abatement specifications, area and personal air monitoring results, clearance air sample data, disposal documentation, daily logs maintained by the asbestos safety technician, etc;

f. UST Closure Reports, Remedial Action Reports, Asbestos Abatement Reports and any other deliverables;

g. Copies of all correspondence to and from regulatory agencies.

1.6 WATER QUALITY

A. The Design Consultant, at the site investigation phase of their project, shall conduct water quality tests at the point closest to the school site. The Design Consultant shall perform the tests. The test results must meet or exceed US EPA and NJ DEP requirements for potable water. Coordinate with local water district. Provide data from the local water utility, US EPA and NJ DEP that the water proposed for the school meets or exceeds the requirements of US EPA and NJ DEP. If the water quality does not meet State and Federal standards remediation design shall be performed as an addition to the DC scope of work.

1.7 PLANNING, SITE ANALYSIS, AND PARKING CRITERIA

A. Evaluate building and site options in descending order of assumed priority, as follows:

1. General Program Analysis

2. Recommended relationships of new building elements to each other

3. Recommended relationships of new building elements to existing ones

4. Problems in existing facilities in descending order of priority

5. Historic significance of existing structures, as may be appropriate

B. Site Analysis of Existing Conditions

1. Horizontal and vertical access, fire lanes, and hydrants.

2. Traffic (patterns, noise, danger, density); safety of children; parking.

3. Adequate service area.

4. Location and size of existing utilities.

5. Relationship of School Facilities Project to neighborhood, open space, parks, green acres.

6. Easement restrictions or other deed restrictions.

7. Location of the School Facilities Project to environmentally sensitive areas such as wetlands, floodways, stream encroachment consistent with NJDEP EO 215 guidance.

8. Location of the School Facilities Project in proximity to industrial sites.

9. Site utilization during construction (fence, access, etc.) temporary building location/relocation.

10. Location and size of all existing permanent and transportable structures.

11. Planning and zoning requirements.

12. Landscaping requirements.

13. NJ 'Smart Growth' criteria

14. 'Sustainable Sites' criteria as defined in LEED™ 2.0

15. Safe Route to Schools' program

C. Parking Guidelines

1. Parking recommendations are school specific due to location, environmental conditions, type of school, and size of school. Review local zoning requirements as applicable.

Site type	School type	Parking per Teaching Station
High density urban site w/ public transportation nearby	PreK thru 8	0.8 spaces
High density urban site w/ public transportation nearby	High School	0.8 spaces & 1 space/10 senior students
Low density urban site without public transportation	PreK thru 8	1.2 spaces
Low density urban site without public transportation	High School	1.2 spaces & 1 space/8 senior students
Non urban site without public transportation	PreK thru 8	1.4 spaces
Non urban site without public transportation	High School	1.4 spaces & 1 space/8 senior students

2. Use of compact stalls in lieu of standard parking stalls is encouraged for student parking, when provided, and planned spaces next to the building for vanpool or carpool spaces to meet 5% of the planned building occupancy capacity.

3. Develop special event temporary parking areas over grass or non-paved surfaces

4. Provide loading dock(s) as required

5. Underground parking shall be considered in cases where land would otherwise need to be purchased and relocation to occur, solely for the purpose of ground level parking.

END OF DIVISION 2

DIVISION 3: CONCRETE

1.1 SUMMARY

A. This section includes all types of reinforced concrete uses for structures, walls and finished surfaces.

1. Relevant Building Elements

a. Reinforced concrete walls and floors.
b. Precast concrete planking.
c. Tilt-up concrete sections.
d. Lightweight insulating concrete.
e. Concrete and steel decking to form composite floor system.
f. Concrete floor topping.
g. Prestressed concrete.

1.2 STANDARDS

A. An NJSCC certified testing company shall provide all testing, including on-site concrete monitoring, and re-bar testing. The PMF shall co-ordinate the tests required by the Design Consultant's criteria, or NJSCC requirement, which ever is greater.

1.3 REFERENCES

A. ACI 211.1, Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.

B. AC1 214, Recommended Practice for Evaluation of Strength Test Results of Concrete.

C. ACl 301, Specifications for Structural Concrete.

D. AC1 304R, Guide for Measuring, Mixing, Transporting, and Placing Concrete.

E. ACl 305R, Hot Weather Concreting.

F. AC1 306R Cold Weather Concreting.

G. AC1 318, Building Code Requirements for Structural Concrete.

H. SP-15, Field Reference Manual: Specification for Structural Concrete (ACI 301-99) with Selected ACl and ASTM References.

I. ACI 308.1, Standard Specification for Curing Concrete.

1.4 GUIDELINES

A. Use of precise structural concrete, pre-stressed or post tensioned concrete, and systems utilizing excessive spans, or unusual components/procedures requires submittal to and the approval by the NJSCC PO.

B. Standardized bar grades, sizes, and lengths shall be utilized as much as possible. Reinforcing steel should be new billet steel of domestic manufacture.

C. Beam and girder sizes and spacing shall be uniformly chosen.

D. Maintain column cross-sectional areas constant for at least two stories. When necessary, change column thickness only with an inside face setback.

E. Minimal dimensions of column and beam sides should be in multiples of 2 inches.

F. Provide keyways at all construction joints and include continuous water stops wherever subjected to hydrostatic pressures.

G. Slope the top of all exposed concrete surfaces and include drip grooving underneath all cantilevered leading edges.

H. All below grade exterior foundation wall pipe penetrations shall be made with a special cast iron flange to mechanical joint wall casting of matching length with integral intermediate flange. Sleeve and curb all floor slab openings.

I. No standing water or mud shall be allowed before pouring concrete footings.

J. Consider concrete slab design as it relates to the moisture vapor emissions (MVE) through in-service slabs and the effects of these emissions on finished flooring. Slabs that have low permeability greatly reduce the risk of adhesive failures or microbial growth beneath adhered finished flooring, such as carpet or resilient tile, and moisture damage to wood flooring in athletic activity areas. Low water-cementitious materials ratios are critical.

K. Fly ash concrete is acceptable if the product meets or exceeds the Design Consultant's requirements. All concrete delivered to any job-site shall include the delivery ticket showing the quantity, time of delivery and mix criteria. These tickets shall be collected by the PMF, reviewed for compliance, and then sent to the Design Consultant for compliance with their specified design criteria. A copy of the approved mix shall be sent to the PMF who will provide an informational copy to NJSCC.

L. Consider for use of recycled concrete as dense-graded aggregate per NJDOT specifications.

M. Use of coated reinforcing steel (epoxy and others) must be described with referenced standards in accordance with NJSCC requirements and Industry Standards.

N. In cavity wall construction, co-ordinate the outer brick-bearing shelf with the foundation well. Size and locate shelves to allow integral, co-ordinated, casting with the wall.

O. Contractor/Sub contractor shall be required to submit signed and sealed calculations by a NJ licensed engineer or architect for all form work design.

P. A 'pre-pour' meeting is required with the contractor, sub-contractor, design consultant, NJSCC project officer and testing laboratory representative before the initial concrete pour on all projects. Minutes of this meeting shall be kept by the PMF and distributed to the Design Consultant for review and approval and to NJSCC PO for information.

1.5 ACCESSORIES

A. Forms

B. Admixtures

C. Coatings

D. Reinforcing bars

E. Ties and mesh

END OF DIVISION 3

DIVISION 4: MASONRY

1.1 SUMMARY

A. This section includes common types of brick and concrete masonry unit, related accessories and reinforcements for all interior and exterior masonry walls. The listing of specific masonry construction types is not intended to limit School Facilities Project design to only those listed.

B. Common School Facilities Project Building Components:

1. Face Brick:

2. Concrete Masonry Units:

3. Prefaced Concrete Masonry Units

4. Glazed Structural Clay Tile and Glazed Concrete Block Units:

5. Thin Set Brick System:

6. Stone Veneer:

7. Autoclaved Aerated Concrete Block (AACB) and related products (must be made in America) manufacturers include:

a. TruStone America
b. Hebel
c. Ytong

1.2 STANDARDS

A. All concrete masonry work shall be performed in accordance with the recommendations of the National Concrete Masonry Association (NCMA) and Brick Industry Association (BIA).

1.3 PERFORMANCE REQUIREMENTS

A. Single source responsibility for Masonry Units: On a project, all masonry block units shall be from a single source and by a single manufacturer, for each different product required.

B. All masonry systems shall be designed with proper reinforcing in accordance with all loading and building code requirements

1.4 BRICK VENEER AND STRUCTURAL STUD EXTERIOR WALLS

A. Where 4" brick veneer is applied over metal stud back up use glass faced gypsum sheathing over a minimum of 6", 18 gauge galvanized studs. Use stainless steel fasteners and ties. In accordance with BIA recommendations and design guidance.

1.5 EFFLORESCENCE CONTROL

A. All efforts to eliminate efflorescence on exterior masonry walls shall be taken. Proper storage of the masonry product(s) (CMU, brick, etc.) must be defined in the contract documents by the

Design Consultant including dry and covered storage at the manufacturing plant, distributor's site, on-site storage, construction in progress, and entire building, until final occupancy. Requirements of the Brick Institute or America and any other governing standards shall be observed.

B. After the final washdown of any wall, no efflorescence will be accepted. The Design Consultant shall require that the contractor and their subcontractor(s) will be responsible for monitoring and removing any efflorescence or staining on any wall for a period of five years from project completion and occupancy. The DC shall specify that the contractor and their subcontractor(s) shall be responsible for all costs associated with any efflorescence during this period.

1.6 GUIDELINES

A. When face brick is to be used, at least three that are equal should be specified in lieu of specifying by allowance. Also, consideration should be given to compatibility of the brick with other structures at an existing school, as well as the surrounding neighborhood. Durability and availability for current projects as well as future additions should be considered. The DC shall specify that the contractor shall submit unit masonry samples showing the full range of colors and textures available for each different exposed masonry unit, and mortar samples showing the full range of colors available.

B. The DC shall specify that the contractor shall fabricate a mock-up wall panel, approximately 4' x 5', representative of the typical details, for each different exposed masonry system required for the Design Consultant's approval prior to construction and serve as the basis for comparison of workmanship. Partial or sample walls shall be detailed on contract documents as prepared by design consultant for bidding. The sample wall shall be constructed on approval of workmanship, joint sizes, vertical alignment, window and door head and sills, flashing installation, window/door installation, and brick and mortar colors. Approval, in writing, from NJSCC is required before wall construction can begin. Initial 4'x 4' brick sample walls, (up to 4) showing brick and mortar specified shall be constructed for color co-ordination before authorization to complete sample wall. All mock-up including brick sample wall and main wall mock-up require a minimum of 7 days, covered from weather, before review can begin.

C. All masonry walls shall have expansion and contraction joints at spacing suitable to accommodate expected movement. Joints for expansion, contraction, and building movement shall be sealed to prevent weather and water from penetrating to the interior of the building. All vertical and horizontal joints and cavities shall be drained to daylight above all horizontal surfaces.

D. There shall be both a primary (architectural) weather seal and a secondary coated weather seal where water and moisture could penetrate the wall.

E. PVC flashing and associated accessories are not permitted.

F. Through-wall flashing shall be provided at wall caps, window heads, shelf angles, base bearing, etc. Flashing pans with end dams shall be provided at window and doorsills, and all other flashing conditions where water can travel horizontally.

G. Masonry roof parapets shall have their roof face protected from the weather. Parapet face weather protection shall be face brick with through-wall flashing on the roof side as the preferred system. All fasteners shall be corrosion resistant and consideration shall be made for

access and re-roofing without dismantling the wall system. Provide metal closure strips at intersections with copings and other openings in the assembly. No gypsum boards, gypsum sheathing, or stucco shall be used in the assembly.

H. Masonry anchors to structured steel framing shall be of flexible design, i.e. wire tie strap anchors. Corrugated metal ties are not acceptable.

I. Appropriate through wall flashing and weep/vent holes at top & bottom of wall to provide drainage at cavity walls. Use plastic inserts for weeps/vents. Continuous through-wall flashing shall be set at 8" above the finished grade with weep holes at 24" on center.

J. Avoid masonry units with high metallic or salt content to minimize efflorescence.

K. Follow recommended practice and detailing of the *Technical Notes on Brick Construction*, as published by the Brick Institute of America, for brick and masonry construction.

L. All brick veneer wall assemblies shall be a minimum of 4" deep brick and secured to concrete masonry units or suitable steel stud assembly as described by the BIA Technical Notes. Adjustable ties for face brick shall be 16" on center horizontally and vertically at every second block course integral with the joint reinforcement at the alternate block course. Horizontal joint reinforcing shall be placed every course below grade.

M. Provide provisions for vertical and horizontal expansion, contraction, and movement in accordance with BIA Technical Notes.

N. Provide expansion and control joints as a length of function and mass differences. Coordinate locations with parapet and expansion joints and fenestration.

O. A graffiti-resistant coating shall be used on all exposed exterior surfaces up to 10' high above grade.

P. Any face brick or CMU to be used on a Project shall be kept covered and dry including when stored at the supplier's yard, during delivery and at the job site to minimize moisture and efflorescence.

Q. Where multiple exterior finishes are proposed (i.e. multiple brick types), the documents shall show the specific areas for each proposed use. Specific brick type, size color, location, and specifications shall be identified as the brick used for "basis of design'. Alternative or equal products must also be identified. This requirement is not limited to brick. It includes all exterior finishing including, brick, CMU, mortar, EIFS, curtain wall, store front, etc.

R. Contractor/sub contractor shall confirm availably of brick and masonry materials. All products must meet 'Made in America' criteria as defined by the Federal Trade Commission.

END OF DIVISION 4

DIVISION 5: METALS

1.1 SUMMARY

A. Applicable Building Elements:

1. Structural steel
2. Steel joists
3. Steel deck
4. Cold formed metal framing
5. Ornamental metal
6. Miscellaneous metal
7. Aluminum and other metals

1.2 STANDARDS

A. Documentation should be submitted on the recycled steel content.

B. All structural steel members and connectors shall resist seismic forces.

1.3 REFERENCES

A. Structural Steel

1. AISC's Manual of Steel Construction.
2. AISC's Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design.
3. AISC's Code of Standard Practice for Steel Buildings and Bridges.
4. RCSC's Specification for Structural Joints using ASTM A325 or A490 Bolts.

B. Steel Joists

1. Steel Joist Institute's Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders.
2. Steel Joist Institute's Recommended Code of Standard Practice for Steel Joists and Joist Girders

C. Steel Deck/Cold Formed Metal Framing

1. Steel Deck Institute (SDI), "Design Manual for Composite Decks, Form Decks, and Roof Decks."

2. American Iron and Steel Institute (AISI), Specification for the Design of Cold-Formed Steel Structural Members.

D. Metal Fabrications/Railings

1. ASTM A 47 Malleable Iron Castings.

2. ASTM A 53 Welded and Seamless Steel Pipe

3. ASTM A 500 Cold-formed tubing

4. ASTM A 501 Hot-Formed Welded and Seamless Carbon Steel Structural Tubing

5. AWS D1.1 Structural Welding Code

1.4 PERFORMANCE REQUIREMENTS

A. Consideration shall be given when selecting two or more metal types with regard to galvanic action or electrolysis. This applies to all areas of construction.

B. Metal finishes such as anodizing; galvanizing or weathered steel shall be utilized when metal is exposed to weather or moisture. Exposed metals shall be inherently corrosion-resistant, such as stainless steel, or have a corrosion-resistant finish suitable for the type of exposure to which they are subject.

C. Shop fabricated steel members shall be used where possible, especially when repetitious members are utilized.

1.5 GUIDELINES

A. Metal decking for concrete slab form should be of sufficient gauge to support concrete placement without buckling or deforming from wheelbarrow or other such traffic.

B. Flutes of metal decking supporting rigid insulation should be of proper size to accommodate the span capability of the specified insulation.

C. Avoid designs requiring full moment structural steel connections.

D. Select beams for economy of section, however, maintain web thickness as necessary to facilitate detailing.

E. Miscellaneous metal fabrications should utilize readily available local sections.

F. Structural calculations for all structural elements (structural steel, steel joints, steel deck, and miscellaneous steel) and be submitted with original design or with shop drawings. All documentation must be signed and sealed by a NJ licensed engineer.

END OF DIVISION 5

DIVISION 6: WOOD AND PLASTICS

1.1 SUMMARY

A. This section includes commonly used wood products and interior millwork. Wood from industry-certifiable sustainable foresting is strongly encouraged.

1.2 REFERENCES

A. Rough Carpentry, Finish Carpentry, Millwork:

1. APA Plywood Construction Guide.
2. AWPA C20 Structural Lumber, Fire-Retardant Treatment by Pressure Processes.
3. AWPA C27 Plywood, Fire-Retardant Treatment by Pressure Processes.
4. PS1 Construction and Industrial Plywood, US Department of Commerce
5. PS20 American Softwood Lumber Standard, US Department of Commerce.
6. AF&PA National Design Spec. for Stress Grade Lumber and Fastening.

B. AWI Quality Standards for Finish Carpentry:

1. AWI Section 300 — Standing and Running Trim.
2. AWI Section 600 — Shelving. AWI.
3. AWI Section 700 — Miscellaneous Work.
4. AWI Section 400 A, B, and C — Casework and Countertops.

1.3 GUIDELINES

A. Casework: Cost shall be evaluated when deciding between custom and manufactured casework.

B. Consideration and preference should be given to woods that have been certified by a third party such as the Forestry Stewardship Council to be sustainably grown and harvested.

C. Avoid use of non-sustainable, exotic materials

D. Casework, where specified, shall meet AWS ‘standard’ criteria, when custom casework is required.

END OF DIVISION 6

DIVISION 7: THERMAL AND MOISTURE PROTECTION

1.1 CONTENTS

A. Acceptable Roofing Systems

B. Standards

C. References

D. Performance Requirements – General

E. Related Items

F. Guidelines

1.2 ACCEPTABLE ROOFING SYSTEMS

A. Selected roofing system shall comply with manufacturers recommendations and installation to provide a watertight structure and a minimum 20 year warranty.

B. This section does not address other thermal and moisture proofing systems and materials. The Design Consultant should use prudence in designing for these components. The entire building envelope as a whole shall be considered when evaluating envelope performance criteria.

C. Systems Qualification: All roof systems shall be reviewed prior to the bid opening. Roof systems not specified, listed as acceptable substitutions, or considered to be accepted as an "Equal" in the contract documents, shall be deemed non-conforming bids.

D. The membrane roofing system specified herein shall be the product of a manufacturer who can furnish supporting evidence of manufacturing experience in the manufacture of the membrane roofing system and of having been regularly engaged in this business for not less than ten (10) years. Such experience shall be in projects similar to the requirements for the project.

E. Acceptable Building Roofing Systems (light color or white when available):

1. Single Ply Membrane Roofing System. (EPDM, TPO)

2. Modified Bitumen Roofing System.

3. Built-Up Roofing System.

4. Shingled Roofing Systems.

5. Other systems, submitted for approval by the DC shall be approved by the NJSCC PO prior to inclusion within documentation.

1.3 STANDARDS

1. Roof systems shall be designed to resist wind load pressures in accordance with the applicable codes standards including UCC, FM4450, FM4470, UL580 and UL1897.

2. Roof covering materials shall be Class A in accordance with ASTM-E 108.

3. Wind load criteria shall be in conformance with prevailing Code, but no less than ASCE-7 and FM depending on building location, height and other factors contributing to loading analysis.

4. Drainage Requirements

   a. Exterior roof drains and scuppers are encouraged. Interior drains shall only be used where necessary.
   b. Internal roof drains that are offset from the lowest roof point due to structure shall be set in a minimum 4 foot square depression to ensure the drain is at the lowest point.

5. Pitch

   a. The minimum pitch for any roof system is 1/4" per foot.
   b. The minimum pitch for any roof valley, including the leading edge of crickets, parapets, curbing, or other appurtenances, is 1/16" per foot, or .5%.
   c. Crickets should be laid out on a minimum 4:1 ratio perpendicular to sheet flow.
   d. The maximum recommended pitch of any primary roof should is 6 in 12, unless greater pitches have been approved by the NJSCC PO.

6. Equipment

   a. No Equipment shall sit directly on roofing system. Provide all equipment and piping a minimum of 18" above highest point of the roof system.
   b. Pitch pockets shall not be used.
   c. Roof mounted mechanical equipment shall have walk pads to and around the units. Equipment located closer than 10 ft from the roof edge shall have guardrails installed around the equipment. Equipment set on dunnage shall have a catwalk w/ guardrail entirely around equipment. Provide lighting and appropriate power for maintenance.
   d. Provide a steel ladder in lieu of stairs to all roofs with mechanical equipment. Roof hatches shall be minimum 3' x 3' aluminum hatches.

1.4 REFERENCES

A.	FM	Roof Assembly Classifications.
B.	NRCA	Manual or Roof Maintenance and Roof Repair.
C.	NRCA	Roofing and Waterproofing Manual
D.	UL	Fire Hazard Classifications.
E.	SMACNA Association	Sheet Metal and Air Conditioning Contractor's National
F.	MBMA	Metal Roofing Systems Design Manual
G.	NCARB	Lows-Slope Roofing – II

H. Manual of Low Slope Roof Systems Griffen & Fricklas

I. ASCE American Society of Civil Engineer

1.5 PERFORMANCE REQUIREMENTS – GENERAL

A. All roof systems shall be fully adhered and comply with NJSCC approved roofing systems.

B. Roof system shall provide a total system warranty, including insulation, cover boards, flashings and edge trims (ie copings).

C. Design roof system with overflow drains or scuppers.

D. Roofs shall be adequately designed to sustain all snow loads based on code or a minimum ground snow load of 30 PSF. Where drifting occurs, loads will change.

E. All roofing projects requiring a permit shall have drawings and specifications signed and sealed by a New Jersey State Licensed Architect or Engineer.

F. Wind resistance of metal edge flashings & copings shall be designed in accordance with ANSI/SPRI ES-1.

G. Drawings shall be prepared to adequately indicate the project requirements. The roof plan shall be drawn to scale and show all penetrations, provide references to all typical and special roof details, and delineate locations on the roof that have difference wind uplift pressures. The roof plan shall clearly convey the required information.

H. Materials: Listed materials, when part of an acceptable roofing system shall meet the requirements of the material standards specified.

I. Ladders: Internal ladders shall be provided to all roof areas where possible.

J. Parapet Heights: All parapet heights above highest roof points shall be in accordance with code.

K. Installation Timing: Installation criteria shall include manufactures recommendations including temperature. No exceptions to the manufacturer's recommendations will be accepted.

1.6 RELATED ITEMS

A. Water proofing: waterproof membranes and/or granular fill along with foundation drains shall be provide on all foundation walls of below grade interior spaces. Filter fabric shall be provided around drains.

B. Thermal and Moisture Protection

C. Other Related Items (not included in this Section)

1.7 GUIDELINES

A. New Building Projects:

1. Geometry

    a. Buildings with less complicated, simple roof geometry are preferred.

2. Roof Drains:

    a. Drainage of roofs shall be accomplished with appropriately placed roof drains and overflow scuppers rather than merely sheet flow to scuppers or "over-the-side" onto walls. No drainage onto walls shall be permitted except in the event of roof drainage failure. Avoid parapets and pitch pans; use alternate details.

3. Decking:

    a. When standing seam metal roofing is used, materials test firm shall inspect all flashing joints and seams; rigid non-hygroscopic insulation shall be fastened to the underside of the roof but protected on the interior surface. Roof and deck assemblies shall comply with UL fire resistance requirements as required by New Jersey UCC and other authorities having jurisdiction.

4. Walkways

    a. Provide walkways as required by roof system manufacturer from the point of roof access to all units requiring periodic access and to access to other roof levels.
    b. Walkways shall be provided or approved by the manufacturer for inclusion in the required roof system warranty.

5. Mechanical Equipment:

    a. Mechanical equipment should be designed to be set on a full curb.
    b. Provide additional sloped insulation below framework and between equipment support curbs to remove water from below units. Provide taper strip on all sides of all full-curbed equipment to prevent water standing against flashings.
    c. Rooftop equipment shall be designed to resist wind loads.

B. Pre-Installation Requirements

1. New Roof

    a. Prior to ordering of materials, a preroofing conference will be held to discuss the specified roofing system, and its proper application. Conference shall include installer, roofing manufacturer, installers of related work, Architect and representatives of Owner. Record discussions and agreements and furnish copy to each participant. Provide at least 72 hours advance notice to participants prior to convening conference.
    b. Coordinate application of the roofing system in such a manner that the complete installation is weather-tight and in accordance with guarantee requirements.

2. Re-Roofing

a. Shall visit the site after roofing is removed to inspect the existing deck, prior to re-roofing. Manufacturer shall make appropriate visits so as to certify that roof warranty capability is maintained.

b. A pre-roofing meeting is required. The meeting shell includes NJSCC PO, PMF, Design Professional; Contractor, roofing sub Daily Re-Roof: During the construction period, each section of a re-roofing project shall be completed each day, including all essential components of the selected roofing system to maintain the integrity of the work. At the completion of each day as described above, all exposed edges of the roofing and the building shall be made watertight. Therefore, the contractor shall tear off and remove only that which can be replaced in a day.

C. Verification

1. Inspection: Test cuts should be performed only where there is reason to suspect that less than proper installation procedures have been used or materials have been shorted. Otherwise, use 100% non-destructive tests.

2. Manufacturer Approval: Verify manufacturer approval of installation type and attachment for specific installation. System selections shall not be changed without specific approval from the NJSCC.

D. Repairs & Re-Roofing Projects:

1. Site Visit: The Design Consultant and roofing consultant shall visit the site to investigate all existing roof and deck conditions.

2. Investigative Methods: The investigation shall consist of acceptable methods, such as: roof cuts, infrared scans, pullout tests for fasteners, etc. The investigation shall be complete and shall form the basis for the comprehensive scope of work. Design Professional shall submit to the PMF the intended method and roofing consultant prior to commencement of the work.

3. All existing roofs to be repaired or replaced must be tested by a certified testing lab to determine if the material contains asbestos or other hazardous materials.

4. Asbestos: If the asbestos content of material to be removed or otherwise disturbed exceeds the permissible amount of (1%), the roof must be removed in accordance with applicable codes.

5. Report: The roof inspection report and a scope of work shall be submitted by the Design Consultant In the event appreciable time (one year or more) has lapsed from the time of the existing investigation or report to the time of the roof installation, a new report must be provided.

END OF DIVISION 7

DIVISION 8: DOORS AND WINDOWS

1.1 SUMMARY

A. This section includes doors, frames, hardware and window systems most commonly utilized to provide light, barriers, privacy and security to buildings.

1.2 STANDARDS

A. Fire rated assemblies shall be listed with UL (Underwriters Laboratories) and must be labeled.

B. All doors and windows shall be Heavy Commercial Grade Systems with security and reinforced components.

C. Specialty doors should be provided where appropriate.

1.3 REFERENCES

A. Steel Doors And Frames

1. NFPA 252 Standard Method of Fire Tests for Door Assemblies

2. ANSI A250.8 Recommended Specifications for Standard Steel Doors and Frames

3. SDI-105 Recommended Erection Instructions for Steel Frames

4. UL 10B Fire Tests of Door Assemblies

B. Wood Doors

1. WDMA Quality Standard: I.S.I "Industry Standard for Wood Flush Doors," of the Window and Door Manufacturers Association (WDMA.)

2. AWI Quality Standard: "Architectural Woodwork Quality Standard," including Section 1300 "Architectural Flush Doors," of Architectural Woodwork Institute (AWI) for grade of door, core construction, finish, and other requirements exceeding those of WDMA quality standard)

1.4 GUIDELINES

A. Windows

B. Doors

C. Hardware

D. BHMA 1301 - Materials and Finishes.

E. Windows and Glazing:

1. Windows

a. Operable single-hung sliding sash windows, both vertical and horizontal, are encouraged. Operable windows, with pivot and/or crank mechanisms are discouraged but may be considered. Windows that project shall not be used on the grade level in proximity to pedestrian circulation. Screens are required of all operable sashes. Use only heavy-duty balance and guides. All windows shall be Energy Star™ rated, thermal insulated frames with thermal breaks. All windows shall meet or exceed the code requirements for each specific building. The design consultant shall provide the code wind speed requirements in conjunction with the specific performance criteria of the proposed wind lift.
b. Aluminum window systems (thermally broken) are preferable over aluminum or clad wood systems.
c. Consideration shall be given to solar tinted or low-emission coated high performance glass especially where sun glare is a factor. Exterior glazing shall be double-glazed as a minimum. Triple glazing is encouraged for added envelope efficiency and increased sound control.
d. Replacement windows compatible with existing windows size, shape, finish, and function is preferred.
e. The DC shall carefully review environmental criteria for door and window units in humid environments. Units should be selected based among other criteria, their ability to with stand these conditions for long periods of time.

2. Doors:

a. All Egress doors shall be provided with vision panels.
b. Glazing in fire resistant door assembly shall be in accordance with applicable codes.
c. All doors equipped with latching devices in school buildings or portions of the building used for Assembly shall be equipped with panic hardware defined by the Design Consultant.
d. Doors shall not be used on student rest rooms. The restroom entry path shall maintain visual privacy but allow for security. Barrier free clearance must be maintained. Concealed security closures are suggested for maintenance activities.

3. Hardware:

a. Quantity and type of door hinges shall be as recommended by hinge manufacturer for the specific application and intended use.
b. All hinges on exterior doors and on storage rooms, library, kitchen, administrative suite opening out shall have non-removable pins.
c. Stainless steel hinges are required for exterior doors.
d. All hinges on doors with door closers shall have ball bearings.
e. All anchor hinges shall be of one-piece construction.
f. All closers shall be heavy duty, one manufacturer, surface mounted with hex bolts.
g. All exterior doors shall have closers mounted on the inside of the door with solid forged heavy duty knuckle and parallel arm design.
h. All interior doors with closers must have the closers mounted on the opposite side of public area. Parallel-arm closers are preferred.
i. All exterior and high-frequency-use doors shall have factory non-sized closers with full-spring adjustments allowing on the door adjustment; power range size 1 through

5, along with back check feature. No concealed closers are to be used, except for double-acting closers.

j. Exterior, high frequency, and heavy-duty closers shall be independently certified to a minimum of 10 million cycles in accordance with ANSI testing requirements to insure long life span and reduced maintenance cost.

k. Specify stop arms, floor stops, bumpers, or other high traffic door swing limit devices to prevent closer and door damage by door over travel in high traffic locations.

l. All exit devices to be mounted with hex bolts.

m. Where possible, all pairs of doors requiring exit devices shall have lockable removable mullions. Main delivery area shall have no mullions.

n. Do not use cross bar design exit devices. Provide "touch pad" with "T" design to prevent finger pinching. Touch pad shall not extend full length of exit device for safety reasons. All latches shall be dead latching type with roller strikes.

o. Specify fluid dampers on exit devices to absorb shock and noise where serving instructional spaces.

4. General: All wood doors or hollow metal doors with push plates or exit devices shall have kick plates or armor plates.

   a. Single doors: 1 ½" less width of door
   b. Pair doors: 1" less width of door
   c. All wood or hollow metal frames shall have silencers.
      1). Single doors up to 8'-0": three (3) each
      2). Single doors over 8'-0": four (4) each
      3). Pair doors: four (4) each leaf
   d. All listed and labeled door hardware to meet all UL 10C requirements.
   e. All pairs of labeled doors with overlapping astragals must have coordinators.

5. Holders: Exterior Overhead type shall be made of heavy stainless steel construction; the sliding member in channel shall be bronze and have an accessible adjustment screw to regulate hold and open tension. Channel must be applied to the door by hex bolts. All shock blocks, components, endcaps shall be metallic material.

   a. Floor Type:
      1). Due to safety hazard, avoid the use of floor stops where possible.
      2). Special screw studs shall extend through the rubber into top of housing to prevent removal of rubber bumper.
   b. Wall Type:
      1). Shall be made of brass or bronze with a high-grade rubber bumper securely held to mounting backplate.
      2). Use wall type only at masonry walls.
      3). All above items to be sourced from one manufacturer.
   c. General Hardware Considerations, Keying: Keying systems, complete keying schedule, and policies must be verified and coordinated with individual School and District needs. It is suggested that the following be provided at each School Facilities Project:
      1). Three (3) Grandmaster keys

2). Nine (9) Master keys
3). Three (3) keys per lock or cylinder
4). Lockable key cabinet, capable of storing 125% of the keys furnished.

d. All locks and cylinders to be provided with removable cores.
e. Keying equipment, including codes and additional pins for all key combinations.
f. All kitchen doors are to be keyed alike with removable key cores. Kitchen and locker room areas shall have paddle turn trim locksets in lieu of levers. Paddle trim is more durable and complies with ADA requirements.
g. Generally, all exterior entrances to lobbies, corridors, and stairs are to be keyed alike. When community functions are planned, a separate sub-key system shall be provided. Classrooms shall be keyed separately. Group toilet security gates shall have keyed locks and shall be keyed alike to mechanical equipment rooms and custodial areas doors. Smaller rooms, with locks opening into larger rooms, shall be keyed alike with the locks for the larger room.
h. Only the individual lock keys and the Grandmaster keys may open the Principal's office, secured storage, kitchen, and such areas as audio/visual storage rooms. These locks shall not be passed by the Master keys.
i. Although not keyed under a part of the building lock / keying system, attention is called to the fact that all teachers' cabinets are to have locks and should be keyed separately and master locked.
j. It is important that the receipt of all keys by the school be documented. The DC shall specify that the Contractor prepare an itemized key list in complete detail, with a statement that the keys, type and quantity, were turned over, including that the keys were received and the receiver's signature. Each Key should be identified with a tag corresponding to the approved room number designation.

END OF DIVISION 8

DIVISION 9: FINISHES

1.1 SUMMARY

A. This section provides general guidelines for commonly used surface finishes.

1.2 GUIDELINES

A. Floors:

ACCEPTABLE FINISH FLOORING

Primary School, Floor Surfaces

Classrooms	
Pre-Kindergarten, Kindergarten, 1st, 2nd, 3rd, and Special Education Room	Carpet, in conjunction with Ceramic Tile, Sheet Vinyl, or VCT in front of sink counter units, lavatories and the entryway to restrooms.

Elementary School, Floor Surfaces

Classrooms, Intermediate	
(4th, 5th, 6th, and Special Purpose Rooms)	Vinyl Composition Tile (VCT)
Media Center	Carpet
Offices, Lounges	Carpet
Restrooms/adjacent to classrooms	Ceramic Tile
Restrooms off corridor	Ceramic Tile
Kitchens	Quarry Tile (non-slip) or Resinous Flooring
Cafeteria	VCT
Corridors	VCT
Entryways	Quarry Tile, Terrazzo, linoleum
Gymnasium	Hardwood
Platforms (Stages)	VCT
Auditoriums	Sealed Concrete, Carpet in Aisles and Orchestra

Secondary School, Floor Surfaces

Classroom and Corridors	VCT
Laboratories, Science, and others	VCT
Gymnasiums	Hardwood
Shops	Sealed Concrete or Resinous Flooring
Offices, Media Center, and Lounges	Carpet
Kitchen	Quarry Tile (non-slip) or Resinous Flooring
Stages - High School	Softwood
Stages - Middle School	Hardwood
Auditoriums	Sealed concrete Carpet aisles and orchestra

General, Floor Surfaces

Mechanical Rooms	Sealed Concrete or Resinous Flooring
Under drinking fountains	Ceramic Tile
Under kilns	Ceramic Tile

1. Use carpet, in conjunction with ceramic tile or VCT in front of sink counter units, lavatories and the entryway to restrooms

2. Concrete floors in all instructional areas except shop shall be covered with resilient Vinyl Composition Floor Tile.

3. Floors of toilet rooms, shower rooms and drying-off rooms shall be water tight and impervious to moisture. Floors shall have an integral cove base at least 4" high.

4. Floors, walls, and ceilings of rooms used for instructional uses shall be free from moisture, peeling paint, plaster, and potentially hazardous materials.

5. Concrete slabs with a moisture vapor emission (MVE) rate in excess of 3 lbs of water/1000 sq. ft. of slab in a 24-hour period when tested by tested per ASTM F 1869 are not considered suitable for adhesively applied finished flooring. Therefore, consider requiring moisture testing per ASTM F 1869, for re-flooring applications. Consider contingency plans for MVE-retarding coatings or other remedial measures.

6. Recycled content per LEED™ should be considered where equivalent performance and cost effectiveness could be achieved. For carpet, level loop tuft is preferred for durability. Carpet tile may be used wherever carpet is identified.

B. Walls and Partitions:

ACCEPTABLE WALLS & PARTITIONS

Classrooms, Instruction and Kindergarten	Painted gypsum board, Concrete Masonry Unit (C.M.U.)
Corridors	Multilayered gypsum wallboard impact resistant gypsum board, or C.M.U. split-faced or ground faced block
Toilets, Kitchen, Custodial, Gym Dressing Rooms, Showers	C.M.U., multi-layered gypsum board (water resistant), cementitious backing board, ceramic tile full height of wall, prefaced CMU
Cafeteria	C.M.U., multilayered gypsum wallboard
Faculty and Administrative Restrooms	ceramic tile wainscot, height TBD by DC
Clinic, Administrative Offices	Gypsum board, C.M.U.
Stages	C.M.U., multi-layered gypsum board.
Shops	C.M.U. painted with vitreous coating if required.
Laboratories	Gypsum board or C.M.U.
Stairs	C.M.U., multilayered gypsum board
Gymnasium	C.M.U. with acoustical properties at appropriate heights

1. Double layer or high performance impact resistant gypsum board on heavy gauge stud shall be provided in locations subject to potential vandalism, i.e., corridors, laboratories, stairs, etc. Use such assemblies exclusively on all Early Childhood Center classroom spaces.

C. Ceilings:

ACCEPTABLE ACOUSTICAL CEILINGS

All areas except kitchen	mineral-base panel with exposed suspension system
Kitchen areas	vinyl faced - washable panel with exposed suspension system

1. Ceiling material in kitchen, storeroom, and cafeteria must be acceptable to the local health department. Provide access to firestat on kitchen exhaust hood. There shall be no exposed piping or ducts in the kitchen area.

2. Lay-in ceilings should be designed to restrict criminal uses, such as the concealment of weapons, drugs and stolen property.

D. Paints and Coatings

1. Eggshell (low-luster) finish is preferred. Low VOC paints in accordance with NJDEP standards should be met.

2. Low VOC or no VOC Epoxy paint shall be allowed on "high use" surfaces.

3. Consideration should be given to paints with higher reflectivity where suitable, i.e. lighting strategies.

E. Colors

1. The DC shal specify that the colors for finishes, including paints, casework, toilet partitions, flooring, doors and frames, etc. should be submitted by the contractors as soon as possible so a final presentation of all materials selections and colors may be presented for approval by the Client School District and NJSCC representative.

F. Miscellaneous: Specifications shall require contractor to provide designated minimum amounts (5% if not identified) of finish materials for ceilings, flooring, paint (all types) and all other materials identified by the NJSCC and the District for future use. Delivery and storage is to be coordinated as part of final project closeout procedures.

END OF DIVISION 9

DIVISION 10: SPECIALTIES

1.1 SUMMARY

A. This section includes all of the specialties necessary that lead towards a successful design.

1.2 RELATED ITEMS

A. Chalkboards and tack boards.

B. Toilet partitions.

C. Louvers and vents.

D. Access flooring.

E. Flag poles.

F. Directories and bulletin boards.

G. Specialty signs.

H. Metal lockers.

I. Fire extinguishing cabinets, and accessories.

J. Postal specialties.

K. Operable partitions.

L. Telephone enclosures.

M. Toilet accessories.

N. Mirror units.

1.3 GUIDELINES

A. Chalkboards:

Note: Markerboards are preferred, provide chalkboards only when specifically requested by the Client School District, as below.)

1. Three-component type: (composition is acceptable)

2. 24 gauge galvanized face steel with porcelain enamel, laminated to

3. ½" nominal hardboard, with

4. .015" aluminum back sheet laminated to hardboard

5. Length - one piece through 16 feet

6. Thickness - ½"

7. Mounting height (elementary and secondary): Rail 24 inches A.F.F.

8. Trim – Extruded aluminum (trim should match markerboards if in same room).

9. Accessories - Map rail/hook hardware.

B. Tackboards:

1. Three-component type:

2. Vinyl cover, over corkboard, laminated to ¼" hardboard

3. Length - one piece through 16 feet

4. Thickness - ½"

C. Markerboards

Note: Do not use chalkboards in rooms that house computers. Provide markerboards in computer classrooms instead.

1. 24 gauge minimum steel base metal plate.

2. Concealed splice joints for writing surfaces.

3. Colors - white.

4. Trim - extruded aluminum (trim should match chalkboards if in same room).

5. Mounting height (elementary and secondary): Rail 24 inches A.F.F.

6. Accessories - Map rail/hook hardware.

D. Display Cases

1. Quantities/locations/type/size:

   a. Elementary schools: one, near general office.
   b. Secondary schools: Two, one near the office, and the other at another location.
   c. Locations: hallways as follows - foyer, cafeteria entrance, art classroom area, homemaking classroom area, and library area.

2. Type:

   a. Glass (safety) sliding bypass openings for hallway side with locks.

3. Provide internal lighting and ventilation as required of lighting.

4. Minimum of 18" depth.

5. Size: optional

E. Bulletin Boards: Bulletin Boards are suggested in all offices and in corridors (as permitted by code) adjacent to:

1. General Office
2. Area of Teacher "sign-in"
3. Lounge and workroom area
4. Cafeteria (covered or enclosed)
5. Head Custodian workroom
6. At entrance to corridors/classroom wings.
7. Nurse's office.

F. Toilet Compartments and Accessories

1. Toilet Compartments

a. Heavy duty solid plastic, Class A fire-rate, partitions shall be floor mounted, with ceiling or overhead support and nonferrous cast zinc alloy, chromium-plated, heavy-duty vandal-resistant hardware with gravity pivot hinges.
b. Alternate partitions systems shall be considered by the PMF in consultation with the NJSCC PO.

G. Toilet and Dressing Room Accessories

1. Tissue Holders - compatible with district standards
2. Paper Towel Dispensers and Receptacles - are suggested in all Staff Toilet Areas.
3. Hand Dryers - Surface mountedto be provided in all student restrooms.
4. Liquid soap dispensers - Surface mounted,
5. Mirrors (unbreakable) - Compliant with ADA requirements
6. Grab bars - Compliant with ADA requirements.
7. Robe/Towel Hooks - All staff bathroom stalls..
8. Sanitary Napkin Dispenser and Receptacles: at all female staff toilet rooms and in middle and high school female student toilet rooms.

H. Lockers

1. Student – (1 per Student):

a. Open ‘cubby’ style lockers shall be provided in elementary classrooms. Metal, 16GA max., pre-finished baked enamel units with separate padlocks function shall be provided in corridors of middle and high schools.

b. Provide sloped tops or soffit for lockers. Provide end panels and base as appropriate.

2. Athletic Facilities:

a. Street Clothes' Lockers: 12" x 12" x 35" or 48"; units with separate padlocks function.
b. Gym Clothes' Lockers: ventilated 12" x 12" x 12"; units with separate padlocks function

3. Kitchen and Custodial Staff:

a. Lockers are to be provided for kitchen employees for coats and street clothes.

I. Miscellaneous Specialties

1. Exterior Signage (Includes ADA signage, and traffic controls)

a. School name - (new school only)
b. School Street Number - (for Fire Department Use)

2. Interior Signage:

a. Design Consultant shall develop graphics, room numbers and room numbering convention, and nameplates with both raised relief and Braille lettering for review and approval of Client School District in consultation with the PMF and NJSCC PO.
b. Teacher's card insert and room number combined for classroom type spaces.
c. Vandal resistant sign and mounting.
d. Plaque - new construction and additions only; cast aluminum preferred include project name, construction year, names of Board Members at time of award of general contract, name of General Superintendent, Project Management Firm (PMF), Design Consultant, General Contractor and the New Jersey Schools Construction Corporation.

3. Overall for specialties: recycled content in accordance with LEED™ should be considered where equivalent performance and cost effectiveness could be achieved.

4. Shelving coat racks:

END OF DIVISION 10

DIVISION 11: EQUIPMENT

1.1 SUMMARY

A. This section includes miscellaneous equipment necessary for School Facilities Project design.

B. Equipment guidelines are recommended.

1.2 CUSTODIAL ROOM EQUIPMENT

A. Storage:

1. Shelving to allow for tissue and lamp storage.

2. Allow space for storage carts 36" (W) x 18" (D) x 30" (H).

3. Allow space for workbench and tool storage cabinets (not in contract).

4. No storage shall be allowed in designated mechanical and electrical service equipment rooms ('closets').

B. Mop Racks

1. Wall mounted – pre-fabricated metal type preferred.

C. Custodial Sinks

1. Service sink to accommodate 12-16 quart mop buckets.

2. Use floor-basin-type service sinks.

3. Trash and Recycling Containers: Identify Locations.

1.3 GYMNASIUM EQUIPMENT (SECONDARY SCHOOLS)

A. Basketball Backstops:

1. Fiberglass or polycarbonate backstops for full court play.

2. Additional sets of wooden backstops for half court play – equip backstops with manual operating lifting ratchet. (Structural supports for backstops are required.)

B. Floor Inserts for Equipment Standards:

1. Anchor to concrete slab beneath gym floor. Install during slab pour. No drilling.

C. General Gymnasium Considerations:

1. Provide support bar for mats on walls within close proximity to the court surface.

2. Gym Seating - Secondary: Folding bleachers in quantity to allow for seating of students, preferably locating half on each side of gym in performance gyms. Metal or wood

bleachers are acceptable. Seating capacity shall be recommended by Client School District and approved by NJSCC.

3. Gym Seating - Elementary: (none).

4. Impact Protection - Clocks, Metal Halide lighting scoreboards, fire alarm equipment, and like fixtures in gymnasium shall be protected by suitable means.

1.4 STAGE EQUIPMENT

A. Secondary school, with full production auditorium:

1. Overhead lights - minimum of three rows (bars with individual spots) or retractable equipment.

2. Dimmer control with public address systems amplifier, switch panel and monitor speaker, sound system connected to school control tele/data system with phone input. Dimming capability for stage and spotlighting only with incandescent lights on dimmer, fluorescent on switches.

3. Spotlights for general stage – illuminations: include off stage spots for front stage illumination. A catwalk is optional, at Client School District's direction.

4. Projection screen

5. Curtain, stage – fire resistant/retardant, Front curtain, rear cyclorama and both side cycloramas.

6. Public address system with alarm signal override.

7. Acoustical treatments, as required. Provide professional acoustical sound criteria recommendation for NJSCC approval.

8. All circuits identified and labeled.

9. Ventilation for control panels and dimmer boards.

B. Elementary school, with stage auditorium

1. Dimmer control panel: stage, spotlights only. Provide ventilation for control panel.

2. Spotlights for stage illumination (ceiling or wall mounted).

3. Projection screen

4. Curtains: fire resistant/retardant, front curtain, rear cyclorama and both side cycloramas.

5. Public address system with alarm signal override.

6. Consider folding partition when multi-use of stage area desired.

7. Ventilation for control panels and dimmer boards

1.5 LIBRARY EQUIPMENT

A. Library stacks systems

B. Book depositories

C. Coordinate equipment with DOE requirements, School District, and NJSCC

1.6 FOOD SERVICE EQUIPMENT

A. Food service equipment shall meet all applicable codes including the National Electric Code, National Sanitation foundation, Department of Health criteria, and shall be UL Listed. Equipment shall comply with accessibility guidelines especially for each limitation at self serve stations.

1.7 FIXED AUDITORIUM SEATING

A. Seat:

1. Folding seat
2. Plastic
3. Self-rising.

B. Back:

1. Plastic

C. Table (tablet) Arm:

1. As required

D. Anchorage:

1. Bolt to concrete floor or riser if floor is sloped.
2. Allow space for band seating between stage and first row of fixed auditorium seating.

E. Barrier Free:

1. Indicate wheelchair accessible locations
2. Follow ADA requirements

1.8 RELATED ITEMS

A. Library equipment.

B. Portable theater and stage equipment

C. Stage curtains

D. Projection screens

E. Parking control equipment

F. Loading dock equipment

G. Food service equipment

H. Unit kitchen

I. Shop equipment

J. Provide smoke seal and threshold.

1. Provide manual or electronic combination type lock, keyed separately.

2. Energy Star specification for equipment is to be used where possible.

END OF DIVISION 11

DIVISION 12: FURNISHINGS

The design consultant shall provide full interior design services. The scope of work shall be defined in the contract. A furnishings catalog for selection and purchasing shall be provided to the DC by the PMF.

END OF DIVISION 12

DIVISION 13: SPECIAL CONSTRUCTION

Building Management Systems (BMS)

The concept of a Building Management System for a specific school in a district are generally defined below in a "performance" format. The Facilities Management System describes the concepts of managing multiple school buildings in a district, with the eventual capability of sharing that information between districts, the Department of Education, and the New Jersey Schools Construction Corp.

General

a. Define the goals and extent of the Building Management Systems (BMS) with the School District, Design Consultant, PMF, and the SCC. Maximize environmental comfort while reducing energy use.
b. Complete an economic analysis on the proposed BMS design. Set goals for the equipment that the BMS should manage based on the school's need and staff capabilities. Provide for interoperability with district's scheduled and preventive maintenance system.
c. Design the system to a level of complexity that is appropriate for the staff who will be supporting its use.
d. Provide proper DDC points, hardware, software, and interface for all equipment to achieve control, tracking, and monitoring.
e. Track all readings for water, natural gas, electric and fossil fuel usage for the building, including renewable energy systems (if provided)
f. Provide backup power for Building Management System (BMS).
g. Allow for local manual control if the BMS malfunctions.
h. Require training for the staff that will be accessing the system.
i. All software, diagnostic tools, wiring diagrams, and manuals become the property of the school district and shall be of generic type where the software, diagnostic tools, wiring diagrams and manuals are available on the open market. Including but not limited to; web browser graphic based operation, archiving alarms, trends/totals, upload/download programs, diagnostics, change of state monitoring, scheduling, reporting, alarming and backup.
j. Alarms shall be provided for equipment malfunction, security breaches, and fire/life safety conditions
k. All systems shall use Ethernet interfaces (internet protocols) and operate over the school LAN/WAN.

HVAC

a. Controlled equipment including all major system components such as:
    - Heating plant
    - Cooling Plant
    - Pumps
    - Air Distribution System
    - Ventilation & Exhaust Systems

b. Additional Monitoring:
   - Static pressure on both sides of filter banks
   - Monitor BTUH of the solar radiation available outside above roof level
   - Provide CO_2 sensors to control outside fresh air
   - Monitor electric consumption at light and power panels in addition to main electric service
   - Temperatures of kitchen coolers and freezers

Lighting

a. Control artificial lighting by the amount of daylighting available.
   - Provide manual override
   - Allow for lighting control in every classroom
   - Control other major spaces using daylighting

Security (define with Project Team)

a. Monitor and control
   - Motion detectors
   - Open and closed doors (exterior doors and selected interior doors) and windows
   - Closed circuit security cameras, if used: provide remote control and adjustment.
   - Security alarm system

Fire And Life Safety Systems

a. Monitor systems by zone or smaller areas
   - Smoke/fire detectors
   - Fire suppression systems
   - Fire pump (if needed)
   - Emergency generator

Building Management System (BMS) Description

a. Controls and the equipment within the school building
   - Require non-proprietary interfaces between all equipment and systems, including monitoring. This will be provided over the school facility network and shall be accessible from any computer via a web browser with access to the network. The system will continue to operate in a distributed manner in the event of a network failure.
   - Provide multiple levels of log-on security.
   - System shall be run over building fiber optic and category 6 cabling on the building network with connection to the Internet. All software and hardware interfaces shall be non-

proprietary, building controllers using common open standard protocol, such as LonWorks, BACnet, or Ethernet TCP/IP .

Facilities Management System (FM) Description

a. Allows for remote Web-based Internet access to all building management systems. This will be available districtwide. An FM web server will provide for district wide operation and interoperability with LonWorks, BACnet and Ethernet TCP/IP building systems. This unit shall be located within a designated building or in a central location. Each building should not be equipped with a dedicated PC workstation to maintain system operation. Schools within a district that are not planning renovations will be able to upgrade in the future. -Systems must maintain generic compatibility and interoperability.

- Access to be building management systems through the facilities management system, shall be read-only, password protected, and have multiple levels.
- Access for monitoring and control shall be password protected with multiple levels of access.
- Allow for future incorporation of a facilities management system using CAD plans of the school facility, and electronic operations and maintenance manuals of school buildings.

Testing, Training, Operations, Maintenance, and Warranties

a. Provide complete testing of entire management system(s) and submit results to the Design Consultant for review and approval, PMF, and the SCC.

b. Provide on the job training and certification, where appropriate, for all personnel and staff that will be operating be systems. The training and shall be provided at multiple levels of complexity that is appropriate for the staff who will be supporting its use.

c. Operations and Maintenance for these Management Systems shall be coordinated with the Operations and Maintenance manuals provided by the equipment manufacturers. The Management Systems contractor or vendor shall provide the Operations and Maintenance manuals for the specific Management Systems designed as part of the school project.

d. Maintenance Contracts shall be provided for a five year term for the complete Building Management System, including routers, servers, fiber optics, cabling, termination devices, all software, etc. Computers and other peripheral devices are not included. A five year Maintenance Contract shall be provided for the entire telephone system, including all hardware and software, and to the public interface. The actual telephone instruments are not included.

e. Extended warranties on all hardware and software related to the management systems shall be provided. Telephone Help and support shall be provided, at no cost, to the school district for a period of five years after formal acceptance of the management systems.

f. All software, diagnostic tools, wiring diagrams, and manuals become the property of the school district and shall be of generic type where the software, diagnostic tools, wiring diagrams and manuals are available on the open market.

Building Management System

a. The Building Management System (BMS) shall be Direct Digital Controlled (DDC) and run over the building fiber optic/cabling IT backbone and report to both a central control panel. Switching, connection, programming, coordination, and commissioning the BMS system shill be the responsibility of the DDC contractor. Monitoring/Control points with electric actuators, where applicable, shall be provided on all major equipment. All systems shall be designed for future Internet (Ethernet interfaces) Web Access monitoring/tracking and remote control of systems. It is critical that the BMS system maintain extreme simplicity and compatibility for future maintenance and operations. All systems shall be designed for future Internet Web Access Monitoring and remote control of systems. It is critical that the BMS system may be maintained with minimal training and compatible with future non-proprietary systems.

END OF DIVISION 13

DIVISION 14: CONVEYING SYSTEMS

1.1 SUMMARY

A. This section contains the design information for elevators and lifts. Acceptable lift mechanisms:

1. Hydraulic Elevators.
2. Electric Traction Elevators.
3. Wheel Chair Vertical Platform Lifts.
4. Incline Stair Platform Lifts.

1.2 STANDARDS

A. All lifts / elevators shall comply with the elevator safety subcode and all other applicable codes.

1.3 GUIDELINES

A. Vertical accessibility is required in multilevel School Facilities Projects not provided with ramps. This can be achieved by means of elevators, incline chairlifts, or vertical lifts. It is intended that the elevators be designed for not less than two wheelchairs and that the use be restricted to persons with disabilities. Operations should be limited to electro-hydraulic.

B. Elevator controls shall be accessible to the disabled, and shall comply with the ADA requirements. Provide emergency power where elevator(s) are considered part of a Barrier Free Means of Egress.

C. Cab size should not be less than 20 sq. ft and accommodate wheelchair turning radius.

D. A bucket sump with a pump should be provided in all elevator pits.

E. Elevator rooms should not be heated or cooled, only ventilated.

F. Waterproofing of elevator pits is required.

G. Provide pad hooks and pads with elevator.

H. All software, diagnostic tools, wiring diagrams, and manuals of the elevator system selected shall become the property of the building owner including software licensing. Software updates shall be made available for 10 years at no cost.

I. Provide extended warranty including full maintenance and call back service (24/7) of the equipment for a period of one year with an option for five years after substantial completion.

J. Cab finishes: Design cab enclosures doors; hoist way frames, etc., for maximum durability. Protective devices shall be provided with all related accessories (locks, etc.) for all new or renovated elevators.

END OF DIVISION 14

DIVISION 15: MECHANICAL

1.1 SUMMARY

A. This section includes heating, ventilating and air conditioning, (HVAC) and plumbing along with requirements for energy efficient design.

1.2 HVAC STANDARDS

A. HVAC mechanical work shall be designed in accordance with the codes adopted in NJ. However, NJSCC is requiring that energy consumption be calculated by means of both the AHRAE Standard 90.1 – 1999, and 2001.

1.3 HVAC GUIDELINES

A. HVAC:

1. Windowless classrooms and other instructional spaces (excluding gymnasiums, auditoriums, and cafeterias), which do not have operable windows equal to at least 4% of the floor space, shall be air-conditioned. Building corridors, other major circulation spaces, and multi-purpose rooms, which also serve as gymnasiums, will be heated and cooled.

2. New facilities, additions and major renovations shall be designed to:

   a. Require energy consumption to comply with ASHRAE Standard 90.1 – 2001. Exceeding the criteria in ASHRAE 2001 by 20% or more is achievable and encouraged.
   b. Reduce thermal transmissions through the building envelope as determined by energy analysis software tools.
   c. Effectively design glazing areas so as to accomplish daylighting and views with optimal efficiency as determined by lighting analysis software or similar physical models.
   d. The design process shall include a computer model of the entire building (utilizing DOE 2, Energy Plus, eQuest or equivalent as approved by the NJSCC PO) for the purpose of evaluating alternativebuilding envelope, high efficiency HVAC system(s), and lighting options. Modeling (Upon completion of the Schematic Design Sub-Phase) shall consider estimated energy usage, first cost, life cycle cost, and ease of operations and maintenance.

      Minimum options to be studied as examples shall include:

      1). Alternate Building Envelope Assemblies
      2). Humidity Reduction (Desiccant) Systems
      3). Gas Fueled Absorption Chillers
      4). Geothermal
      5). Thermal Storage Technology
      6). High Efficiency DX Cooling Equipment
      7). Combined Heat and Power Units (CHP)
      8). Heat Recovery (specifically enthalpy wheels)

B. Full Building Commissioning

a. See Deliverable Section 4

1. The selection of the heating, ventilating and air conditioning system for New Jersey school facilities is the responsibility of the Design Consultant who will address energy efficient systems that are most appropriate for the project being designed. The Design Consultant shall evaluate a minimum of three concept schemes against a base scheme (code minimum), as prepared by the Design Consultant, in the Program Phase. These are 'quick' freehand studies with basic design narratives for the major building envelope and MEP systems. Simple cost-benefit analysis based on a square foot basis and using order of magnitude for energy and cost values, including both total first cost and20-year life-cycle costs for the building envelope, HVAC system, and lighting strategies. These comparative estimates will aid and justify the selection of a scheme for further development, during the Schematic Design Sub-Phase, by the DC upon approval of the PMF and NJSCC PO.

2. Individual room temperature control is highly preferred. Consideration of innovative, cutting edge energy efficient systems is encouraged. The Project must be evaluated as a 'whole' from the beginning of design, integrating such elements as the envelope, windows, and orientation, in concert with all other systems. Building system(s) shall be designed to allow same temperature control based on each space function and hours of operation (day, night, monthly etc.).

3. Outdoor air ventilation shall be controlled at the rate recommended by ASHRAE Standard 62.1-2001 "Ventilation for Acceptable Indoor Air Quality," and as recommended in the chapter on Educational Facilities in the latest edition of the ASHRAE Applications Handbook. CO_2 sensors controlling the CO_2 levels located in the return air to each AHU serving spaces with significant variation in the number of occupants (such as auditoriums and gymnasiums) shall be provided for the economical operation of the outside air ventilation damper. Designers shall locate outside air intakes well above grade and away from elements such as boiler exhaust stacks, cooling tower air discharges, vehicular exhaust, parking areas loading docks.

4. Provide a separate cooling system for all rooms containing computer network 'head-end' equipment (such as servers, routers). Unit(s) will operate continuously, independent of the main HVAC system. These units will be equipped to control room lower and upper level humidity

5. Provide a separate air-handling unit (AHU) for each area, which is to be separately zoned for operation. These areas specifically include the auditorium, cafeteria, multi-purpose room, gymnasium, kitchen, media center, and administrative area. Air handling unit zones shall be selected so that areas used in off hours and in summer months can be economically operated independent from other areas. Alternate: If the goal of these recommendations can be more effectively reached when 100% outside air is used, a single, large, appropriately designed, 100% outside air handling system can outperform air handling systems predicated on re-circulation of air and serve the needs of a variety of occupancies while avoiding contaminant migration or redistribution. Availability of ventilation and cooling can be better controlled through occupancy sensing systems such as VAV boxes and accomplished at lower cost. Air from science rooms and laboratory areas should not be re-

circulated to other areas. These areas are OSHA hazardous occupancies and have special requirements under CFR 29 (Code of Federal Regulations), 1910.1450.

a. Science rooms and laboratory areas should be designed to exhaust 100% in the event of an emergency.
b. Air from exhaust hoods should not be re-circulated to other areas under any circumstances.
c. Exhaust ducts within the building should be maintained at a negative pressure relative to surroundings to prevent the escape of pollutants in the event of a duct perforation due to corrosion.
d. The NJSCC supports the NJPOSHA recommendation to use 65% efficient filters (as tested by the ASHRAE Dust-Spot filter test method) for new School Facilities Project construction. This document requires a minimum of 65 % efficient (ASHRAE Dust spot method) filtration.
e. It is suggested that the Design Consultant consider ultraviolet C light incorporated into the return air duct, in front of the filter banks. Some of the new Ultraviolet C systems emit plasma that will kill most all bacteria and viruses, such as 'Legionnaires' and e-Coli. In addition, the high output vaporizes particulate matter down to 0.1 micron. This includes dust mites, dander, fine hair, etc.
f. Humidity shall be maintained, in conditioned spaces, throughout the year at a maximum of 60% RH.

Permissible sound levels in instructional spaces (classrooms, media centers, libraries, etc.) shall comply with the proposed ANSI Standard S12.60 – 2002 which functionally limits background noise from HVAC systems to 35 dBA. The background noise level limit of 35 dBA is generally not achievable with almost all unitary HVAC equipment (e.g. unit ventilators, fan coil units, rooftop units, cabinet mounted ground source heat pumps), and effectively requires the use of central station air handling systems for such spaces. HVAC equipment, such as heat pumps, should not be located in close proximity of instructional spaces.

6. Insulation for refrigerant suction piping and condensate drainage shall be aminimum of one half-inch thick foam plastic insulation. All air handling units shall be provided as double wall units, so insulation shall not be exposed to conditioned air.

7. Provide an electronic sensor or adjustable thermostat with a limited control range in each classroom to modulate the terminal box air valve temperature associated with its area. Provide both direct and reverse action for changeover from heating to cooling and vice versa.

8. Provide close coupled electronic damper/valve operators. Outside air (OA) dampers shall be minimum leakage type (four CFM/SF or less at 1-inch differential pressure).

9. HVAC main and branch ducts shall be galvanized sheet metal fabricated and installed per SMACNA Second Edition 1995. Fiberboard duct shall not be used. Flex duct may be used to connect outlets to branch duct and shall be limited to no more than five feet lengths. Insulate duct with fiberglass with vapor barrier on exterior so as to allow for ease of maintenance..

10. It is not intended that "design conditions" be applied to cooling of kitchens, science laboratories with fume hood exhaust, gymnasia, or shops with foundry or dust collection systems. Wherever possible, utilize conditioned air from adjacent areas that is to be relieved to supply areas with high exhaust rates, consider also using exhaust air for the ventilation of crawl spaces, where needed.

11. Mechanical equipment rooms shall be large enough to provide access to all equipment for maintenance, and the means to remove and replace equipment must be provided. Access shall be provided to mechanical equipment room spaces without going through other assigned space. No equipment shall be installed that is not readily accessible/serviceable or requires the use of lift equipment or ladders.

12. When applicable for energy saving purposes, variable frequency drives for all motors in excess of 7 ½ HP shall be considered, including all Energy Star™ compliant devices.

C. Emergency Generators

1. (See Electrical Division - 16).

D. Boilers

1. Boilers shall meet local, state and federal codes. Boilers are to be opened periodically by the district maintenance so that inspectors may observe conditions on both the water and fireside. This opened condition may exist for an extended period of time; therefore, the system shall be valved to allow isolation of the boiler.

E. Steam and Condensate Piping

1. Piping shall meet local, state and federal codes.

F. Chilled And Condenser Water Piping Systems

1. Condensate drain hubs shall be located higher than the rim of the lowest fixture in the particular sewer run. Positively slope condensate piping for proper drainage, including AHU condensate pans.

2. Condenser water piping should be arranged to require minimum removal should condenser "rodding" or tube removal be necessary.

3. A shut-off valve shall be provided upstream of the strainer in hydronic piping. An air separator with strainer shall be installed upstream of the pump in hydronic piping. Air valves shall be placed in all high places in the piping where air pockets could form.

4. HVAC controls shall be accessible for maintenance. Flow switches in water lines shall be installed with spacing to valves and fittings according to manufacturer recommendations or minimum two feet.

5. All closed loop systems shall have corrosion protection activities in water

G. General

1. When use of roof-mounted HVAC equipment is used, provide appropriately sized roof hatch and steel ladder (both to be secured by locks). Walkway surface shall be provided so that equipment can be serviced without traffic directly on the roof. If unit is above the roof, provide a stairs up to catwalk around all sides of unit with guards around the unit for ease of access. Provide service light with switch, electrical outlet near equipment for power tools. All rooftop outlets to be GFCI, local reset, in weatherproof boxes.

2. Ground mounted HVAC equipment shall be surrounded by a fence (on four sides) or wall with clearance, which is adequate to perform service and maintenance, securable with gate or door, and will provide the required ventilation and heat disposal necessary to permit the equipment to perform per specification. An electrical outlet shall be provided nearby. Poured in place concrete pads shall be minimum six inches larger than the mounted equipment in all directions. A similar approach must be taken with emergency generators.

3. Restrooms, kitchens, science labs, shops, and maintenance storage areas shall be negatively pressurized and provided with isolated exhaust systems.

4. Outside air intakes are to be protected with rainproof louvers with bird screens (1/2 inch stainless steel mesh).

5. Existing controls if found to be functional and energy efficient in existing buildings shall not be modified except as required for major remodeling or addition.

6. Electrical power to HVAC equipment shall be sub-metered, have DDC points monitored by the BMS system, and circuited to panels separate from other building systems' electrical circuits.

7. All water and sprinkler piping potentially exposed to freezing conditions, such as attic spaces, shall be protected by either heat trace elements and /or comntained within the thermal envelope.

8. Where applicable appliance or equipment shall be Energy Star™ rated.

PLUMBING

A. Plumbing Standards

1. This section includes plumbing fixtures, and toilet room design. In general, the Design Consultant should set a water consumption baseline and then target a 20% reduction as the design progresses.

B. Plumbing Guidelines

1. Restrooms:

a. Individual toilet rooms shall be provided in reasonable proximity to each classroom identified on the plans or schematics as early intervention, pre-kindergarten, and kindergarten classrooms, and shall meet code criteria:

1). Pre-kindergarten and kindergarten classrooms shall contain a junior/juvenile size water closet suitable for children's use, equipped with an open front seat, and a lavatory (sink) with a flood rim height no greater than 26" from the floor.

2). Toilet rooms may be provided adjacent to or outside a classroom, provided that it is readily accessible and signage is visible to a child from the classroom door.

3). Where showers are provided: One showerhead shall be provided for each 10 students (based on the capacity/occupancy of the gym/locker room). Pre-kindergarten and kindergarten classrooms shall be equipped with a drinking water facility.

4). Arts and craft classrooms shall be equipped with a water source, sink, and plaster trap. Floor drains in an automobile mechanics shop shall be equipped with an oil interceptor.

b. Each toilet room or battery of fixtures shall have a valved cut-off.. Waterless urinals are encouraged.

c. Electronic 'hands-free' controls on water closets, urinals, and lavatories are preferred.

2. Water Supply Piping Installation:

a. Require water quality testing of the system prior to operations. The water quality at the point of use must meet the US EPA and the NJDEP (Agencies) water quality standards.

b. Piping penetrating exterior walls below grade shall be installed in such a manner as to prevent water or breakage due to building settlement.

c. Provide type L copper water supply piping with wrought copper sweat fittings and no-lead solder.

d. Access shall be provided to all valves and other working parts of plumbing devices as well as to items of plumbing requiring periodic maintenance.

e. All mechanical rooms housing air conditioning machinery shall have a deep seal floor drain. Minimum size: 4". Avoid locating under machinery.

f. All water lines exposed to weather shall be insulated and shall be wrapped with electric heat cable and insulation to protect the piping from freezing.

g. Provide surface mounted type electric water coolers with integral chilling units. Specify only units, which are certified by EPA as lead free and ADA compliant.

h. All outdoor drinking fountains shall have valves to cut off the supply and drain the line for freeze protection.

i. Non-freeze hydrants with removable keys shall be located around the building perimeter at maximum 120-foot maximum intervals.

j. Administrative areas (teachers' lounge, toilets, etc.), clinic, showers, janitors' closets and kitchens shall be provided with hot and cold water.

k. All connections between dissimilar materials in the piping system shall be made with dielectric unions or couplings.

l. Do not run water supply piping in concrete floor slabs except for island mounted fixtures.

m. A 2" high cast-in sleeve or curb shall be provided wherever piping penetrates floor construction (except slab on grade). Install oakum and flexible sealant around pipes or conduits to prevent access by insects and rodents, as well as air penetration.

3. Waste Piping:

   The capture and use the waste heat in the plumbing system as appropriate within the HVAC system is encouraged.

   1). Mains 12" in diameter or larger and more than 100 feet in length shall have a manhole. A manhole shall be installed at the edge of the property.
   2). Drain slopes shall be two percent for lines less than 3 inch diameter and one percent for lines 3 inch and larger inside the building.
   3). Provide floor drain(s) and connect to the sanitary sewer (not the storm sewer) in each public toilet, janitor's closet, kitchen and mechanical room housing HVAC machinery. Minimum size shall be 4".
   4). Waste piping shall be PVC with factory fittings and solvent welded joints above grade, or hub and spigot cast-iron with rubber gaskets below grade.
   5). Line size cleanouts shall be located each 50 to 75 feet. Of sewer run inside and 100 feet. Outside the building and at every change in direction. Provide two-way cleanouts on outlet side of grease traps.
   6). Provide acid neutralization tanks, for each chemistry laboratory sink or other location where chemical use is anticipated. Several sinks may drain to a central common tank(s).
   7). g. For special vocational programs, consideration shall be given to a central acid neutralization tank. Acid waste and vent piping may be high-silicon cast iron, glass, or polypropylene, or combination thereof. Exterior clean outs shall be set in a concrete pad flush with finished grade. Reuse of grey water for onsite nonpotable uses-irrigation is recommended

4. Gas Piping:

   a. Gas piping shall be located underground only when necessary.
      1). Where gas demand exceeds 1000 CFH and piping runs more than 100 feet, 5 psi mains shall be used if allowed by the local utility.
      2). A test tee with nipple and cap shall be provided downstream of each regulator. Vent regulators to outside as required by the Gas Code.
      3). At all laboratories, power, water, and gas shall be controlled by means of a emergency shut-off button located at the teacher's station and adjacent to the egress door.
      4). Gas piping shall be schedule 40 black steel with threaded or welded factory fittings installed and tested as required by the local utility.

5. Storm and Roof Drains:

   a. Storm drains shall be sized per local engineering requirements or good practice. Provide cast-iron roof drains with cast-iron dome.
      1). Overflow drains shall not be connected to interior drains. Extend overflow lines to spill outside of building.
      2). Consideration should be given to reusing the captured storm water for onsite irrigation or other non-potable uses.

6. Domestic Water Heating:

    1). Consider solar pre-heat for domestic hot water.
    2). Provide combustion air source, and vent per manufacturer recommendations.

Showers:

    1). At individual showers, provide hot and cold water.
    2). A master control with cut-off shall be provided at boys' and girls' locker room showers located for supervision by Physical Education instructors.
    3). Column type showers may be used for boys' showers only.

8. Piping Thermal Insulation:

    a. Hot water distribution piping, hot water tail piece and trap under lavatories for the handicapped, roof drain body and horizontal piping, and to prevent freezing of any pipe exposed to outside temperatures. Insulate cold water piping to prevent condensation.

9. Utilities:

    a. Design shall permit gravity drainage of sanitary sewage. Pumping of sanitary sewage is not acceptable unless no other alternative exists. Where sewage ejector pumps or sump pumps are used, they shall be duplex type pumps and be located to allow adequate headroom to remove the pumps from the pits.
    b. Design shall permit gravity drainage of storm water. Pumping of storm water is not acceptable unless no other alternative exists, in which case the Design Consultant shall review with the Project Management Firm (PMF) or NJSCC.
    c. Locate the gas meter as close to the building as possible.
    d. All utilities (gas, electric, water, etc.) and fossil and renewable energy systems shall be metered and connected to the web-enabled data acquisition and the buildings DDC/EMS. Wire and conduit shall run from the meter to these systems.

10. Fire Protection:

    a. Provide an automatic fire suppression system with an in-line electric pump connected to the emergency generator, complete with approved backflow preventer, flow and tamper alarms, and tied back to central fire alarm system. Design and installation shall meet local and state requirements shall be provided in new schools and additions. Provide full system per NFPA 13.
        1). Protect all lines from freezing.
        2). CFC free and Halon free systems. In existing buildings CFC equipment and use shall be phased out.
        3). The DC shall develop Construction Documents suitable for the purpose of the Fire Protection Contractor’s development of shop drawings suitable to assure compliance with both design intent and applicable codes and referenced standards. It is the responsibility of the DC to review the final design, layout, and hydraulic calculations submissions for wet and dry

sprinkler, pre-action and dwelling systems, including fire pumps, piping, runs, valves, floor switches, bells, nozzles and heads, activation methods, and building systems interconnect (such is fire alarm activation and shut down)stand pipes, hose connections, fire hydrants and test stations for compliance with design intent.

4). Contractor shall have NJ licensed professional engineer submit fire protection shop drawings.

5). All equipment shall be UL listed (UL 864) and have fire marshal approvals.

END OF DIVISION 15

DIVISION 16: ELECTRICAL

1.1 SUMMARY

A. This section includes all the electrical requirements, wiring, and fixtures utilized in School Facilities Projects.

1.2 STANDARDS

1. All electrical work shall be in compliance with all applicable codes.

1.3 GUIDELINES

A. IEEE 241, Recommended Practice for Electric Power Systems in Commercial Buildings

B. IEEE 1100, Recommended Practice for Powering and Grounding Electronic Equipment

C. IESNA Lighting Handbook, Ninth Edition

D. Requirements of ANSI/IESNA RP-3-00, Lighting for Educational Facilities shall be included.

1. Service:

a. Electrical service shall be 480Y/277 volt, 3 phase, and 4 wire where available on all new projects, subject to confirmation by the local utility company. Consider upgrading any existing electrical service that is other than 480Y/277.
b. The electrical service need not be increased if an increase in service is not required for the work on the current project.
c. All new electrical service should be installed with wiring and conduit for bringing the signal from the meter into the building for attachment, as appropriate, to the DDC/Building Management System.
d. Existing electrical characteristics should be maintained, where feasible, for all additions and renovations. Any new electrical service panel required should be back-fed through the existing electrical service, so that only one electric meter per school building is provided (except for Temporary Classroom Units and similar 'swing' spaces).

2. Distribution System:

a. Utilize 480Y/277v, 3 phase, 4 wire power distribution where possible.
b. 277 volt fluorescent lighting should be installed where possible.
c. 120 volt, 3 wire branch circuits should be used for 120 volt receptacles & small motor loads (1/4 hp or less).
d. Supply copy machines as required of equipment on dedicated circuits.
e. Electrical requirements of all equipment furnished by New Jersey Public Schools, should be verified, especially heating and motorized equipment such as electric ranges in the home economics areas, shops, and for other kitchen equipment. Power shall be at the voltage required by the equipment nameplate.
f. Exit lighting shall be be Light Emitting Diode configuration (LED), tied to emergency power source.

g. Parking lot lighting shall be circuited separately from other building loads and provided with a time clock/photocell control. For additions, add parking lot lighting to existing photocell and/or time clock parking lot lighting circuits.
h. Exterior security lighting shall be circuited separately from other building loads and provided with a photocell and a time clock.
i. Conduit should be suspended from the building structure, not from ceiling suspension system. Conduits larger than 1" under the floor slab should be entirely encased in concrete.
j. Electrical underground feeders should be encased in concrete with a minimum cover of 2'-0".
k. Flexible conduit should be used for final connection to equipment.
l. Aluminum wiring is not allowed, aluminum panels and buses are acceptable.
m. Panels should be located in locked rooms; do not locate in corridors or toilets. Ground fault circuit breakers should be used for required ground fault circuits.
n. On recessed panels, provision should be made for spare empty conduit into space above the ceiling for remaining circuits available in the panel.
o. All panel directories shall be typed
p. Provision for lighting protection complying with Underwriters Laboratory, Inc. approved "Master Label" system shall be considered for new buildings three stories or higher. Review with PMF and provide written recommendation and a risk assessment based on NFPA 780 Appendix H.
q. The power quality conditioning requirements as IEEE Power Quality Standards to manage and monitor voltage sags/harmonics shall be provided to equipment designated as critical by the PMF in consultation with the Client School District.

Emergency Generator:

a. Provide dual fuel, water-cooled emergency generator(s) for fire-life safety systems for systems under 200 kW, otherwise use diesel system. Provide storage tanks, above ground as appropriate for each project. Diesel generators shall use #2 diesel fuel.
b. The Design Consultant shall provide all designs and construction administration necessary to include the number and type of generators required to provide an effective temporary source of power for all new schools, additions, and major renovations. This will apply to all buildings that have not begun the construction document phase of work.
c. The building emergency generator shall be air-cooled with dual fuel capability. Natural gas in the street will be the primary fuel. A connection for bottled propane near the generator shall also be provided. If the natural gas service is lost, an emergency propane tank can be brought to the site and connected to the propane tank connection. A natural gas/propane system is recommended where the size of the generator is 200 kW or less. A diesel generator, using diesel fuel no. 2, will be acceptable where natural gas is not available or the generator size is over 200KW. An automatic transfer switch shall be provided.
d. The generator system must be accessible for service and testing, secure from vandalism and other sources of potential damage. If the system is exterior, all sides and top shall be enclosed in a chain link fence. The generator can be located inside the building near the main electrical feed if all applicable codes are met. Acoustic isolation from other building functions is also very important and required. Building

systems or elements to be supported by emergency power from the building emergency generator include:

1). Life safety systems, including smoke or fire detection systems and all related control panels

2). Exit/emergency lighting, including horns, strobes and night lighting (battery backup may be considered).

3). Power to operate elevator(s) in an emergency situation

4). All mechanical equipment necessary to prevent freezing of mechanical components and pipes.

e. Lighting Systems: Require daylighting for 75% of the building's instructional spaces, specifically excluding auditoriums and gymnasiums or otherwise undesirable, with daylight controls on the interior lights. Review the feasibility of automatic light level control areas in conjunctions with appropriate day lighting. When daylighting provides adequate lighting levels, the control system shall shut off the interior lights. Provide DDC points for monitoring energy consumption.

f. Interior Lighting: all interior lighting should be fluorescent: metal halide may be used in areas with high ceilings such as gymnasiums. Incandescent shall not be used.

g. Exterior lighting: shall be metal halide.

h. Standard classroom fluorescent fixture: is the three lamp with CBM approved electronic dimming ballast. Alternative lighting and lamps that are more efficient and cost effective should be considered.

i. Standard fluorescent lamp: Standard fluorescent lamp is the F32T8 800 series for use with electronic dimming ballast or multi-level switching. T5 HO should be considered where appropriate.

j. Lighting levels:
Each instructional space and room of assembly that is illuminated with the use of high intensity discharge (HID) shall also be provided with a second source of illumination to provide illumination instantly upon activation of the circuit. All HID lamps shall be of the fail-safe type, which will permanently extinguish within 15 minutes after the outer glass of the bulb is broken. All lamps shall be provided with a glass or plastic lens to protect the bulb.

3. Lighting Quality and Illumination levels:

a. The Design Professional shall pay particular attention to source-task-eye geometry. This includes consideration for glare and veiling reflection for a variety of visual tasks including but not limited to: reading, writing, viewing CRT screens with either negative or positive contrast, viewing LCD screens, viewing keyboards, viewing white boards, and viewing projected surfaces.

b. b. Minimum illumination levels shall be provided at the defined area of the task surface. Illumination levels shall be determined as either raw installed intensity levels, or as levels to support the task as outlined in ANSI/IESNA RP-3-00. Minimum illumination levels are defined by DOE regulations.

c. Fluorescent light fixtures in hallways should be placed with the long axis parallel to the long axis of the hallway except in those instances where the hallway is wider than normal.

d. Emergency lighting including LED exit signs shall include self-contained NICAD maintenance free batteries or battery inverter systems and emergency generator power installed in designated fixtures.
e. Light fixtures should be suspended from the building structure; the ceiling system should not be used to support light fixtures. The Design Consultant should approve the method of supporting fluorescent fixtures including fixtures in an exposed tee system.
f. Stem-mounted fluorescent fixtures with stem spacing at 4'-0" on center with stems within 1'-0" from the end of the fixture are recommended.
g. Exterior fixtures should be mounted above 10'-0" to reduce vandalism.

4. Receptacles and Switches

a. Number of receptacles per circuit should be limited to seven.
b. Switches and receptacles should not be located in chalk or tackboards.
c. Normal mounting height of switches should comply with state and local requirements regarding access by the handicapped.
d. Mounting height of wall receptacles should be 12” above finished floor to the bottom of receptacle, except in CMU walls where the top or bottom of the box should be in the masonry course.
e. Receptacles outside buildings in play areas shall be provided with lockable weatherproof covers.
f. Large group areas such as assembly rooms, auditoriums, and other large group instructional spaces shall be provided with convenience outlets, as indicated on the schematics.
g. All 125 volt, single phase, 15 and 20 amp receptacles, when installed outdoors, where there is direct grade level access, shall have ground fault circuit interrupt protection at the panel. This shall apply to, but is not limited to, all outlets on the exterior of the building, athletic and playing fields, track areas, picnic areas, tennis courts, and other similar areas.
h. Occupancy sensors shall be integrated in the control schemes of classrooms, restrooms, storeroom, etc.; use sensors with combined ultrasonic/infrared technology with an internal, manual over ride switch. Include an ambient light sensor.

5. Miscellaneous

a. Special systems related to the electrical system include:

1). Fire alarm and detection system
2). Central clock and program system, connected District wide
3). Telephone raceway, and cable, telephone system
4). Public address and intercom system
5). Television conduit system
6). Central building security system/central panic alarm
7). Wired/wireless voice/data/video network
8). Special IT and EdTech systems

END OF DIVISION 16

NJSCC Design Manual

Section Four

Deliverables

SCOPE AND INTENT

This section of the *Design Manual* details the deliverables required at each major phase of Work:

Design

- Programming/Concept Design (PG)
- Schematic Design (SD)
- Design Development (DD)
- Construction Documents (CD)
    - 100% CD submission (Final Review/Permit Application)
    - 100% CD Bid documents (Revisions based on review comments, as required)

Construction

- Bidding and Contract Award (BC)
- Construction Administration (CA)
- Project Close - Out (PC)
- Post Occupancy Review (PO)

The Deliverables Checklists in the *Design Manual* **replace and supercede** the "Submission Checklists" contained in the *Procedures Manual for Design Consultants, Volume 2001A*. Consultants are expected to provide all the Deliverables listed in the *Design Manual* and to conform with all other requirements in the *Procedures Manual*.

Key changes embedded in the new Deliverables Checklist include the following:

- The deliverables for the Design Development phase are more detailed so that they can be used for more accurate cost estimating and for more detailed Department of Education review.
- The 60% CD submission required in the *Procedures Manual* is **eliminated.**
- The 95% CD submission required in the *Procedures Manual* is **eliminated.**
- A new, 100% CD "Bid Documents" submission, containing, as required, revisions based on review comments, is required.
- There is a requirement that the PMF's convene – and Design Consultants attend – at least one, formal Project Review Meeting during each major phase of design/construction. The purpose of these meetings will be to review all design/construction activities over the course of the phase, to ensure that all required activities have been accomplished and all deliverables submitted, and to evaluate Project Teams on their progress.
- During the Review Meetings, Project Teams are required to present oral presentations of the requirements in the Project Progress Reports, explaining how they are addressing the 24 Design Criteria described in Section 2 of this Manual. Appendix A provides structured Guides to help Project Teams prepare these presentations.

Deliverables listed in the *Design Manual* shall be submitted accompanied by a Transmittal for each required submission.

ORGANIZATION AND CONTENT

As noted above, this section of the *Design Manual* is organized by phase of Work. – from Programming/Concept Design through Post Occupancy Review.

Each phase is treated separately and begins with a **deliverables checklist** that summarizes the actions that must be taken by the Design Consultant– and the specific work products that must be delivered to the NJSCC – during that particular phase. The **deliverables** checklists in this *Design Manual* replaces the **'Submission Checklists'** in the *Procedures Manual for Design Consultants, Volume 2001A*.

A short narrative section immediately follows each checklist. The purpose of the narrative is to explain and clarify select aspects of that particular project phase in greater detail.

In addition, there is a special section on **General Requirements** immediately preceding the phase-by-phase subsections. The General Requirements section provides narrative descriptions of three key deliverables that are required across several phases of Work (not just one particular phase):

Project Progress Reports
LEED Checklists
Project Review Meetings.

General Requirements also includes descriptions of two special requirements concerning electronic submissions and the provision of office space for NJSCC/PMF personnel.

USING THIS SECTION OF THE DESIGN MANUAL

Design Consultants should familiarize themselves with all the deliverables listed and described in this section of the *Manual* at the beginning of any project, starting with the four, cross-cutting deliverables described in the General Requirements subsection.

Consultants should conduct all activities – and prepare all deliverables – described herein for each specific phase of Work as the project proceeds. Consultant progress will be evaluated at least once during each phase at a formal Project Review Meeting (see General Requirements subsection) wherein Consultants will provide all required deliverables and will formally report on their activities and accomplishments during that phase, specifically how they are addressing the 24 Design Criteria established by the NJSCC and contained in Section 2 of this *Manual*.

GENERAL REQUIREMENTS

Following are descriptions of crosscutting deliverables that are required at more than one phase of Work over the course of a project. The General Requirements section also includes special requirements concerning net to gross factors, lump sum costs, electronic submissions and the provision of office space for NJSCC/PMF personnel.

Net to Gross Sq. Ft. factors

The grossing factor is the ratio of a building's total or gross square footage to the building's approved DOE program or net square footage. Grossing factor x net sq. ft. = gross sq. ft.

In order to determine the allowable size of a school, the Department of Education applies a grossing factor of 1.4 to the net square footage to determine the gross square footage of the building. The net Sq. Ft. represents the education program including educational and certain educational support spaces. The gross Sq. Ft. includes the net Sq. Ft. plus everything else including corridors, stairs, toilets, wall thickness, shafts and mechanical spaces. The final or actual grossing factor is a measure of the efficiency of the building.

The SCC manages Abbott school construction. It is the intention of the Program that school designs reflect the characteristics of a 21st Century school. The designs should be healthy and productive, cost effective, educationally effective and sustainable.

For the purpose of a discussion on grossing factors, the Design Consultant should focus on the DOE's intent with respect to the 1.4 grossing factor. This is a measure of the efficiency of the design in the simplest case. Consider a one-story school on an ample site. In such a base case, there may be no adverse impacts due to issues of code compliance, constructability or site constraints.

Factors and examples that affect the efficiency of a design:

Code compliance. Contrast the multi-story school against the base case, above. To provide proper egress, it is now necessary to include stair towers in the design. This will increase the gross Sq. Ft. and the grossing factor even as the educational spaces are kept the same. Similarly, elevator shafts and chases will increase the gross square footage over a one-story base example.

Constructability. Unlike an office building, the stacking of a school and necessary adjacency requirements for the program may require differently sized classrooms or other approved educational spaces above each other. This would reduce the efficiency of the column spacing and layout.

Site constraints. The geometry of a site may require single-loaded corridors or multiple-story structures, particularly in more dense urban settings.

It is important to note that in each of the above examples, the educational program was not changed while the gross Sq. Ft. was adversely impacted. Of course, each of the applicable impacts is cumulative.

SCC is responsible for the design and construction. This includes the issues of code compliance, constructability, and site impacts. It also includes cost effectiveness, not only in first cost, but also in maintenance and operation over time. Similarly, 21st Century design requires that schools be safe and comfortable. This may require more than minimum corridor widths at times to accommodate specific

programs. Prudent design must balance all these to provide for the educational program, safety, comfort, and O & M in a cost efficient manner. Educational space should not be provided at the expense of necessary mechanical space, for example, in order to maintain a constant net to gross ratio. Should that be the case, there should be recognition of the reasons for the inefficiency and the most reasonable and efficient solution should be determined. The grossing factor should reflect the most reasonable and efficient solution, not blindly drive the solution. SCC should identify such impacts when necessary and determine the appropriate grossing factor for a site and building specific design that compares with the 1.4 grossing factor on an unaffected site and structure.

The Department of Education has been clear that adherence to a 1.4 grossing factor is not the strict intention of DOE in all cases, but rather reflects an optimum condition as described above. DOE is responsible for and defines the educational space. DOE looks to SCC for matters of construction including analysis of the grossing factor. **On an individual project basis, the SCC will allow flexibility with the grossing factor when it is demonstrated by the Design Consultant that a higher grossing factor is warranted.**

This is not to say that efficient design and value engineering are not an intrinsic part of the design process and accordingly estimated project costs should be consistent with the regional cost matrix.
This information modifies and re-defines the method SCC shall use to calculate the Construction Cost Estimate (CCE) for School Facilities Projects. The CCE shall be calculated and applied to all new schools, additions, and renovations when the approved Project Model and Educational Specification is transmitted to NJ Schools Construction Corporation (SCC) from the NJ Department of Education (DOE).

Cost Control

The total approved area in net square feet shown on the DOE Project Model shall be multiplied by a 1.4 gross up factor, providing total gross square feet for the School Facilities Project.

The School Facilities Project gross square feet shall be multiplied by the regional cost per gross square foot to obtain a total **Lump Sum Cost** for that School Facilities Project. The typical School Facilities Project includes traditional site work, and building foundations along with the typical school facility building. Extraordinary, unexpected, or unusual costs are excluded. Adjustments will also be necessary for addition and renovation projects.

The Design Consultant shall use this Lump Sum Cost as the Project Budget. From Project inception, the Design Consultant shall be required to complete the School Facilities Project within this Lump Sum Cost.

Fixing the Project Cost as a Lump Sum allows flexibility for the net to gross factor and the regional cost per gross square foot, as long as the project Lump Sum Cost is maintained.

The Design Consultant must still meet the net square feet requirements of the DOE approved Project Model.

Project Progress Reports

Formal Project Progress Reports are required during each of the first six phases of Work. (Reports are not required for the Project Close-Out or Post-Occupancy Review phases)

The Reports shall be in the form of oral presentations, delivered during the formal Project Review Meetings that are required at the end of each major design/construction phase (see below). The purpose of these reports is to provide Project Teams an opportunity to explain how they are addressing the 24 Design Criteria described in Section 2 of this Manual.

Appendix A provides structured Project Review Guides – organized by project phase - to help Project Teams prepare these reports. PMF and NJSCC personnel will also use these Guides to structure and review a Team's Report presentation and to evaluate a Team's progress in addressing the 24 Criteria contained in Section 2.

Please note that while the Reports are oral presentations, written summaries are also welcome, particularly if they highlight innovative ways a Team is addressing the NJSCC's Design Criteria.

LEED™ Checklists

LEED™ Checklists are required to be submitted during each of the first seven phases of Work. (Checklists are not required for Post-Occupancy Review).

Design Consultants shall submit the Checklists following the guidance provided in Appendix B of this *Design Manual*. The guidance provided in Appendix B – including the checklist form and the submission procedures – are required for all Design Consultants and **replace and supercede** any previous NJSCC guidance/requirements concerning LEED™.

Project Review Meetings

PMF and NJSCC personnel shall convene, and Design Consultants shall attend, a minimum of one formal Project Review Meeting during each phase of Work (from Programming through Post Occupancy Review). The purpose of these meetings shall be to review all design/construction activities over the course of the phase, to ensure that all required activities have been accomplished and all deliverables submitted, and to evaluate Project Teams on their progress.

During the first six phases of Work (from Programming through Construction Administration), Design Consultants will be expected to deliver formal Project Progress Reports (described above) at each Project

Review Meeting. These Reports (in the form of oral presentations) will provide Design Consultants the opportunity to describe their activities over the course of the phase and, specifically, to indicate how they are addressing the 24 Design Criteria for high performance schools established by the NJSCC and included in Section 2 of the *Design Manual*.

Design Consultants will be evaluated based on the quality of work accomplished over the course of the phase, the timeliness and quality of the deliverables they are required to submit, and on how well they are addressing the NJSCC's 24 Design Criteria.

Any requests for exceptions to the Design Performance Standards described in Section 3 of the *Design Manual* should be presented for discussion at the Project Review Meetings.

Electronic Document Submissions

Electronic submissions shall be required for all design and construction documentation in their native format as stipulated herein. This includes drawings, which shall be submitted in AutoCAD release 2000 or higher, Specifications, submitted in Microsoft Word 2000, data analysis, including base modeling and all other modeling in Microsoft Excel 2000 format, and graphic images in .jpg or .bmt formats. PDF files are not acceptable. Electronic data shall be submitted on CD ROM discs, in addition to hard copy as required for all phases requiring submissions herein, to the PMF for review and approval. When approved by the PMF, the documents shall be transmitted to the NJSCC. Refer to the Agreement for legal criteria.

Office Space

The Design Consultant shall provide space for one project person from NJSCC or the PMF to visit the Design Consultant's office during normal business hours, without prior notice. The project person shall have complete access to 'on the boards' review of the specific project with the Design Consultant's project team. Telephone and Internet access shall be provided for the project person.

PROGRAMMING/CONCEPT DESIGN

Design Consultant: _____
_____
_____
_____

Project Name _____
District _____
NJSCC Project # _____
DOE Project # _____

Deliverables:

The purpose of the products of the Programming/Concept Design is to document all the key decisions, which have been made throughout this phase of work.

Programming/Concept Design Requirements

- ❑ Project kickoff meeting and minutes
- ❑ Define and document Project communication and organization
- ❑ Confirm Project scope and work plan
- ❑ Current Project schedule
- ❑ Discuss, define, and document Project Goals and Objectives
- ❑ Review approved DOE model/comments
- ❑ Confirm commitment to integrated design
- ❑ Define approach to community involvement
- ❑ Conduct Design Charrette
- ❑ Educational Specifications
- ❑ Site Analysis drawing w/ utilities availability
- ❑ Test borings and surveys
- ❑ Written site analysis document w/ utilities availability
- ❑ Adjacency diagrams
- ❑ Blocking and Stacking diagrams
- ❑ Conceptual Designs w/ energy modeling
- ❑ Conceptual Cost Estimates
- ❑ Rationale for selected concept
- ❑ Site plan @ minimum scale 1/32” = 1’-0”
- ❑ Floor plans, and elevations @ 1/16” = 1’-0”
- ❑ Description of exterior architectural school facilities project materials
- ❑ Description of MEP systems
- ❑ Description of structural system
- ❑ Summary of applicable legal/regulatory approvals
- ❑ Estimated utility loads (based on sq ft unit rates)
- ❑ Construction Cost Estimate
- ❑ Project Progress Report
- ❑ LEED™ Checklist
- ❑ Commissioning Report
- ❑ Project Review Meeting

_____ _____

Design Consultant Signature **Date**

PROGRAMMING/CONCEPT DESIGN

Description:

All School Facilities Projects will include a Program performed by the Design Consultant unless indicated otherwise in the RFP and the Agreement. The Client School District working with the Department of Education completes the development of eligible and required educational space or the approved Model. The DOE approved Model, consisting of net square footage approved for the Project is provided to the Design Consultant. The Design Consultant uses this document (in Net Square Feet), and multiplies it by a Net to Gross maximum allowable ratio of 1.4. The result determines the Gross Square feet of the Project. When multiplied by the regionally adjusted allowable gross dollars/sq. ft., this determines the Lump Sum Project Budget. This initial Lump Sum Project Budget must be maintained throughout the project. The net to gross factor may vary, however the Design Consultant is held to meeting the Lump Sum Budget for the Project as approved by the NJSCC with appropriate justification by the Design Consultant.

The Design Consultant shall develop a Scope of Work (SOW) that shall include an analysis of the three concept alternatives. These alternatives shall be based on program definition, narrative description, space analysis, site evaluation, Community input, the Design Charrette, diagrammatic sketches and concepts, systems analysis and energy modeling, first cost (CCE), operating and maintenance costs, 20 year life cycle cost, budget, schedules and Contract deliverables.

Project Kick Off - the purpose of this effort is to clearly establish the lines of communication and responsibilities between all parties and confirm Project scope, and schedule.

Design Consultant will meet with the New Jersey School Construction Corporation (NJSCC) to confirm the project goals and objectives for the Project.

Design Consultant will introduce their project team and review their project responsibilities.

The lines of communication will be defined between Project team representatives from Design Consultant, the school facilities project Users, the Project Management Firm (PMF) and the NJSCC.

Design Consultant will meet with the PMF/NJSCC to review the work plan and Project schedule. Key milestones and decision-making points will be confirmed.

Integrated Design - the intent of this list is to help clarify the responsibly of the Design Consultant and PMF working in conjunction with the entire Team which includes the School District, community, PMF, Design Consultant, and NJSCC.

PMF holds kick-off meeting to define Project goals of Team for Design Consultant.

PMF documents goals (design intent) developed by Design Consultant for Team.

Design Consultant begins design process.

Throughout design phase, Design Consultant develops QA/QC, training, maintenance plan, and requirements to be used in the construction phase as design progresses.
Review and update of design intent at completion of DD phase for Design Consultant.

PMF provides continuing review of design for adherence to design intent. Design Consultant completes contractual documents, including requirements for start-up, testing, warranties, O&M, and training.

PMF reviews contractual documents for adherence to design intent, and develops construction phase plan including verification checks and test procedures for building envelope and major building systems. Project is bid and awarded.

Information Gathering - the purpose of this effort is to collect information on existing conditions that will impact the planning and design and to get a clearer understanding of relationships.

Design Consultant will tour and photograph the site.

Design Consultant will acquire planning, zoning and construction ordinances for the site.

In some projects, the NJSCC and their consultants may provide any of the following to Design Consultant:

-Base survey plans accurately showing existing conditions including contours (one foot intervals), property lines, internal and adjacent roadways, parking, walkways, security fences, site utilities, buildings and other structures.

-Any previous reports on development of this site including parking studies, master plans, environmental hazards or constraints, etc.

-Location, size, capacity, etc. of existing utilities.

-Any deed, developer agreements, restrictions, easements, covenants, etc. that may impact the location or design of the Project.

-Soils and Environmental reports including test borings as required to identify soil conditions, water table, bearing capacity, possible wetlands, etc.

Community Involvement -the school is the true center of a Community. Because of this, the NJSCC requires all Design Consultants to solicit and incorporate input from the members of the community to be served by the school. Community involvement in the site selection and school design process, incorporating community design features where possible, and maximizing public access to the school are critical elements in the effort for the school to meet the needs of the community it serves. This will be developed in a Design Charrette co-coordinated by the PMF.

Design Charrette - the Design Charrette is a full day working session, led by the PMF and the Design Consultant. It includes the Design Professional, Project Management Firm (PMF), Client School District, the Community, and NJSCC Project Officer. The Charrette is executed after site information program information and cost criteria for the specific school project have been obtained. The result is a collective effort solution that optimizes the design solution for the project. After information for the Charrette is collected and assimilated, the Program Concept designs shall begin. Once the Concept designs are

completed, the designs shall be presented to the Team attending the Charrette. From this input and technical evaluation, a final Concept design shall be selected to use for the beginning of Schematic Design.

Programming - the purpose of this effort is to define the user's space needs and space adjacencies and to identify special school facilities project requirements as defined by the users and NJSCC.

Design Consultant will meet with the NJSCC and Project Team to identify the proposed for the Project.

Based on the above, Design Consultant will develop Educational Specifications, that will include an executive summary, general description of the Project goals and objectives, summary tabulations and square foot areas, adjacency diagrams and a brief verbal description of each area.

Design Consultant will meet with the Project Team to present and review the draft of the Educational Specifications to obtain input and comments. Thereafter Design Consultant will refine the Educational Specifications incorporating this input.

Based on these meetings Design Consultant will develop Educational Specifications that shall be submitted to the NJSCC and Department of Education and the Project Team for approval.

Blocking and Stacking - The purpose of this activity is to establish alternative idealized school facilities project envelopes based on the approved Educational Specifications.

Design Consultant will develop a maximum of three alternative Blocking and Stacking concept schemes based on the approved Educational Specifications and existing space standards. Each diagram will include a summary of anticipated square foot areas, cost, and anticipated energy performance.

Design Consultant will meet as needed with the NJSCC and Project Team to review progress and obtain additional input. Three concept schemes will be refined as a result of these meetings.

Site analysis - this effort focuses on uncovering and analyzing existing site conditions, which will impact the site selection and Project design.

Design Consultant will develop composite site analysis drawings that combine all the site information provided by the NJSCC. The drawings will illustrate the following:

- City planning and zoning/land use requirements
- State planning requirements
- Existing infrastructure locations and capacities
- Existing construction and its current condition
- Existing pedestrian and vehicular circulation
- Character of immediately adjacent urban area
- Soil conditions (through the NJSCC consultant)
- Traffic evaluation (through the NJSCC consultant)
- Environmental conditions (through the NJSCC consultant)

Meet with City officials to discuss Project opportunities.

Design Consultant will meet with the NJSCC to review progress and obtain additional input.

Design Consultant will prepare a written summary of the regulations affecting this site and the implications to the design solutions.

Conceptual Design - this effort focuses on establishing three alterative school facilities project concepts located on the proposed site that are based on the approved final Educational Specifications, Blocking and Stacking diagrams and the Site Analysis.

Design Consultant will develop three Alternative School facilities project Concepts each with a site plan, floor plans and a front elevation that shows site development, major mechanical, electrical and utility areas, pedestrian and vehicular circulation as well as all major program spaces. A description of major materials and systems will be included. Cost analysis and energy performance shall also be included.

Design Consultant will present and discuss these concepts with the Project Team.

Conceptual Cost Estimates - based on the three concept designs, the Design Consultant will develop a Conceptual Cost Estimate for each of the concept alternatives.

Design Consultant will review the Conceptual Cost Estimates in detail with the PMF and the NJSCC. It is assumed there will be minor refinements based on the PMF's and the NJSCC's input.

Final Concept Design - the three Alternative School facility design Concepts and related Conceptual Cost Estimates will be presented to the NJSCC and Project Team for selection of a final concept design.

The final Concept Plan will be documented with a site plan, floor plans, elevations, and color rendering. A Construction Cost Estimate will be prepared.

SCHEMATIC DESIGN

Design Consultant: _____
_____
_____
_____

Project Name _____
District _____
NJSCC Project # _____
DOE Project # _____

Deliverables:

The purpose of the deliverables during the Schematic Design is to document the continuing development of the school facilities project and its major components and to establish a Project budget.

- ❑ Site plan and Landscape plan @ 1/16" = 1'-0"
- ❑ Floor plans @ 1/16" = 1'-0" showing all partitions and door swings
- ❑ Color Rendering
- ❑ Exterior elevations @ 1/16" = 1'-0"
- ❑ Typical building wall sections
- ❑ Single line engineering diagrams
- ❑ Outline specifications
- ❑ City Planning Board submission
- ❑ Civil engineering drawings (scale as required)
- ❑ Confirm Project schedule
- ❑ Site engineering calculations
- ❑ Construction Cost Estimates
- ❑ Project Report
- ❑ LEED™ Checklist Form
- ❑ Commissioning Report
- ❑ Project Review Meeting
- ❑ Educational Specifications and Schematic submission to DOE

_____ _____

Design Consultant Signature **Date**

SCHEMATIC DESIGN

Description:

In the Schematic Design phase the physical school facilities project and supporting system configurations continue to be developed based on the approved Concept Design. Schematic design concerns itself with scale, proportion and relationships. The Schematic Design breaks the school facilities project down into major building components, and then identifies relationships between the components through established design criteria and integrated design.

The Design Consultant will continue to develop the Schematic Design based on the approved Concept Design and will meet as required with the NJSCC and Project Team to review progress and obtain additional input. The design will continually be refined as a result of these meetings.

Reconcile the Schematic Design with the final Educational Specifications. Present any variations to the NJSCC and Project Team and adjust the Educational Specifications or Schematic Design if necessary.

Design Consultant and the NJSCC and Project Team will review the Schematic Design documents with City Planning. Their comments will be incorporated at the NJSCC's direction.

Design Consultant will prepare final Schematic Design documents for the NJSCC review and approval. The documents will establish preliminary size and configuration of major school facilities project systems including structural, architectural, parking, elevators, HVAC, plumbing, fire protection, security, tel/data and electrical systems.

Based on the approved Schematic Design, Design Consultant will prepare a courtesy submission to the City Planning Board.

The Design Consultant will prepare a Schematic Design Construction Cost Estimate.

Design Consultant will participate in a 'value engineering' effort with the PMF and the NJSCC at the completion of the Schematic Design Construction Cost Estimate. This effort will review major components of the school facilities project that have large potential impact on the cost of construction.

Based on the above documents and in consultation with the NJSCC and Project Team, the Design Consultant will develop systems maintenance and operating cost estimates for the major school facility design and engineering systems.

The Design Consultant will incorporate the PMF's recommendations in the Schematic Design documents as deemed appropriate by Design Consultant and the NJSCC.

At the completion of the phase, the Design Consultant will submit documents, approved by the Project Team, to DOE for approval.

DESIGN DEVELOPMENT

Design Consultant: _____
_____
_____
_____

Project Name _____
District _____
NJSCC Project # _____
DOE Project # _____

Deliverables:

Design Development is intended to further develop the school facilities project design with greater detail.

- ❑ Construction drawings for all trades that show the scope of work for the Project as defined in the detailed deliverables description
- ❑ Specifications with general conditions and all technical sections
- ❑ Construction Cost Estimate
- ❑ Legal/regulatory approvals completed as required
- ❑ Confirm Project schedule
- ❑ Project Report
- ❑ LEED™ Checklist Form
- ❑ Commissioning Report
- ❑ Project Review Meeting

Detailed requirements of the Design Development Deliverables follow.

_____ _____

Design Consultant Signature **Date**

DESIGN DEVELOPMENT

Description:

The Design Development phase refines the school facilities project based on the approved Schematic Design to the point where all the major building architectural and engineering systems have been identified, defined, and coordinated. This phase of documentation shall be sufficient to develop a Guaranteed Maximum Cost. Use of this project delivery system shall be the option of the NJSCC.

Design Consultant will meet as needed with the NJSCC and Project Team to review on-going progress and obtain additional input.

A progress set (50% complete) of the Design Development documents will be distributed to the NJSCC and the PMF for review and comment.

The Design Consultant will submit a complete Design Development package to the NJSCC for approval before proceeding to the next phase of documentation.

When selected by the PMF, where applicable, bid packages will be accelerated and brought to completion to create 'early' construction document packages (fast track) that the PMF can bid, receive construction permits, and allow construction to start while the remaining construction documents are being completed. These packages may include a demolition package, footings and foundation package, a site development package and a structural steel package.

Design Consultant will provide these bid packages to the NJSCC and the PMF for cost verification, construction permits, and bidding. NJSCC and Project Team approval is required before any packages are released for construction.

Design Consultant will begin the release of these packages sequentially at the completion of the Design Development, when required by the NJSCC.

The following defines the Design Development Deliverables description.

Deliverable Details:

The following is an outline of the minimum information required for the Design Development Submission. Items listed that are not applicable to the specific School Facilities Project may be disregarded.

A. GENERAL

1. Name of School District, Design Consultant and any Sub-Consultants.
2. Date work is to start and when completion is required.
3. Brief description of building and function.
4. List of School NJSCC or District Furnished Equipment.
5. Special conditions pertaining to site:
   a. Ground water level
   b. Adjoining buildings
   c. Existing utilities
   d. Other special conditions
6. Drawings for existing building if renovation work required.

B. DRAWINGS

1. Site Drawings
   a. Site plan showing buildings, paving, walls, and curbs, landscaped areas and retaining walls.
   b. Plans showing existing grades in relation to finish grades.
   c. Boring information.
   d. Sections through typical paving, walk, curb.
   e. Site drainage pattern, location of utilities and service entry points for the building.
   f. Utility relocations.
   g. Special requirements such as storm water retention, etc.

2. Architectural Drawings
   a. Floor plans, 1/8" scale minimum, showing layouts in enough detail so that quantities of such items as wall finishes, doors, and toilet fixtures may be measured.
   b. Exterior elevations, 1/16" scale minimum with appropriate enlargements at 1/4" scale.
   c. Section through buildings, showing story heights.
   d. Typical sections and details of each major type of exterior wall treatment.
   e. Finish schedule, including ceiling heights, for all spaces.
   f. Details of major special items.
   g. Door Schedule.
   h. Typical Window details.

3. Structural Drawings
   a. Foundation layout showing number of footings and extent of foundation walls, underpinning, caissons, special conditions.
   b. Design of typical footing(s), pile cap(s), etc.
   c. Typical section through grade wall, basement wall, and slab on ground.

d. Structural floor plans, including column schedule and floor loads. Section through typical slab design.

4. Plumbing Drawings
   a. Floor plans showing locations and quantity of fixtures, house tanks, pumps, drains as well as major piping systems including sanitary, storm, domestic water and fire standpipes. All sizes should be indicated.
   b. Schematic Riser Diagrams of sanitary, storm, domestic water, gas and fire standpipe systems with pipe sizes indicated.
   c. Equipment schedule identifying all equipment and giving their capacities, location, and current characteristics.
   d. Site Plan showing new utility work for storm, sanitary, water, gas, fire services, including piping, manholes, catch basins, and hydrants. Indicate points from which services will be run to the building.
   e. Indicate special requirements such as kitchens, laboratories, darkrooms, etc.

5. Fire Suppression Drawings
   a. Typical floor plan indicating basic design.
   b. Schematic Riser Diagram indicating sprinkler standpipes, fire standpipe, combined sprinkler/fire standpipe, etc. Indicate pipe sizes.
   c. Equipment Schedule indicating pumps, capacities, and current characteristics.
   d. Indicate special fire protection systems and such as dry chemical/Halon, automatic kitchen system, etc.

6. HVAC Drawings
   a. Floor plans showing double line distribution for all floors indicating piping, ductwork and unitary equipment, depending on system type. All sizes should be indicated. The following must also be indicated:
      1. Perimeter System showing type (Finned-tube radiation, fan-powered, etc.).
      2. Interior Systems, showing type, delivery method (VAV, fan-powered, etc.).
      3. Services for special equipment.
      4. Piping, valves, fire and smoke dampers, air outlets.
      5. Delineation of work.

   b. Schematic Riser and Flow Diagrams sufficient to evaluate basic system design. Indicate duct and piping sizes and systems, and controls.
   c. Schematic layout of mechanical equipment rooms, central or local. Indicate fresh air intake, exhaust, return, and supply air including all piping shafts to and from MER's.
   d. Equipment Schedule (drawings or specifications) identifying all equipment. Indicate capacities, current characteristics, location and area served by equipment.
   e. Indicate any special systems such as computer rooms, kitchen, fuel oil system, etc.

7. Electrical Drawings
   a. Floor plan showing all lighting fixtures including exit & emergency, and switching. Delineate scope of work.
   b. Floor plans showing all devices for fire alarms, smoke & heat detection, sprinkler tamper & water flow, clock system, security, CRT, audio/visual, CATV, communications, intercom, and building automation system and monitoring.

c. Floor plans showing all power requirements including equipment location, motors, motor control centers, panels, transformers, telephone cabinets & outlets, elevator connections, empty conduit systems, and all power receptacles.
d. Schematic layout of switchgear room and typical electric & telephone closets.
e. Single line riser distribution diagram indicating incoming service, switchgear, distribution & local panels, motor control centers, transformers, emergency generator, automatic transfer switches, and bus duct and all feeders sized.
f. Equipment schedule for lighting fixtures, switchgear, panels & motor control centers.
g. Schematic riser diagrams of fire alarm, smoke & heat detection, sprinkler alarms, security monitoring and telephone/data systems.
h. Site plan showing incoming power, telephone, data and other services with manholes and related equipment.
i. Site lighting showing light locations & details of pole types.

C. SPECIFICATIONS

Each Section to describe the extent of the work included and any special conditions.

1. General Conditions
   a. Reference may be made to the AIA General Conditions revised edition.
   b. State who assumes cost of:
      1. Building permit
      2. Fire insurance
      3. Drawings
      4. Water for construction
      5. Temporary electric power (current)
      6. Fuel for temporary heat
      7. Surveys
   c. State watchmen requirements.
   d. Give any additional supplementary general conditions and/or special conditions.
   e. Standard Liability Insurance as specified in Agreement.
   f. State whether or not Performance and Payment Bonds will be required.

2. Demolition
   a. Special instructions.

3. Underpinning
   a. Type and location, if needed.

4. Piles
   a. Type, capacity and number, if not shown on plans.
   b. Lengths to be given by Engineer or agreed upon from boring data, if available.

5. Excavation
   a. Extent of excavation of mechanical trades, building and site.
   b. Earth excavation assumed unless otherwise shown on borings, drawings, or specified.
   c. Special conditions such as crosslot bracing, sheeting, surcharge, porous fill, etc.

6. Site Work
   a. Describe excavation and grading.
   b. Specify site structures such as manholes, catch basins, tank foundations, retaining walls, bridges, electrical sub-stations, etc.
   c. Specify paving and curbs, for roads and parking areas.
   d. Specify storm water system, water system, electric site work, etc. (if not included in mechanical specifications).
   e. Specify finishes.
   f. Give allowance for work not described.
   g. Landscaping, topsoil, planting - description and extent.

7. Foundations
   a. Specify concrete mixes.
   b. Specify construction pattern, including expansion joints, water stops, etc.
   c. Specify waterproofing, type and locations
   d. Specify dampproofing, type and locations.
   e. Foundation drainage system.

8. Structural Steel
   a. Give engineers' tonnage.
   b. Indicate if tonnage includes hung spandrel lintels and other special steel; if not, specify.
   c. Type of connections.
   d. Specify shop and field paint, and extent.
   e. Special conditions such as trusses, etc.
   f. Specify strengths of steel.

9. Metal Deck
   a. Specify type, gauge and locations.

10. Bar Joists
   a. Type of designation.
   b. Spacing and live load.
   c. Give Engineers' tonnage.

11. Concrete Work - Superstructure

   a. Types of concrete and where used.
   b. Specify concrete mixes.
   c. Thickness of fills and where used.
   d. Specify finishes.
   e. Specify reinforcing in slabs, rods or mesh and sizes.
   f. Specify column fireproofing, interior and exterior.
   g. Describe concrete stairs, stair pan fill and finish.
   h. Describe machine, equipment, and miscellaneous pads and bases.
   i. Describe Site Concrete Work.
   j. Specify precast concrete plank.
   k. Describe special hangers and inserts.

l. Describe poured gypsum deck - size and spacing T's, thickness and type of insulation, thickness of gypsum, type of mesh.
m. Special conditions, such as screed coats, membrane protection, fills, etc.

12. Masonry
    a. Specify face brick or F.O.B. allowance per M.
    b. Specify face brick bond and mortar mix including admixtures.
    c. Masonry reinforcing.

13. Cut Stone Work
    a. Specify kind and locations.
    b. Specify thickness, finish, support, anchorage or backup.
    c. Specify finish.

14. Roofing and Sheet Metal Work
    a. Specify insulation, ply, bond, etc. for roof.
    b. Specify flashing material and gauge.
    c. Specify location, size, gauge and finish of louvers.
    d. Specify material, type (felt or fabric) and ply of membrane waterproofing.
    e. Specify location, gauge, finish of gravel stops and fascias.
    f. Specify special terrace finishes.

15. Spandrel Waterproofing
    a. Specify kind and location.

16. Dampproofing
    a. Specify type, application and locations.
    b. Specify insulation and protection.

17. Caulking
    a. Specify kind of material.

18. Metal Furring, Lathing & Plaster
    a. Specify gauge and weight of lath, location of corner and base beads.
    b. Specify types of plaster.
    c. Indicate furring on exterior and interior walls, if any.
    d. Special finishes.

19. Terrazzo Work
    a. Specify type and locations.
    c. Specify base (as to height and cove or straight).

20. Tile Work
    a. Specify size, type, finish of wall and floor tile.

21. Resilient Flooring
    a. Specify location, grade, thickness of linoleum, asphalt, vinyl or rubber tile floor.
    b. Specify base (as to kind, height, cove or straight).
    c. Mats, thresholds, etc.

23. Architectural Metal
    a. Enumerate architectural metal items.
    b. Specify gauge, finish and grade of enumerated items.
    c. Specify flashing material and gauge.
    d. Hardware and glass if any in this section.
    e. Give allowance for work not detailed.

24. Exterior Metal Siding
    a. Specify gauge, finish, insulation, material, type of fastening and sub-framing.

25. Metal Windows
    a. Specify type, gauge, finish of windows.
    b. Special sash - operable sections, etc.

26. Miscellaneous Iron
    a. Enumerate items and locations.
    b. Describe steel stairs and railings.

27. Steel Rolling Doors/Overhead Doors
    a. Specify type and location.

28. Gypsum Drywall Partitions
    a. Specify type and location.
    b. Special requirements - insulation, bumper rails, etc.
    c. Section through each type.

29. Carpentry & Millwork
    a. Specify kind and locations of paneling and cabinet work, ceilings, glazed partitions, doors etc.
    b. Describe type and location of stud partitions.
    c. Specify type and location of folding partitions.
    d. Indicate nailers, blocking and grounds for other than millwork.
    e. Hardware, if any, in this section.
    f. Specify back painting
    g. Special millwork.
    h. Wood Doors.

30. Insulation
    a. Specify insulation such as under slabs, behind convector and A.C. enclosure at exterior walls, firestop, etc.

31. A.C. Enclosure & Venetian Blind Pockets
    a. Specify quality, type, gauge of material and finishes.
    b. Specify insulation behind A.C. enclosures.
    c. Special A.C. enclosures.

32. Hollow Metal Work
    a. Specify quality, type, gauge of material and location for doors and frames.
    b. Describe borrowed lights, column closures, etc.

33. Finish Hardware
    a. Specify quality, special hardware, or allowance.

34. Metal Partitions
    a. Specify quality, type, locations, height, fillers, doors, glazing and hardware.

35. Toilet Partitions
    a. Specify quality, type, locations, accessories and hardware.

36. Glass and Glazing
    a. Specify kind, thickness and locations.
    b. Specify glazing compound.
    c. Specify mirrors.

37. Acoustical
    a. Specify quality, type and method of suspension.

38. Paint & Finishing
    a. Specify paint for plaster, metal, wood and masonry.
    b. Specify special wall coverings, such as fabrics, cement glaze, etc.
    c. Specify finish on millwork.
    d. Specify mechanical painting.

39. Mail Chute (if used)
    a. Indicate number of openings.
    b. Describe mail box.

40. Vault Work (if used)
    a. Specify doors, interior finishes.

41. Correspondence Conveyors (Telelifts, etc.)
    a. Specify type and operation.
    b. Specify number of openings and finishes.

42. Food Service Equipment - Kitchen/Cafeteria/Pantry/Vending Machines/etc.
    a. Enumerate fixtures.
    b. Describe walk-in refrigerators.
    c. Specify special equipment.
    d. Enumerate furniture items.

43. Miscellaneous Specifications - Quantity, quality and locations should be indicated.
    1. Cranes
    2. Venetian blinds
    3. Lockers & benches
    4. Toilet Accessories
    5. Material Handling System; Carts/Tracks
    6. Laboratory Equipment/Casework
    7. Automatic Doors

8. Skylights
9. Laundry Equipment
10. Raised Flooring
11. Special Storage Units
12. Locker Room Equipment
13. Library Equipment - Carrels, Stacks
14. X-Ray Protection, Radio Frequency Shielding
15. Pneumatic systems
16. Vacuum Cleaning Systems
17. Rubbish Compactors
18. General Waste Incinerator
19. Conveyor Systems
20. Walk-In Freezers/Refrigerators
21. Sewage Treatment Facility
22. Shop Benches
23. Fume Hoods
24. Dark Room Equipment
25. Flagpoles
26. Signs
27. Stage Equipment
28. Built-In Furniture & Carpets
29. Dock Levelers
30. Conveyors
31. Curtain Tracks
32. Window Washing Equipment
33. Other

44. Plumbing
    a. Describe location, pressure of and distance to source of water.
    b. Specify depth of any wells and type or give allowance.
    c. Give cold water volume requirements for building, and other uses.
    d. Describe sanitary and storm drainage systems in building and on site.
    e. Give locations of sewer or any septic tanks.
    f. Give maximum flow of combined drainage including sanitary, storm, laboratory and emergency.
    g. Describe source of water for fire protection system.
    h. Describe, and specify characteristics, and requirements for other systems such as gas, soap, services for laboratories, etc.
    i. Describe and locate wet columns, if used.
    j. Specify standards for fixtures, piping and equipment.
    k. Specify test requirements.
    l. Specify insulation as to scope and quality.

45. Sprinklers
    a. Describe sprinklered areas.
    b. Describe site work:
        1. Source and location
        2. Specify piping and manholes, hydrants, P.I.V.'s
        3. Specify capacity, type and location of storage tank

c. Specify type of systems (wet, dry, or deluge, etc.) and locations.
d. Specify standards of equipment, type of heads, and other fixtures.
e. Specify alarm system.
f. Specify test requirements.

46. HVAC

a. Specify design criteria, provide cooling and heating loads, define building hydronic pressure zones, and airside pressure conditions.
b. Give engineer's cooling tonnage required, noting any extra capacity to be provided.
c. Describe basic cooling and heating systems.
d. Define projected energy usage.
e. Specify all equipment as to quality, capacity (unless scheduled on plans), materials, accessories, and features.
f. Specify pipe, valves, fittings, hangers, and appurtenances for each piping system.
g. Specify any glycol and/or chemical treatment systems.
h. Specify standards for sheet metal duct construction, all VAV or fan powered terminal units, heating coils, air distribution devices, balancing dampers, fire and smoke dampers, etc.
i. Specify duct and pipe insulation, sound attenuation, and vibration isolation.
j. Specify automatic temperature controls and any automation system, including whether pneumatic or electric, remote control and monitoring features, controllers, sensors, valves, dampers, thermostats, wiring, etc., together with cross connections with building fire alarm and security systems.
k. Specify requirements for start up, testing, and balancing.
l. Specify standards for electric motors, starters, motor control centers, etc., furnished by mechanical with delineation of responsibility for installation and wiring.
m. Specify and describe any requirements for mechanical work associated with an emergency generator such as fuel oil tanks, pumps and piping, engine exhaust piping, louvers, plenums, cooling water piping, ventilation system, etc.
n. Specify and describe any special requirements such as heating coils in pavement, heat tracing of piping, site work, laboratory systems, etc.
o. Specify requirements for submittals, shop drawings, coordinated drawings, maintenance manuals, test reports, balancing reports, training, etc.
p. Include equipment schedules for any mechanical equipment not scheduled on drawings.

47. Electrical

a. Describe primary source current characteristics and location, and whether service will be underground or overhead.
b. Specify who is to bring electric service to the building.
c. Describe service entrance including any transformers, vaults, network protectors, sub-stations, main switchgear, number, size and type main feeders, and responsibility for installation of the various components.
d. Specify standards and requirements of main switchgear.
e. Give design electrical power loads for HVAC, building service power, elevators, lighting, appliance power, etc.
f. Specify illumination requirements in footcandles for the various building areas.
g. Define core and shell versus tenant finish work.

h. Describe lighting and power distribution systems as to standards, characteristics of power, metering, etc.
i. Specify materials and methods for conduit, wire, buss ducts, etc.
j. Specify standards and characteristics of lighting panels and power panels.
k. Specify building standard lighting fixtures or stipulate an allowance for same.
l. Specify light switches, receptacles, etc., or stipulate an allowance for same.
m. Specify floor distribution system as to in floor fill, under floor, floor duct, or in raised floor system.
n. Specify and describe special systems such as fire alarm, intercommunication, CCTV, security, TV, data, building management, telephone, etc.
o. Define division of responsibility for building management system as applicable.
p. Specify or give allowance for special ceilings, etc.
q. Specify or give allowance for special provisions for computer rooms, UPS systems, etc.
r. Specify and describe site lighting.
s. Schedule any equipment or fixtures not scheduled on plans.

48. Elevators
a. Specify elevator characteristics as to type, speed, capacity, operation.
b. Specify number of cars for low, medium and high rise with number of openings for each.
c. Specify or give allowance for cabs.
d. Specify material, gauge, finish for typical openings.
e. Specify special openings.
f. Specify corridor and special fixtures.
g. Specify above information for freight cars.

49. Dumbwaiters
a. Specify number, size, speed, type operation and number of floors served by each.
b. Specify material, gauge and finishes of openings.

CONSTRUCTION DOCUMENT

Design Consultant: _____
_____
_____
_____

Project Name _____
District _____
NJSCC Project # _____
DOE Project # _____

Deliverables:

The deliverables of Construction Document phase are prepared to set forth in detail the requirements for the construction of the Project and shall consist of the following:

- ❑ Construction drawings for all trades that show the complete scope of work in detail for the entire Project
- ❑ Final specifications with general conditions and all technical sections, including commissioning
- ❑ Construction Cost Estimate
- ❑ Confirm Project schedule
- ❑ Construction schedule review
- ❑ Project Report
- ❑ LEED™ Checklist Form
- ❑ Commissioning Report
- ❑ Project Review Meeting

_____ _____

Design Consultant Signature **Date**

CONSTRUCTION DOCUMENT

Description:

Construction Documents - the purpose of this phase is to prepare final contract drawings and specifications that set forth in detail the requirements for the construction of the Project.

Based on the NJSCC and Project Team approval of the Design Development documents, the Design Consultant will develop complete contract documents for construction.

Design Consultant will meet as needed with the NJSCC to review progress and obtain additional input both on the drawings and the technical specifications. Specifications will include detailed requirements for full building commissioning.

Design Consultant will continuously coordinate the documentation across all design disciplines to minimize potential construction conflicts between trades during construction.

Design Consultant will review and make recommendations for special provisions in the contract documents of the NJSCC's General Conditions and General Supplementary Conditions requirements (CSI divisions 0 & 1) to be included in the contract document package.

Design Consultant will submit completed construction documents to the NJSCC for review, comment and approval. Any minor comments after the NJSCC review is complete will be incorporated into the documents before the documents are released for construction.

Design Consultant will submit documents to Department of Community Affairs for construction permits.

Construction Control Cost Estimate - a detailed cost estimate will be developed by the PMF that provides a basis for comparison of contractor's bids received on related bid packages during the Bidding and Contract Award .

Design Consultant will assist the PMF will reconcile each of their construction control cost estimate.

BIDDING AND CONTRACT AWARD

Design Consultant: _____
_____
_____
_____

Project Name _____
District _____
NJSCC Project # _____
DOE Project # _____

Deliverables:

- ❑ Construction schedule review
- ❑ List of Qualified Bidders (by PMF)
- ❑ Pre Bid Meeting
- ❑ Addenda.
- ❑ Opening of Bids
- ❑ Evaluations and recommendations.

_____ _____

Design Consultant Signature **Date**

BIDDING AND CONTRACT AWARD

Description:

Bidding and Contract Award - as the construction documents are released for bid, Design Consultant will clarify questions from the bidders pertaining to the documents. Design Consultant will assist the NJSCC and the PMF in evaluating the bids and selecting the contractors to perform the actual construction.

Design Consultant will attend a pre-bid meeting organized and run by the PMF and the NJSCC.

Design Consultant must be present a bid opening and tabulate them with the PMF.

In response to questions from the bidders, Design Consultant will prepare and issue addenda that further define the documents to the bidders.

Design Consultant will assist the NJSCC and the PMF in evaluating contractor bids and contractor alternative proposals. Three meetings have been allocated to this process.

Design Consultant will make recommendations to the NJSCC and Project Team.

NJSCC will prepare the necessary construction contract and forward to the Contractor. The executed contract will be returned with payment bond and Insurance certificates to the NJSCC, the Design Consultant, PMF, SCC Project Officer shall receive copies.

CONSTRUCTION ADMINISTRATION

Design Consultant: _____
_____
_____
_____

Project Name _____
District _____
NJSCC Project # _____
DOE Project # _____

Deliverables:

- ❑ Reviewed submittals
- ❑ Construction schedule review
- ❑ Construction observation reports
- ❑ Requests for Information
- ❑ Punch list
- ❑ All required guarantees and project manuals
- ❑ Certificates of Substantial and Final Completion
- ❑ Project Report
- ❑ LEED™ Checklist Form
- ❑ Commissioning Report
- ❑ Project Review Meeting

Activities:

Meeting held by PMF and contractors to finalize construction phase plan and schedule.
PMF reviews submittals for completeness; Design Consultant reviews and approves submittals for compliance with design intent.
Contractors begin construction of school facility.
PMF performs QA/QC on all work in progress for compliance with contractual documents.
PMF verifies installations to ensure readiness for functional tests.
Contractors, with PMF oversight, fix deficiencies and fine tune as needed.
PMF and contractors retest: District and NJSCC monitor as needed.
PMF develops punch list.

Design Consultant will assist PMF with:

- ❑ Requisitions for Payment
- ❑ Change Order documentation
- ❑ Minutes of Project meetings
- ❑ Release of all liens
- ❑ Contractor affidavit of payment of debts and claims
- ❑ As-built drawings, electronic and hard copy

_____ _____
Design Consultant Signature **Date**

CONSTRUCTION ADMINISTRATION

Description

Construction Administration is the monitoring process during the actual construction of the Project. The entire Design Consultant Project team that completed the design and documentation will remain involved throughout the Construction Administration.

The Design Consultant shall expedite the flow of shop drawing submittals, Requests for Information (RFI), and other related construction information through the Design Consultant office. Cost control of the Project by expediting the shop drawing review process and by providing RFI's to the Contractors as quickly as possible.

Design Consultant will attend pre-construction meeting(s) at the site.

Design Consultant will review submittals, including shop drawings, project/maintenance manuals and guarantees that are required by the Construction Documents.

Design Consultant will attend regular Project meetings at the site during the construction period. The PMF will keep the Project meeting minutes.

Periodic review of construction progress by Design Consultant will occur at least weekly in conjunction with the regular Project meeting.

The PMF and the NJSCC will complete preparation, review and approval of Requisitions for Payment and for Change Orders. Design Consultant will review information and provide recommendations to the Project Team.

Design Consultant will prepare a Certificate of Substantial Completion for the construction.

Design Consultant will review the Project and a 'punch list' will be prepared for the PMF and the NJSCC. Once the PMF states that the 'punch list' items have been completed, Design Consultant will make additional reviews as needed of the Project to verify satisfactory completion of the items and provide a final report to the NJSCC.

Design Consultant will provide a Certificate of Final Completion.

PROJECT CLOSE-OUT

Design Consultant: _____
_____
_____
_____

Project Name _____
District _____
NJSCC Project # _____
DOE Project # _____

Deliverables:

- ❑ Record Set of drawings
- ❑ Maintenance and Operating Manuals
- ❑ Guarantees/Warrantees
- ❑ Testing and balancing reports
- ❑ Boiler inspection certificates
- ❑ Elevator inspection report
- ❑ Shop drawings
- ❑ Submission Checklist
- ❑ Contractor Invoice for final payment
- ❑ Project Report
- ❑ LEED™ Checklist Form
- ❑ Commissioning Report
- ❑ Project Review Meeting

Activities:

Complete punch list monitored by PMF.
PMF and contractor perform deferred tests as needed.
PMF reviews O&M manuals, systems manuals, and as-built drawings for completeness and forwards to Design Consultant for review and approval.
PMF verifies operator training with Design Consultant assistance.
Substantial completion.
PMF and Design Consultant define ongoing testing requirements as needed.
Design Consultant updates as-builts as needed.
Update Systems Manual with maintenance, operation, and other relevant ongoing documentation.
PMF and Design Consultant prepare and submit final report, documenting that design intent has been met.

_____ _____

Design Consultant Signature **Date**

PROJECT CLOSE-OUT

Description:
Project Close-Out constitutes the final activity of the Construction Administration Phase.

Responsibilities
The PMF has the full responsibility for the planning, scheduling, and execution of project close-out activities. The Design Consultant is responsible to cooperate with the PMF in the planning, scheduling, and execution of project close-out activities.

Commencement
The documentation of Project Close-Out is initiated at the pre-construction meeting with the distribution to the Contractor of a Project Close-Out Documentation List. This document is included by the Design Consultant in the project specifications and advises the Contractor that documents it is responsible to provide to the NJSCC prior to close-out and final payment.

Development of Punch lists and Inspection Reports
Upon written notification by the Contractor to the PMF that the Contract work is complete, pre-tested and ready for inspection, the PMF will request a final code inspection. Project Close-Out should include pre-final and final inspections, final payment and similar actions evidencing completion of the work. Other specific requirements are included in the Construction Contract Documents. As used in this Manual, the pre-final and final inspections include the resolution of all Contract and code requirements. Upon receiving a written request from the Contractor, a pre-final and subsequently a final inspection shall be arranged by the PMF, who will also arrange for the following people to attend the pre-final and final inspections:
Client School District representatives, Design Consultant, code inspectors and NJSCC representatives, and the appropriate Contractor/Subcontractor(s). The purpose of pre-final and final inspections is as follows:

To ensure that the work has been completed in substantial conformance with the approved plans, specifications, changes and related documentation

Conformance with applicable construction codes.

To ensure that all installed equipment works properly. While the inspection may show the equipment works, the inspection report must:

(1) be qualified when the equipment/system cannot be tested in the appropriate climatic season (2) provide a scheduled date for testing during the appropriate season. To have required certificates of conformance and tests, certified analyses, laboratory tests, etc., on hand.

Immediately after the code inspection is completed, code inspection reports will be prepared and distributed to the Contractor's field representative at the site.

A separate Punchlist will be developed to identify items noted by the Design Consultant, the PMF, the NJSCC Project Officer and the Client School District. At the conclusion of the pre-final inspection, the PMF will prepare an official consolidated Punchlist with input from and signed by all parties present at the pre-final inspection including the Contractor identifying the work remaining and/or needing correction. If any of the designated signatories declines to sign, the reason must be stated on the Punchlist.

The Construction Administration Phase of a School Facilities Project is not considered closed out until the Construction Contract has been closed out.

Correction/Completion of Punchlist Items
The PMF is responsible for verifying correction/completion of the work identified on the consolidated Punchlist. The verification process shall include representation from the Design Consultant, the PMF, the NJSCC and the Client School District.

Determination of Substantial Completion
Substantial completion means that a pre-final Construction Contract and code inspection was conducted, but that additional work (the Punchlist) may remain to be performed or corrected that can be accomplished at a later date without interference to the Client School District. It also means the date warranties and guarantees begin, or a combination of the above. The difficulty occurs in determining when Substantial Completion occurs. There are two principal elements required for finding of Substantial Completion; namely, a high percentage of completion and the availability of the School Facilities Project for its intended use. High Percentage of Completion Although at least 95% of the work must be completed for Substantial Completion, the prudent approach is that there is no rigid formula as to the percentage of work which must be accomplished before Substantial Completion may be said to be achieved. Lower percentages have been deemed adequate.

The amount of payments to the Contractor may be considered as evidence of Substantial Completion. Work with important or material omissions or technical defects or deficiencies should not be considered substantially complete. However, Punchlist items may not prevent an item from being considered completed for percentage of completion purposes. Availability for Use To support a claim of Substantial Completion, the Contractor must (a) establish that the School Facilities Project is capable of adequately serving its intended purpose and (b) show that all code deficiencies cited have been corrected, addressed and accepted by the code inspection agency such that the conditions for issuance of a TCO/Approval prevail. Thus, where air conditioning is required for the operation of equipment, Substantial Completion does not occur until air conditioning is functional.

If at the conclusion of the pre-final Inspection, the Design Consultant determines that the contractual completion status of the Construction Contract supports the condition of Substantial Completion; the Design Consultant forwards a completed Certificate of Substantial Completion Form along with the Punchlist and other documentation to the PMF for approval.

The PMF shall then request the issuance of a Temporary Certificate of Occupancy (TCO) from the code inspection agency.

Issuance of a "Temporary Certificate of Occupancy"
When Uniform Construction Code items are resolved, the Code Inspection Agency will issue a TCO. This TCO may be issued for the entire School Facilities Project or for a specific area or portion of the project.

Initiation of Final Contract Acceptance Process
When the Punchlist items are completed and signed off as being completed or otherwise resolved, and a TCO has been issued, the PMF shall initiate a Final Contract Acceptance form.

Submission of Close-Out Documentation

As-Builts And Record Sets Of Drawings
The Contractor shall keep their Construction Contract drawings up to date at all times by recording the final location of any changes in the work, pipes, traps, conduits, ducts, footings, anchors, etc.

Upon completion of the School Facilities Project, the Contractor shall submit its As-Built drawings to the Design Consultant through the PMF with Contractor's certification as to the accuracy of the information prior to final payment. All As-Built drawings submitted by the Contractor shall be entitled As-Built above the Title Block and dated.

The Design Consultant shall acknowledge acceptance of the As-Built drawings by signing a transmittal indicating that it has reviewed them and that to the best of the Design Consultant's knowledge they reflect the As-Built conditions, as they exist. Upon receipt of all of the As-Built drawings from the Contractor, the Design Consultant shall obtain the original mylars from the PMF and transfer the As-Built conditions to the original mylars to reflect RECORD conditions.
The Design Consultant shall place the following statement on the original drawings: "The As-Built information added to this drawing has been supplied by the Contractor. The (Architect) (Engineer) does not assume the responsibility for its accuracy other than conformity with the design concept and general adequacy of the "As-built" information to the best of the (Architect's) (Engineer's) knowledge."

Unless noted otherwise in the Design Consultant Agreement, the Design Consultant shall complete the Record Set within 90 days of receipt. Upon completion, the Design Consultant shall deliver the Record Set original mylars back to the PMF who will acknowledge its receipt in writing. The Design Consultant may produce a set of prints or reproducibles of those drawings. The original mylars shall become the property of the NJSCC. Final payment to the Design Consultant is subject to receipt of all documents including the Record Set of drawings.

Operating Manuals, Warranties, Shop Drawings, Etc.
The Contractor shall forward to the Design Consultant all maintenance and Operating Manuals, Guarantees, Testing and Balancing Reports, Shop Drawings, Specific Warranties (Waterproofing, Boiler Inspection Certificates, Elevator Inspection Certificates, etc.) The Design Consultant shall review all such documents for accuracy, completeness and Contract compliance and shall transmit them along with one set of all of the approved shop drawings that the Design Consultant has retained during the construction of the School Facilities Project to the PMF for distribution. The transmittal shall include a complete listing of all documents by name.

Submission Checklist
The Submission Checklist shall be completed by the Design Consultant and submitted as the cover sheet of this submission to the PMF at the completion of Project Close-out to insure that all of the Design Consultant's contractual responsibilities have been completed.

Final Payment

Contractors Final Payment
When all Punchlists have been completed and all required demonstrations and instructions of mechanical and control systems have been provided, the PMF will initiate a Final Construction Contract Acceptance form and distribute it to the Design Consultant and Contractor for signature. All parties must return the signed documents within ten (10) working days. Upon receipt of the signed form the PMF will forward the Contractor's final invoice to the NJSCC for payment.

Design Consultant's Final Payment
Upon completion of the Construction Administration Phase of the issuance of a Certificate of Occupancy, the final invoice of the Design Consultant may be submitted to the PMF for review, recommendation and forwarding to the NJSCC Project Officer for approval and signature. The PMF will verify that the Design Consultant has satisfied all aspects of the Contractual Documents by initiating a Final Acceptance of Design Consultant Agreement form. Under no circumstances will the final invoice be processed until all contractual requirements have been satisfied. Upon signature by the PMF and NJSCC Project Officer, final payment will be authorized.

Final Performance Evaluations of the Contractor
The Design Consultant shall complete and submit the final Contractor performance evaluations to the NJSCC Project Officer.

POST OCCUPANCY REVIEW

Design Consultant: _____ **Project Name** _____
_____ **District** _____
_____ **NJSCC Project #** _____
_____ **DOE Project #** _____

Deliverables:

The purpose of the products delivered during Post Occupancy Review is to confirm the intent of the design was met. All warrantees shall be in place and performance of project components is evaluated as information for future projects.

Post Occupancy Review Phase Requirements

- ❑ Final warranty inspection report
- ❑ Written product inspection report of recommendations for future projects
- ❑ Commissioning Report
- ❑ Project Review Meeting

Activities:

Design Consultant and PMF shall monitor performance over time (energy, comfort, etc).
Design Consultant and PMF shall implement other ongoing requirements as defined by Design Consultant in contractual documents.
Warranty inspection by Design Consultant, PMF, and District.

_____ _____

Design Consultant Signature **Date**

POST OCCUPANCY REVIEW

Description:

Prior to the expiration of the warranty period, the Design Consultant shall be engaged on School Facilities Projects to perform an inspection of the project to review the adequacy and performance of materials, systems and equipment under warranty.

Post Occupancy Review Phase occurs during the first year following Substantial Completion of the School Facilities Project.

Warranty Period

The Design Consultant shall assist the PMF in the resolution of the Contractor's obligation under the one-year warranty and guarantee period for each School Facilities Project when design issues arise.

Warranty Inspection

The Design Consultant shall attend, in conjunction with the PMF, approximately eleven (11) months after Substantial Completion or final payment, a one-year warranty inspection and submit a written report to the NJSCC Project Officer on the findings and then advise the NJSCC Project Officer on the findings. The Design Consultant shall, upon completion of warranty work by the Contractor (but not later than thirty (30) days after the end of the one-year warranty period), re-inspect the Work, and submit a final warranty inspection report. The final report shall include a list of all warranty issues identified, current status of correction by the Contractor, and remaining work yet to be completed.

Product Inspection

The Design Consultant shall attend, in conjunction with the PMF, approximately eleven (11) months after Substantial Completion, a one-year inspection to review quality and durability of products specified and utilized in the School Facilities Project. A written product inspection report of recommendations for future projects shall be submitted to the PMF. The final product inspection report shall detail findings related to durability and suitability of products specified for the School Facilities Project, including architectural finishes and HVAC equipment.

NJSCC Design Manual

Appendix A

Project Progress Report Guides

INTRODUCTION

SCOPE AND INTENT

The NJSCC now requires formal Project Progress Reports to be presented by Project Teams at the end of the following six major design/construction phases:

Programming
Schematic Design
Design Development
Construction Documents
Bidding and Contract Award
Construction Administration

The Reports shall be in the form of oral presentations (written summaries are welcome but not required) delivered during the formal Project Review Meetings that are required at the end of each major design/construction phase. (Note: Reports are not required for the Project Close-Out and Post Occupancy Review phases.) The purpose of these reports is to provide Project Teams an opportunity to explain how they are addressing the 24 Design Criteria described in Section 2 of this Manual.

Since Project Teams will be evaluated on how well – and how creatively – they are addressing the NJSCC's 24 Design Criteria, preparing and presenting informative Project Progress Reports is extremely important.

This Appendix provides guidance on how to prepare the required Reports.

ORGANIZATION AND CONTENT

This appendix contains six individual Guides, one for each Project Progress Report that Design Consultants must prepare.

Each Guide is organized according to the 24 Design Criteria developed by the NJSCC and included in Section 2 of this Manual. Each Criteria is presented, together with a series the individual questions - or "prompts"- designed to help Design Consultants understand some of the key issues they are expected to address in their designs and explain in their Progress Reports.

During Project Review Meetings, PMF and/or NJSCC personnel will use these "prompts" as a basis for questioning Design Consultants about how they are addressing each of the 24 Design Criteria. Design Consultants should, therefore, be prepared to address the prompts during their formal Progress Report presentations. While the Report presentations need not address every "prompt" individually, they should provide information that systematically addresses the key issues raised by the prompts.

USING THE APPENDIX

The NJSCC intends for the information contained in this Appendix to be used in three ways:

1. To help Design Consultants better understand – and therefore better address – the 24 Design Criteria contained in Section 2.
2. To help Design Consultants prepare their required Project Progress Reports.
3. To help NJSCC and PMF personnel effectively review Design Consultant progress toward creating high performance, 21st century schools.

Design Consultants should, therefore, review all the Guides in this Appendix at the beginning of any School Facilities Project in order to clearly understand the design goals the NJSCC has established. This review should be accompanied by a review of the Design Criteria contained in Section 2.

As the School Facilities Project proceeds from phase to phase, Design Consultants should continue to review the Guides for each particular phase, and to do so several times over the course of the phase. At the conclusion of each phase, Consultants should again review the Guide for that phase to help prepare their Progress Report presentation.

NJSCC and PMF personnel will use the Guides during Project Review Meetings to evaluate Design Consultant progress on creating high performance, 21st century schools.

PROGRAMMING

Design Consultant: _____
_____
_____
_____

Project Name _____
District _____
NJSCC Project # _____
DOE Project # _____

PG ACOUSTIC COMFORT

- ❑ Are there major sources of noise near the site?
- ❑ Can the site be used to minimize the impacts of these noise sources?
- ❑ Have good classroom acoustics been established as a design goal for the project?
- ❑ Can spatial adjacencies in the program work together to limit unnecessary noise?
- ❑ Has ANSI/ASA S12.60-2002 for acoustics been reviewed?

PG THERMAL COMFORT

- ❑ Are there prevailing breezes that could help naturally ventilate the building?
- ❑ Has thermal comfort been established as an overall design goal, especially for the classrooms?
- ❑ How can potential heat gain from southern orientations, fenestration and skylights be mitigated in school spaces, esp. classrooms?

PG VISUAL COMFORT

- ❑ Does the site provide special views that should be preserved?
- ❑ Has visual comfort been established as a design goal, especially for the classrooms?

PG DAYLIGHTING

- ❑ Has daylighting been established as a specific design goal for the school and, in particular, for the classrooms?
- ❑ How will siting and site elements influence the building's access to sunlight?
- ❑ Can the site accommodate one-story construction to allow skylights or roof monitors in the classrooms?
- ❑ Does the site allow the building to be oriented so as to optimize daylighting opportunities?
- ❑ How are the proposed daylighting strategies reflected in the program; specifically, what are the implications for the height and massing of the building?

PG INDOOR AIR QUALITY

- ❑ Has superior indoor air quality been established as a design goal for the project?
- ❑ Is the site near any sources of outdoor pollution?

PG SAFETY AND SECURITY

- ❑ Has security been established as a design goal for the project?
- ❑ As part of programming, are basic room placements and adjacencies being considered in terms of their impact on safety and security?
- ❑ Is the facility part of a state or countywide emergency shelter plan?
- ❑ Has a defined high bay area of the building been designated for use as an emergency shelter?
- ❑ Have appropriate shelter spaces been designated, specifically excluding kitchens, open corridors, MEP, storage, science, and shop or computer rooms?
- ❑ Does the proposed facility coordinate with district wide and/or DOE security provisions?
- ❑ Has the site been studied to find where potential security risks come from, i.e. high traffic corridors, adjacent blighted areas, etc.

PG ENERGY ANALYSIS

- ❑ Has the design team selected an energy analysis tool?
- ❑ What tool has been selected?
- ❑ At what stages in the design process will the tool be used, and what types of analyses will be performed?
- ❑ Has an energy use goal been established? What is it (e.g., __% better than the building code requires)?

PG LIFE CYCLE COST

- ❑ What form of cycle cost analysis methodology will be used by the design team?
- ❑ Have durability and maintainability issues been considered as part of the analysis?
- ❑ What basic assumptions have been built into the methodology? Have all parties agreed to these assumptions?

PG COMMISSIONING

- ❑ How has the team committed to commissioning as a basic component of the project?
- ❑ Has a commissioning agent been engaged?
- ❑ Is the commissioning agent beginning to document operational needs specific to the client's needs and the design team's intent?

PG LEARNING CENTERED DESIGN

- ❑ How does the program reflect a "learning centered" approach? (What has been done to accommodate individualized, self-directed, collaborative and activity-based/project-based learning? To what extent is the facility a "3D Textbook"?)
- ❑ How have consultations with teachers, administrators and students influenced the development of the program?

PG STIMULATING ARCHITECTURE

- ❑ What precedents have been analyzed to inform the development of this school's program? Are there national, regional or local examples that have proved to be informative and useful to the development of the program?
- ❑ Has teacher, student, staff and community input been solicited? Has this input helped identify community aspirations for the school? Has this input help generate a feeling of ownership for the school among these key stakeholders?

PG ACCESSIBILITY

- ❑ Have special education and/or school health care personnel been involved during the programming process to ensure the facility's design is inclusive for both physically and cognitively disabled students?
- ❑ Has the curriculum been examined for any specific requirements for students with either physical or cognitive disabilities? How are these requirements reflected in the program? What measures are planned to ensure the facility is friendly to cognitively disabled students?
- ❑ Will all significant spaces within the program be accessible for students with physical and/or cognitive disabilities?
- ❑ How have the special service needs of students with disabilities been accommodated in the program (e.g. in the health suite, bathrooms, special classrooms, etc.)?

PG FLEXIBILITY AND ADAPTABILITY

- ❑ Have potential future changes to the facility been considered; for example, changes in grade structure, changes in curriculum, changes in community use, possible consolidation or expansion over time, etc? How have these considerations impacted the program?
- ❑ Can the school be easily converted into two or more "small schools"? How is this adaptability reflected in the program?
- ❑ Is the school adaptable to a year-round and/or 24-7 operation?

PG INFORMATION TECHNOLOGY

- ❑ Have the provisions of the statewide technology plan been reviewed?
- ❑ Have the provisions of the district technology plan been reviewed?
- ❑ Have the DOE core curriculum standards for technology been reviewed?
- ❑ Has the E-Rate evaluation and application process been reviewed?
- ❑ How does the technology plan influence programmatic space requirements (For example; are dedicated wireless carts being provided, and if so, where will they be stored? Will long distance learning be provided, and if so, what will the space impacts be?)

PG BUILDING SHELL

- ❑ Does the basic program contribute to an energy efficient building envelope? For example, does the program group functions that may need less glazing (auditoriums, kitchens, etc.)on the east and west, and those that will benefit most from daylight (classrooms, corridors, etc.) on the north and south?

PG RENEWABLE ENERGY SYSTEMS

- ❑ Is maximizing the cost effective use of renewable energy a design goal for the project?
- ❑ Does the site have good solar access – for daylighting, active and passive solar heating, solar hot water, and/or photovoltaic systems?
- ❑ Could the site use wind power to generate electricity?
- ❑ Have available renewable energy incentives been considered when evaluating various renewable energy technologies and systems?

PG HVAC

- ❑ What types of high performance mechanical systems are being considered? How are the site and space planning implications of these systems reflected in the program?
- ❑ Have available incentives for high performance HVAC been explored?

PG ELECTRIC LIGHTING

- ❑ Have available incentives for high performance lighting been explored?
- ❑ Is optimizing 'watts per square foot' performance a design goal for the lighting system?
- ❑ Are lighting strategies for each type of space in the facility going to be distinct from each other based on the function and necessary light levels?

PG ENVIRONMENTALLY RESPONSIVE SITE PLANNING

- ❑ Can existing natural areas on the site be preserved? Does the site selected support the goals of open space preservation and smart growth? Does the site lend itself to naturally controlling storm water runoff?
- ❑ Has the site been studied in terms of solar orientation, prevailing breezes, shade trees and significant landforms and vegetation?
- ❑ Is there good pedestrian, mass transit, and/or bicycle access? Have safe routes to the school been identified?
- ❑ What areas of the site and/or the surrounding community could be used as 'outdoor laboratories' for teaching?

PG ENVIRONMENTALLY PREFERABLE MATERIALS AND PRODUCTS

- ❑ What initial goals are being set for the facility in terms of environmental materials? What percentage of materials should have recycled content and what percentage of recycled, sustainable, post-consumer and/or post industrial content should these materials contain? What standards are being followed and applied?
- ❑ Will provisions be made to "design-in" areas to collect and store recyclable materials? Will a waste recycling plan be part of the facility management plan? What are the goals for percentage of material to be recycled (by weight) for the facility?
- ❑ Does the opportunity exist to preserve a significant portion of an existing building and /or envelope? Are there materials on site that may be reused for the project, such as structural

steel beams, crushed concrete serving as aggregate, etc? Are salvage materials available locally?

- ❑ What major building material can be sourced within the region or within a 500-mile radius of the facility? What percentage of the building's material will be sourced by this means?
- ❑ Is a construction waste management plan for the project being developed?

PG WATER EFFICIENCY

- ❑ Does the site lend itself to controlling storm water runoff?
- ❑ Could the site accommodate on-site wastewater treatment, a retention pond, etc.?
- ❑ What water use goals for the school have been established?
- ❑ Are water efficient fixtures, including waterless urinals, being considered?
- ❑ Can a cistern be incorporated to store water (from roof runoff or non-potable uses such as irrigation and building maintenance)?

PG COMMUNITY INVOLVEMENT

- ❑ Has the Local School District received the Community School Information Packet?
- ❑ Has the Local School District established a Community School Working Group?
- ❑ Have local governmental, higher educational, and other private organizations been encouraged to participate?
- ❑ Has the NJSCC Communications Officer monitored community meetings?
- ❑ Has the NJSCC Project Officer facilitated and maintained information exchange with the Communications Officer?
- ❑ How has community input to the programming process been obtained: planning meetings, workgroups, surveys, interviews, design charettes, etc.?
- ❑ Has there been local collaboration with the NJSCC Project Officer?

PG COMMUNITY USE

- ❑ Has the school district considered the opportunity to use the facility after hours and during summer recess for other community activities such as a healthcare center, meeting/conference rooms, fitness center, computer lab, emergency shelter, and the like)?
- ❑ Has the school district considered complementary functions such as police sub-stations, child daycare, outdoor events complexes (such as amphitheaters, track, field, stadium), and the like to be funded by other means?
- ❑ Are outdoor spaces going to be developed as an integral part of the design?
- ❑ Has the district considered the potential for shared use among and between other schools in the district and/or other facilities such as the YMCA, public library, etc.?
- ❑ What has been done to accommodate the learning needs of the community? What are their programmatic needs?
- ❑ Has the potential for using non-school facilities within the community as extended learning centers been considered? How have these considerations influenced the program?

PG CATALYST FOR ECONOMIC DEVELOPMENT

- ❑ Does the selected site require infrastructure improvements beyond the property line and /or immediate street utility connections? Have opportunities for leveraging shared installation of infrastructure been explored?

- ❑ Have opportunities for leveraging the school development process - for example, through the financing, design, or construction of complementary uses such as housing, office and/or retail on or adjacent to the site - been explored?
- ❑ How does the program relate to/enhance relevant local land use, business improvements and/or economic development plans?

- ❑ Does the school facility location contribute to the vitality of an existing urban center?
- ❑ How will the school facility support new jobs in the community?

Design Consultant Signature **Date**

SCHEMATIC DESIGN

Design Consultant: _____
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Project Name _____
District _____
NJSCC Project # _____
DOE Project # _____

SD ACOUSTIC COMFORT

- ❑ Does the basic layout of the classrooms help or hinder good acoustics?
- ❑ Do any of the classrooms face sources of outside noise? If so, what measures are proposed to reduce the impact of this noise?
- ❑ Are any of the classrooms located next to sources of inside noise? If so, what measures are proposed to reduce the impact of this noise?

SD THERMAL COMFORT

- ❑ Are windows and skylights being designed to minimize 'hot spots' caused by direct sunlight?
- ❑ Are temperature controls being considered for each classroom?
- ❑ Are MEP systems separately controlled at the perimeter of the building envelope, especially areas of glazing?
- ❑ Has the thermal massing and orientation of floor and wall assemblies been designed for thermal comfort?
- ❑ Has solar orientation been taken into account when analyzing heat gain?

SD VISUAL COMFORT

- ❑ Are the basic daylighting and electric lighting designs being developed so that they provide illumination in as uniform a manner as possible, using task or accent lighting as appropriate to meet specific needs?
- ❑ Are individual lighting designs being developed for individual room types? Do the designs vary, even within room type, depending on the amount of daylight the room will receive?
- ❑ Is the potential for glare being analyzed, and are the lighting/daylighting systems being designed to minimize it?

SD DAYLIGHTING

- ❑ What basic strategies are being considered for bringing daylight into the school, particularly the classrooms?
- ❑ What strategies are being considered to control unwanted heat gain and glare?
- ❑ What tools are being used to analyze the impact of any daylighting strategies on the electric lighting system and on visual comfort and energy use?
- ❑ What are the preliminary results of these analyses?

SD INDOOR AIR QUALITY

- ❑ Will the HVAC system being considered provide adequate ventilation, especially to the classrooms?

- ❑ Does the basic layout of the school keep operable windows and air intake vents away from sources of exhaust?
- ❑ Have CO^2 monitors been considered for spaces with large variable occupant loads?
- ❑ Has ASHRAE standard 62.1-2001 been reviewed?

SD SAFETY AND SECURITY

- ❑ How have Crime Prevention through Environmental Design (CPTED) principles been applied during this phase of the process?
- ❑ Are opportunities for natural surveillance and access control being 'designed in'?
- ❑ What security technologies are being considered? How do they reinforce and extend the impact of the school's security-focused design features?
- ❑ Does the site plan designate emergency vehicle routes and have they been reviewed by the local jurisdictions?
- ❑ Have access/egress points been reviewed on the basis of lockdown, evacuation, and relocation plans?
- ❑ How do the designated entrances assure security by means of location, locking function, and cameras?
- ❑ Have exterior lighting, hydrant locations, and areas of refuge been designed to assure safety?
- ❑ Have passive provisions for safety (e.g. clear way-finding, unobstructed views, elimination of doors where possible, etc.) been incorporated in the design?

SD ENERGY ANALYSIS

- ❑ Have the energy analysis tool(s) selected for the project been used to project energy consumption at least once during this phase of design?
- ❑ Do the results meet or exceed the energy goal for the facility?
- ❑ Have innovative energy efficient systems (e.g. geo-thermal, variable speed fans and pumps, mini-cogeneration, enthalpy wheels, local individual room controls etc.) been considered on a life cycle cost basis?
- ❑ Have innovative energy storage strategies (thermal mass, desiccant wheels, phase change materials, etc.) been considered on a life cycle cost basis?

SD LIFE CYCLE COST

- ❑ Has the life cycle cost methodology selected for the project been used to compare and optimize alternative design strategies at least once during this phase of the process?
- ❑ Have durability and maintainability issues been considered as part of the analysis?

SD COMMISSIONING

- ❑ Is appropriate design documentation being collected by/delivered to the commissioning agent?

SD LEARNING CENTERED DESIGN

- ❑ How is "personalization of space" being accommodated in the design? How will it help foster the notion of ownership and stewardship for the school?
- ❑ How are social spaces and "places" distributed around the facility? Have informal gathering areas been incorporated around circulation spaces?

- ❑ What strategies are being considered to define individualized learning areas, small group areas, and breakout spaces?
- ❑ How does the design reflect a "learning centered" approach? (What in the design accommodates individualized, self-directed, collaborative and activity-based/project-based learning? To what extent is the facility a "3D Textbook"?)
- ❑ What has been done to accommodate the learning needs of the community? Is the facility easily adapted for evening courses and community gatherings?
- ❑ Does the design provide room for "virtual spaces", such as information kiosks, digital displays, and the like to feature student/team activities and foster community identity?
- ❑ Does the facility have well developed outdoor spaces? Does the school have a strong link to them?

SD STIMULATING ARCHITECTURE

- ❑ How have the community aspirations identified in the program phase been incorporated into a "vision" for the school? How is this "vision" being realized in the schematic design?
- ❑ How does the schematic design respond to the school's physical, social, cultural, and economic contexts?
- ❑ How is the design providing a setting, character and "feel" that is appropriate for the students who will use it, especially for early childhood and K-5 facilities?
- ❑ How is the school's identity being defined and articulated?

SD ACCESSIBILITY

- ❑ What features of the design are a result of consultations with special education specialists and school health care personnel during the schematic design process? Are spaces designed with both physical and cognitive disabilities in mind? Do instruction spaces offer a variety of sub-spaces that are visually and acoustically distinct, and can instructional spaces accommodate a teacher plus other adults (special teachers, personal aides, et al.) if necessary?
- ❑ Are key spaces accessible to all students without having to unnecessarily separate students with disabilities from the rest of the student body (i.e. cafeteria, auditorium, libraries, etc.)? Are accessible areas integrated well into each space; i.e. accessible spaces and seating areas are not separated from the rest?
- ❑ Do outdoor spaces accommodate the various needs of disabled students?
- ❑ How have the special service needs of students with disabilities been accommodated in the design (e.g. in the health suite, bathrooms, special classrooms, etc.)?

SD FLEXIBILITY AND ADAPTABILITY

- ❑ Do spaces facilitate short-term reconfigurations of the learning environment to suit different activities and programs? Are spaces being designed so they can accommodate numerous furniture layouts?
- ❑ How have potential future changes to the facility - for example, changes in grade structure, changes in curriculum, changes in community use, possible consolidation or expansion over time, etc - been incorporated into the schematic design?
- ❑ Will the design allow the school to adapt to year-round and/or 24-7 hour operation?

SD INFORMATION TECHNOLOGY

- ❑ Where and how have the selected technology systems been accommodated?

SD BUILDING SHELL

- ❑ What basic assemblies and configurations are being considered for the walls, floors, and roofs of the facility? What are the energy implications?
- ❑ What types of materials (glazing, shading, insulation, air barriers, structural materials) are being considered? What are the energy implications?
- ❑ How will the overall performance of the shell as a whole be optimized?
- ❑ How are the impacts of thermal mass being addressed?
- ❑ Are light colored surfaces being considered as a means of reducing heat gain?
- ❑ Can landscaping be used to reduce heat gain on the building envelope?

SD RENEWABLE ENERGY

- ❑ What renewable energy strategies are being considered for the school?
- ❑ How much energy will they save?
- ❑ What are their life cycle cost benefits?
- ❑ How will they impact the site plan or the building design?
- ❑ How will they impact other building systems?

SD HVAC

- ❑ What type of HVAC system is being considered for the school?
- ❑ Why is this system optimal from a comfort/energy performance perspective?
- ❑ How are the interactions between the HVAC system and other key building systems being analyzed and optimized?
- ❑ Is natural ventilation being considered? If so, are its potential impacts on HVAC performance being factored into the analytic process?

SD ELECTRIC LIGHTING

- ❑ Is the design team optimizing a 'watts per square foot' method to design the high performance lighting system? How are lighting consultants optimizing the interaction between the electric lighting system and potential daylighting strategies as part of an integrated design?
- ❑ What electric lighting strategies are being proposed for specific types of spaces in the facility (e.g. classrooms, labs, cafeteria, etc.)? What are the energy and visual performance benefits of these individual strategies?
- ❑ How does each strategy interact with the daylighting strategies being used? How are these interactions being analyzed and optimized?

SD ENVIRONMENTALLY RESPONSIVE SITE PLANNING

- ❑ Does the design preserve and/or restore existing natural areas of the site? Does it help control stormwater runoff with various measures such as pervious paving, stormwater retention features and strategic landscaping? Is environmental landscaping (xeroscaping, indigenous and low-irrigation vegetation) also integrated in such areas to reduce the need for costly maintenance of grass lawns?
- ❑ If feasible, is the building, particularly the classroom wings, oriented in a predominantly east-west direction to facilitate access to daylight?

- ❑ Is the facility designed for convenient access to public transportation? Does it provide amenities such as secure bike storage and changing rooms to accommodate alternate means of transportation?

SD ENVIRONMENTALLY PREFERABLE MATERIALS AND PRODUCTS

- ❑ What environmentally preferable materials and products are being considered for the facility and where will they be used?
- ❑ How does the basic design facilitate recycling by students and staff?
- ❑ How has the construction waste management plan for the project evolved during schematic design?

SD WATER EFFICIENCY

- ❑ Is water efficient landscaping part of the preliminary site design?
- ❑ Is irrigating only the athletic fields being considered?
- ❑ Are water reduction techniques being considered for school plumbing fixtures and equipment?
- ❑ Is capturing and reusing rainwater being considered?
- ❑ Are innovative wastewater/ graywater treatment and/or reuse techniques being considered?

SD COMMUNITY INVOLVEMENT

- ❑ Have the Design Consultants made a presentation(s) of their proposal to the Community Board, District, NJSCC, PMF and public representatives? How have comments and other responses to their presentations been incorporated into the schematic design of the project?

SD COMMUNITY USE

- ❑ Have the community programs and facilities identified in the Program Design Phase been incorporated?
- ❑ How have issues such as independent access, control, separation of uses and users, etc. been considered in the placement and design of any shared use programs or facilities?
- ❑ Have the partners committed their respective funds to non-eligible costs?

SD CATALYST FOR ECONOMIC DEVELOPMENT

- ❑ How have the economic development opportunities identified in the program phase influenced the schematic design?

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Design Consultant Signature **Date**

DESIGN DEVELOPMENT

Design Consultant: _____
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Project Name _____
District _____
NJSCC Project # _____
DOE Project # _____

DD ACOUSTIC COMFORT

- ❑ How do the proposed materials and finishes, especially those used in the classrooms, contribute to reducing sound reverberation?
- ❑ Have the classrooms been analyzed in terms of projected acoustic performance?
- ❑ Will the proposed heating/ventilating/air conditioning (HVAC) system for the classrooms create noise? If so, how will the impacts of this noise be dealt with?

DD THERMAL COMFORT

- ❑ How have HVAC distribution layouts been designed to ensure all parts of a room receive adequate ventilation?
- ❑ How do proposed floor, wall and roof assemblies impact the thermal comfort strategy of the design?

DD VISUAL COMFORT

- ❑ Do the daylighting and electric lighting system designs provide illumination as uniformly as possible, using task or accent lighting as appropriate to meet specific needs?
- ❑ What tools have been used to model the interactions of both these systems in terms of their impacts on visual comfort?
- ❑ Have direct/indirect lighting fixtures been selected for general illumination in classrooms?
- ❑ What shading strategies (internal and external) have been selected?
- ❑ Have individual lighting designs been developed for individual room types? Do the designs vary, even within room type, depending on the amount of daylight the room will receive?
- ❑ Has the potential for glare being analyzed, and have the lighting/daylighting systems been designed to minimize it?
- ❑ Are the color and texture of wall, floor, and ceiling surfaces being taken into account in terms of their interaction with the lighting and their combined impact on the visual environment?
- ❑ Have the color and texture of wall, floor and ceiling surfaces been taken into account in terms of their interaction with lighting and their combined impact on the visual environment?

DD DAYLIGHTING

- ❑ What daylighting strategies have been selected for the school, particularly the classrooms?
- ❑ Are the classrooms receiving as much daylight as possible, while avoiding glare and unwanted heat gain?
- ❑ What types of glazing have been selected (for windows, clerestories, skylights and/or roof monitors) and why are they more energy and cost-effective than alternatives?
- ❑ How will the daylighting and electric lighting systems interact?
- ❑ What analyses have been done to optimize these interactions?

- ❑ How has the design consultant incorporated both daylighting and views to benefit as many users as possible and how has the anticipated performance been verified and coordinated with the MEP systems?
- ❑ Will the combined daylighting/electric lighting strategies reduce energy use and lower the school's operating costs over time?
- ❑ Has the possibility of reducing the number of light fixtures, or the number of lamps, in daylit rooms been investigated?

DD INDOOR AIR QUALITY

- ❑ Will the HVAC system provide adequate ventilation, especially to the classrooms?
- ❑ Is the HVAC system designed to minimize conditions conducive to mold/microbial growth?
- ❑ Does the design include individual exhaust/ventilation strategies for areas that may be sources of pollution, such as: kitchens, restrooms, science labs, janitor's closets, copy rooms, and vocational/industrial shop rooms?
- ❑ Does the design include CO^2 monitors for spaces with large variable, occupant loads?
- ❑ Are all the selected interior materials and products low emitters of indoor air contaminants?
- ❑ Have recessed grates or "walk-off mats" at entrances been included?
- ❑ Have specified materials been evaluated on the basis of pollutant source control?

DD SAFETY AND SECURITY

- ❑ How have Crime Prevention Through Environmental Design (CPTED) principles been applied during this phase of the process?
- ❑ Have opportunities for natural surveillance and access control been "designed in?"
- ❑ What security technologies have been selected? How do they reinforce and extend the impact of the school's security-focused design features?
- ❑ If a portion of the facility has been designated as an emergency shelter, has an emergency generator with an auto transfer switch been included?

DD ENERGY ANALYSIS

- ❑ Has the energy analysis tool(s) selected for the project been used to project energy consumption at least once (preferably several times) during this phase of design?
- ❑ Do the results meet or exceed the energy goal for the facility?

DD LIFE CYCLE COST

- ❑ Has the life cycle cost methodology selected for the project been used to compare and optimize alternative design strategies at least once (preferably several times) during this phase of the process?

DD COMMISSIONING

- ❑ Is appropriate design documentation being collected by or delivered to the commissioning agent?

DD LEARNING CENTERED DESIGN

- ❑ How is "personalization of space" being accommodated in the design?

- ❑ What types of small scale socialization and/or gathering spaces are being incorporated in the design?
- ❑ What techniques have been used to define individualized learning areas, small group areas, and breakout spaces?
- ❑ How are outdoor spaces being developed? Does the design create strong links to them via transition spaces between the inside and the outside?
- ❑ How are furniture, space-defining elements suspended from the ceiling, and other independent building elements contributing to the formation of learning-centered spaces?
- ❑ How is the "3D textbook" concept reinforced in the detailing of the school's design?

DD STIMULATING ARCHITECTURE

- ❑ How are the design goals articulated in the schematic design phase being accomplished in the design development phase?

DD ACCESSIBILITY

- ❑ How is input from special education personnel reflected in the detailing of critical areas (health suites and bathrooms, etc.) for disabled students? Are spaces detailed with both physical and cognitive disabilities in mind?
- ❑ How have the instruction spaces been detailed to offer a variety of sub-spaces that are visually and acoustically distinct? How can the spaces accommodate a teacher plus other adults (special teachers, personal aides, et al.) if necessary?
- ❑ How have specialized program areas, outdoor spaces and bathrooms been developed to accommodate students with special needs?
- ❑ How will proposed furnishings, fixtures, and equipment (FF&E) accommodate students with physical and/or cognitive disabilities (e.g. tables with rounded edges and corners, height-adjustable desks, lockers at the end of locker rows, etc.)?

DD FLEXIBILITY AND ADAPTABILITY

- ❑ How is flexibility - in plan and section - being achieved in individual spaces, especially the classrooms?
- ❑ How do the assemblies and systems selected in this phase reinforce design strategies adopted earlier to make the facility adaptable over time?
- ❑ Are the lighting and IT systems configured to allow for maximum flexibility in room utilization, especially in the classrooms?

DD INFORMATION TECHNOLOGY

- ❑ How have the selected technology systems been integrated with design strategies for specific spaces? Do the locations of projection equipment, whiteboards, monitors, etc. work well with the lighting/daylighting and heating/cooling strategies? Do room configurations positively support the use of technology in those rooms?
- ❑ How will selected technology systems be integrated with other building components (for example MEP, structural, fire protection, etc.)?

DD BUILDING SHELL

- ❑ What basic assemblies and configurations are being considered for the walls, floors and roofs of the facility?
- ❑ What types of materials (glazing, shading, insulation, air barriers, structural materials) have been selected and why are they better, from an energy and life cycle cost perspective, than other alternatives?
- ❑ How have trade-offs (between amounts of window versus wall, between one type of glazing versus another, etc.) been analyzed, and how has the performance of the building shell as a whole been optimized?
- ❑ How are the impacts of thermal mass being factored in?
- ❑ Are light colored surfaces, particularly roofing, being considered as a means to reduce heat gain?
- ❑ How do the final details address specific area of concern for building envelope performance including: thermal bridging, moisture transfer, air infiltration, water intrusion,etc.?

DD RENEWABLE ENERGY

- ❑ How are the renewable energy strategies selected for the school being incorporated into the design?
- ❑ What are their life cycle cost benefits?
- ❑ How much energy will they save?
- ❑ How will they impact and interface with other building systems (lighting, electrical, HVAC, building shell)?
- ❑ Will other building components interfere with the renewable energy systems (e.g. will the placement of a rooftop HVAC unit prevent sunlight reaching a solar collector, etc.)?
- ❑ Are there non-energy benefits associated with the proposed renewable energy systems; for example: peak shaving benefits, off-setting cost advantages (e.g. using photovoltaics as building materials; using the renewable system as a teaching tool; etc.)?

DD HVAC

- ❑ What type of HVAC system has been selected for the school? Why is this system optimal from a comfort/energy performance standpoint?
- ❑ How will the system perform from a life cycle cost perspective?
- ❑ How have the interactions between the HVAC system and other key building systems (lighting, daylighting, building shell) been analyzed and optimized?
- ❑ Has natural ventilation been considered? If so, have its potential impacts on HVAC performance been factored into the analysis process?
- ❑ Has the HVAC equipment been "right sized" to meet predicted demand? What control system(s) has been selected and how will it affect performance?
- ❑ What level of control will individual teachers have over the heating, ventilating and air conditioning of their classrooms?
- ❑ Is the entire system configured for easy operation, maintenance and repair?

DD LIGHTING

- ❑ What electric lighting systems(s) have been selected for the school and, in particular, for the classrooms?
- ❑ What are their energy and visual performance benefits?

- ❑ How do they interact with the daylighting strategies being implemented? How have these interactions been analyzed and optimized?
- ❑ What control system(s) have been selected and how will they affect performance?
- ❑ What level of control will teachers have over the lighting in their classrooms?
- ❑ Will the lighting design permit the facility to meet the proposed 'watts per square foot' goals?

DD ENVIRONMENTALLY RESPONSIVE SITE PLANNING

- ❑ Does the final design preserve existing natural areas on the site?
- ❑ Does the design help control stormwater runoff?
- ❑ Does the design minimize areas covered with impervious surfaces (e.g. parking lots, paved walkways, etc.)?
- ❑ Do landscaping strategies, particularly tree planting, enhance the building's high performance features (i.e. by providing shade where it's needed but not blocking sunlight that's used for daylighting)?
- ❑ Have exterior lights been designed to focus downward to minimize night light pollution?

DD ENVIRONMENTALLY PREFERABLE MATERIALS AND PRODUCTS

- ❑ What environmentally preferable materials and products have been selected for the facility and where will they be used? What percentage of materials will have recycled content and what percentage of recycled, sustainable, post-consumer and/or post-industrial content will these materials contain? Which materials will be highly durable and easy to maintain?
- ❑ How does the design facilitate recycling by students and staff? Is recycling "designed-in" as an integral part of the building to collect and store recyclable materials?
- ❑ How has the construction waste management plan for the project evolved during design development?
- ❑ What building materials are being sourced within the region or within a 500-mile radius of the facility? What percentage of the building's material will this material represent?
- ❑ How has the construction waste management plan for the project evolved during schematic design?

DD WATER EFFICIENCY

- ❑ Has high efficiency irrigation technology been selected for athletic fields?
- ❑ Does the design use captured rainwater or recycled water for irrigation?
- ❑ Does the design include high efficiency equipment (dishwashers, laundry, cooling towers)?
- ❑ Does the design include water saving strategies such as: low-flow showerheads; automatic lavatory faucet shut off controls; waterless urinals; etc.?
- ❑ Does the design include innovative wastewater/ graywater treatment and/or reuse techniques?

DD COMMUNITY INVOLVEMENT

- ❑ Have the Design Consultants made presentations of their proposal to the Community Board, District, NJSCC, PMF and public representatives?
- ❑ How have comments and other responses to their presentations been incorporated into the design of the project?

DD COMMUNITY USE

- ❑ Have use classifications changed as a consequence of the shared use programs or facilities? If so, how have these changes impacted design details such as egress requirements, building assembly ratings, etc.?
- ❑ What design details have been used to ensure independent access, control, separation of uses and users, etc. for the shared use programs or facilities?
- ❑ Do the shared uses have any specific design or construction requirements? Do the shared use partners, if any, have special needs or requirements?

DD CATALYST FOR ECONOMIC DEVELOPMENT

❑ How have the economic development opportunities identified in the program phase been incorporated into the design?

Design Consultant Signature **Date**

CONSTRUCTION DOCUMENTS

Design Consultant: _____
_____
_____
_____

Project Name _____
District _____
NJSCC Project # _____
DOE Project # _____

CD ACOUSTIC COMFORT

- ❑ Are the walls of classrooms that are located next to noise sources designed so that they reduce sound transmission?
- ❑ Has all potentially noisy equipment been detailed to minimize negative impacts of sound transmission?
- ❑ Have equipment manufacturer's installation recommendations been employed? If not, why not?

CD THERMAL COMFORT

- ❑ Do HVAC distribution layouts in their final configurations ensure all parts of a room receive adequate ventilation?
- ❑ Have controls been installed to provide teachers adequate control over the thermal comfort of their classrooms?

CD VISUAL COMFORT

- ❑ In their final configuration do the daylighting and lighting systems provide illumination in as uniform a manner as possible, using task or accent lighting as appropriate to meet specific needs?
- ❑ Have direct/indirect lighting fixtures been specified for general illumination in classrooms?
- ❑ What shading strategies (internal and external) have been specified?
- ❑ Have the final configurations of other building components - like the color of the walls, floor or ceiling – been changed in ways that might influence system performance?
- ❑ Have the potential impacts of these changes on visual comfort been accounted for?

CD DAYLIGHTING

- ❑ Will the construction details for the daylighting components (the windows, lightshelves, roof monitors, skylights, shading devices, etc.) modify the performance of the system as a whole; i.e. will the required amount of daylight still reach the classrooms, will glare and heat gain still be controlled, etc?
- ❑ What will be the impact – on operating costs and on visual comfort - of any changes in performance?
- ❑ Will the final construction details of other building components (for example, the color and reflectance of roofing materials adjacent to skylights or roof monitors) change the dynamics of the daylighting system and impact performance? What will be the impact – on operating costs and on visual comfort - of any changes in performance?

CD INDOOR AIR QUALITY

- ❑ How will the finally configured HVAC system provide adequate ventilation, especially to the classrooms?
- ❑ How will the system minimize conditions that are conducive to mold/microbial growth?
- ❑ What individualized exhaust strategies have been incorporated?
- ❑ Have CO^2 sensors in large assembly areas been included?
- ❑ Are all the selected interior materials and products - and their installation methods - low emitters of indoor air contaminants?
- ❑ Are recessed grates or "walk-off" mats installed at entrances to reduce the amount of dirt entering the building?

CD SAFETY AND SECURITY

- ❑ What type of exterior lighting has been specified and how will it improve security?
- ❑ Have durable materials been specified in critical areas such as entrances?
- ❑ What security technologies have been specified? How do they reinforce and extend the impact of the school's security-focused design features?

CD ENERGY ANALYSIS

- ❑ Are the materials, systems and equipment specified in this phase consistent with the materials, systems and equipment inputs used in previous energy performance analyses?
- ❑ Have any other inputs (use/schedule, rate structure, incentives, fuel sources, etc) changed since previous phases? How will these changes impact previous energy analysis results?

CD LIFE CYCLE COST

- ❑ Have the energy analysis tool(s) selected for the project been used to project energy consumption at least once during this phase of design?
- ❑ Do the results meet or exceed the energy goal for the facility?

CD COMMISSIONING

- ❑ Have commissioning requirements been included in the construction documents?
- ❑ Has a written commissioning plan been developed?

CD LEARNED CENTERED DESIGN

- ❑ How have the building's MEP systems and data infrastructure been detailed to accommodate the learning-centered design strategies developed earlier in the process, i.e. individualized learning areas, social/gathering spaces, breakout areas, etc.?

CD STIMULATING ARCHITECTURE

- ❑ How do the materials, finishes, and details incorporated into the construction documents support the design goals articulated in the schematic design and design development phases?

CD ACCESSIBILITY

- ❑ Does the detailing of critical areas for disabled students (health suites, bathrooms, etc.) have the benefit of input from special education and/or school health care personnel? Are spaces designed with both physical and cognitive disabilities in mind?
- ❑ How do the specified furnishings, fixtures, and equipment (FF&E) accommodate students with physical and/or cognitive disabilities?

CD 13.0 FLEXIBILITY AND ADAPTABILITY

- ❑ How is flexibility being achieved in the way the project is being detailed? What kinds of furnishings have been chosen to accommodate flexibility?
- ❑ Do the electrical, IT, telecom, and security systems have sufficient excess capacity to expand and change over time?

CD INFORMATION TECHNOLOGY

- ❑ Where have technology system/server rooms been accommodated?
- ❑ Have the selected technology systems be integrated with other building components(for example MEP, structural, fire protection)

CD BUILDING SHELL

- ❑ How do the final construction details for the wall, floor and roof assemblies maintain the original design intent in terms of energy performance. (For example, do the assemblies allow insulation to be installed at the thickness originally specified, do air barriers cover all the areas they are supposed to, can areas - such as roof cavities - that need ventilation be adequately vented in the current configuration, etc.?)
- ❑ How do the final details address specific areas of concern for the building envelope, including: thermal bridging, moisture transfer, air infiltration, water intrusion, etc.?

CD RENEWABLE ENERGY

- ❑ Will the renewable energy systems as detailed and specified perform as designed and analyzed in earlier phases of the project?
- ❑ How are the renewable energy systems in their final configurations anticipated to perform from a life cycle standpoint?
- ❑ What warranty periods have been specified for the systems?

CD HVAC

- ❑ Do the equipment and products specified for the HVAC system continue to meet the design and performance goals established previously?
- ❑ What analyses have been done to ensure the system is “right sized” for the expected demand?

CD ELECTRIC LIGHTING

- ❑ What lamps, ballasts and fixtures have been specified?
- ❑ Why are they the best choices in terms of visual comfort, energy use, and long term performance?
- ❑ Will the system as finally configured and specified be easy to operate, maintain and repair?
- ❑ What is the impact of the system as finally configured on electricity use?
- ❑ Does the system as finally configured minimize waste heat generation?
- ❑ Has this been taken into account in sizing the cooling system?
- ❑ What controls have been specified?
- ❑ How will they help save energy and operating costs?
- ❑ What level of control will individual teachers have over the heating, ventilating and air conditioning of their classrooms?
- ❑ 18.10 Do the lighting fixtures and equipment specified still correspond to the inputs used in previous energy, lighting, and/or cost analyses? Will the "watts/square foot" goals still be met?

CD ENVIRONMENTALLY RESPONSIVE SITE PLANNING

- ❑ Have hardy, indigenous plants been specified in the landscaping plan?

CD ENVIRONMENTALLY PREFERABLE MATERIALS AND PRODUCTS

- ❑ Are the construction documents and specifications clear and explicit concerning the required environmental performance and source of the materials and products specified?
- ❑ Is language included in the documents requiring that a proposed material or product substitution must be equal to or better than the specified product in terms of its environmental attributes and source?
- ❑ Has language concerning the construction waste management plan been incorporated in the general conductions, demolition specs, and other specifications as appropriate?

CD WATER EFFICIENCY

- ❑ Has high efficiency irrigation technology been specified for athletic fields?
- ❑ Has high efficiency equipment (dishwashers, laundry, cooling towers) been specified?
- ☐ Have water saving strategies (such as low-flow showerheads, automatic lavatory faucet. shut off controls, waterless urinals, etc) been specified?
- ☐ What innovative wastewater treatment techniques does the design include?
- ☐ What will be the impact of all these water saving strategies – in their final configurations – on water use at the school? Will the results meet the school's water use goals?

CD COMMUNITY INVOLVEMENT

- ❑ Have changes occurred in the project that will require significant redesign of key components?
- ❑ How will the community be meaningfully involved in these redesign efforts?

CD COMMUNITY USE

- ❑ Have the specific design or construction requirements in the shared use spaces been incorporated into the construction documents? Have the special needs or requirements of the shared use partners been incorporated and/or reviewed by the partners?

CD CATALYST FOR ECONOMIC DEVELOPMENT

- ❑ None

_____ _____

Design Consultant Signature **Date**

BID AND CONTRACT AWARD

Design Consultant: _____ **Project Name** _____
_____ **District** _____
_____ **NJSCC Project #** _____
_____ **DOE Project #** _____

BC ACOUSTIC COMFORT

- ❑ Have any substitutions been proposed – alternate wall/floor/ceiling
- ❑ materials, different types of HVAC equipment – that could impact
- ❑ acoustical quality, particularly in the classrooms?
- ❑ If these substitutions are accepted, how will they impact overall acoustic comfort?

BC THERMAL COMFORT

- ❑ Have any substitutions been proposed – alternate glazing materials, different types of insulation, different types of ventilation hardware - that could affect thermal comfort, especially in the classrooms?
- ❑ If these substitutions are accepted, how will they impact the thermal comfort of students and teachers, the energy performance of the building and its life cycle cost?

BC VISUAL COMFORT

- ❑ Have any substitutions been proposed – alternate glazing materials, different types of lamps or light fixtures, alternate colors for walls, floors or ceilings - that could affect visual comfort, especially in the classrooms?
- ❑ If these substitutions are accepted, how will they impact the visual comfort of students and teachers, the energy performance of the building and its life cycle cost?

BC DAYLIGHTING

- ❑ Have any substitutions been proposed – alternate glazing materials, different types of shading – that could impact the intended performance of the daylighting system?
- ❑ If these substitutions are accepted, how will they impact system performance, visual comfort and life cycle cost?

BC INDOOR AIR QUALITY

- ❑ Have any substitutions been proposed – alternate materials, a different ventilation system – that could impact indoor air quality?
- ❑ Are all substitute materials low emitters of indoor contaminants?
- ❑ Do substitute materials require different cleaning processes that may contaminate indoor air?
- ❑ Are substitutions being proposed for materials or assemblies designed to act as barriers to sources of indoor contaminants? Will the substitute materials/assemblies also act as effective barriers?

BC SAFETY AND SECURITY

- ❑ Have any material substitutions been proposed that could reduce the durability – and increase the vulnerability – of critical areas in the building (like entrances)?
- ❑ Have any security technology substitutions been proposed?
- ❑ How well will the alternative technologies fit in with and complement the school's design-focused security measures?
- ❑ How will the substitute technologies interface with other controls systems in the school (e.g. those for the lighting and HVAC systems)?
- ❑ If substitutions are accepted, will they be as easy to operate, maintain and repair as the originally specified products and systems?

BC ENERGY ANALYSIS

- ❑ Is the energy analysis tool(s) selected for the project being used to evaluate the energy consumption consequences of significant materials, products or system substitutions?

BC LIFE CYCLE COST

- ❑ Is the life cycle cost methodology selected for the project being used to analyze significant material or product substitutions in terms of their impacts on overall performance and cost effectiveness?

BC COMMISSIONING

- ❑ Has the commissioning plan been clearly explained to potential bidders?

BC LEARNING CENTERED DESIGN

- ❑ Have any substitutions been proposed – alternate designs, furniture, systems, different types of materials, etc.- that could affect the success of the original, learning-centered design intent?

BC STIMULATING ARCHITECTURE

- ❑ Have any substitutions been proposed for key architectural elements – alternate designs, different types of materials, etc.- that could affect the design goals established for the school?

BC ACCESSIBILITY

- ❑ Have any substitutions been proposed that will impact the accessibility of the design?

BC FLEXIBILITY AND ADAPTABILITY

- ❑ Have any substitutions been proposed for key elements of the design – alternate designs, different furniture manufacturers, etc - that could affect the overall flexibility of the school?

BC INFORMATION TECHNOLOGY

- ❑ Which parts of the technology bids are considered eligible costs under the E-rate program?

BC BUILDING SHELL

- ❑ Have any substitutions been proposed – alternate glazing materials, different types of insulation, alternate roofing products – that could impact the intended performance of the building shell?
- ❑ If these substitutes are accepted, how will they impact the energy performance and life cycle cost of the whole facility? Will they impact existing construction details? Will any redesign be required?

BC RENEWABLE ENERGY

- ❑ Have any substitutions been proposed – to specific systems or to the materials from which the systems are constructed - that could impact intended performance?
- ❑ If these substitutions are accepted, how will they impact the energy performance and life cycle cost of the whole facility?

BC HVAC

- ❑ Have any substitutions been proposed – alternate equipment, different types of controls, alternate hardware (e.g. diffusers) - that could modify system performance?
- ❑ After the substitutions, will the system still be "right sized" to meet the demand (not over- or under-sized)?
- ❑ If these substitutions are accepted, how will they impact the energy performance of the building and its life cycle cost?

BC ELECTRIC LIGHTING

- ❑ Have any substitutions been proposed – alternate lamps, ballasts or controls, etc. - that could impact the intended performance of the electric lighting system?
- ❑ Will these substitutions provide the same level of visible comfort as the design calls for?
- ❑ Will they add any additional waste heat to the space?
- ❑ Will they work correctly with the specified control system(s)?
- ❑ If these substitutions are accepted, how will they influence energy performance and life cycle costs?

BC ENVIRONMENTALLY RESPONSIVE SITE PLANNING

- ❑ Have any substitutions been proposed – different plants, alternate materials for parking lots or walkways, alternate exterior light fixtures – that could reduce the environmental quality of the site plan?
- ❑ Will any of these substitutions impact the performance of the building (for example, fewer trees may mean less shade and more heat gain in daylit classrooms)?
- ❑ Have these impacts been analyzed? How will they affect the overall life cycle cost of the facility?

BC ENVIRONMENTALLY PREFERABLE MATERIALS AND PRODUCTS

- ❑ Are all proposed substitutions equal to or better than the specified products in terms of environmental attributes?
- ❑ Are the substitutions also functionally equivalent to the specified products? (In other words, if they are accepted they will not adversely affect the performance of the system or assembly in which they are used.)
- ❑ What analyses have been done to ensure substitutions will not degrade environmental quality or system performance?

BC WATER EFFICIENCY

- ❑ Have any substitutions been proposed – alternate plumbing fixtures, different types of landscape vegetation, an alternate irrigation system - that could reduce the water efficiency of the school?
- ❑ If these substitutions are accepted, how will they impact water use and overall life cycle costs at the facility?

BC COMMUNITY INVOLVEMENT

- ❑ Have changes occurred in the project that will require significant redesign of key components?
- ❑ How will the community be meaningfully involved in these redesign efforts?

BC COMMUNITY USE

- ❑ Have the funds for any ineligible costs associated with the shared use programs or facilities been received and placed in escrow?

BC CATALYST FOR ECONOMIC DEVELOPMENT

- ❑ None

Design Consultant Signature **Date**

CONSTRUCTION ADMINISTRATION

Design Consultant: _____
_____
_____
_____

Project Name _____
District _____
NJSCC Project # _____
DOE Project # _____

CA ACOUSTIC COMFORT

- ❑ Is the building being constructed as designed to achieve acoustic comfort?
- ❑ Have any change orders been proposed – alternate wall/floor/ceiling materials, different types of HVAC equipment – that could impact acoustical quality, particularly in the classrooms?
- ❑ If these change orders are accepted, how will they impact overall acoustic comfort?

CA THERMAL COMFORT

- ❑ Is the building being constructed as designed for optimal thermal comfort, especially in the classrooms?
- ❑ Have any change orders been proposed – alternate glazing materials, different types of insulation, different types of ventilation hardware - that could affect thermal comfort, especially in the classrooms?
- ❑ If these change orders are accepted, how will they impact the thermal comfort of students and teachers, the energy performance of the building and its life cycle cost?

CA VISUAL COMFORT

- ❑ Is the building being constructed as designed to enhance visual comfort, especially in the classrooms?
- ❑ Have any change orders been proposed – alternate glazing materials, different types of lamps or light fixtures, alternate colors for walls, floors or ceilings - that could affect visual comfort, especially in the classrooms?
- ❑ If these change orders are accepted, how will they impact the visual comfort of students and teachers, the energy performance of the building and its life cycle cost?

CA DAYLIGHTING

- ❑ Is the building, especially the classrooms, being constructed as designed to provide as much natural light as possible?
- ❑ Have any change orders been proposed – alternate glazing materials, different types of shading – that could impact the intended performance of the daylighting system?
- ❑ If these change orders are accepted, how will they impact system performance, visual comfort and life cycle cost?

CA INDOOR AIR QUALITY

- ❑ Is the impact of the construction process on indoor air quality – for workers and, in the case of renovations, for students and teachers – being managed?
- ❑ Is the building being constructed as designed to ensure high indoor air quality?

- ❑ Have any change orders been proposed – alternate materials, a different ventilation system – that could impact indoor air quality?
- ❑ Are all alternate materials low emitters of indoor contaminants?
- ❑ Do alternate materials require different cleaning processes that may contaminate indoor air?
- ❑ Are change orders being proposed for materials or assemblies designed to act as barriers to sources of indoor contaminants? Will the alternate materials/assemblies also act as effective barriers?
- ❑ Is there a plan to "flush out" the facility for at least 72 hours after construction and before occupancy?

CA SAFETY AND SECURITY

- ❑ Is the building being constructed as designed to improve security?
- ❑ Are security technologies being installed as designed?
- ❑ Have any material change orders been proposed that could reduce the durability – and increase the vulnerability – of critical areas in the building (like entrances)?
- ❑ Have any security technology change orders been proposed?
- ❑ How well will the alternative technologies fit in with and complement the school's design-focused security measures?
- ❑ How will the alternate technologies interface with other controls systems in the school (e.g. those for the lighting and HVAC systems)?
- ❑ If change orders are accepted, will they be as easy to operate, maintain and repair as the originally specified products and systems?

CA ENERGY ANALYSIS

- ❑ Is the energy analysis tool(s) selected for the project being used to evaluate the energy consumption consequences of proposed materials, products or system change orders?
- ❑ Do the change orders impact the school's ability to meet its energy goal for the facility?

CA LIFE CYCLE COST

- ❑ Is the life cycle cost methodology selected for the project being used to analyze proposed material or product change orders in terms of their impacts on overall performance and cost effectiveness?

CA COMMISSIONING

- ❑ Has the commissioning plan been implemented?
- ❑ Has the functional performance of key systems been tested and verified?
- ❑ Are the results documented in a commissioning report?

CA LEARNING CENTERED DESIGN

- ❑ Have any change orders been proposed – alternate designs, furniture, systems, different types of materials, etc.- that could affect the success of the original, learning-centered design intent?

CA STIMULATING ARCHITECTURE

- ❑ Have any change orders been proposed for key architectural elements – alternate designs, different types of materials, etc. - that could affect the design goals established for the school?

CA ACCESSIBILITY

- ❑ Have any change orders been proposed that will impact the accessibility of the design?

CA FLEXIBILITY AND ADAPTABILITY

- ❑ Have any change orders been proposed for key elements of the design – alternate designs, different furniture manufacturers, etc - that could affect the overall flexibility of the school?

CA INFORMATION TECHNOLOGY

- ❑ Are the technology systems delineated in the shop drawings consistent with the design intent established in earlier projects of the program?

CA BUILDING SHELL

- ❑ Is the building shell being constructed as designed to achieve a high level of energy efficiency?
- ❑ Have any change orders been proposed – alternate glazing materials, different types of insulation, alternate roofing products – that could impact the intended performance of the building shell?
- ❑ If these change orders are accepted, how will they impact the energy performance of the building and its life cycle cost?
- ❑ If these change orders are accepted how will they impact existing construction details? Is any redesign required?

CA RENEWABLE ENERGY

- ❑ Are the renewable energy systems being installed as designed to achieve high performance?
- ❑ Have any change orders been proposed – to specific systems or to the materials from which the systems are constructed - that could impact intended performance?
- ❑ If these change orders are accepted, how will they impact the energy performance and life cycle cost of the whole facility?

CA HVAC

- ❑ Is the HVAC system being installed as designed to achieve high performance?
- ❑ Have any change orders been proposed – alternate equipment, different types of controls, alternate hardware (e.g. diffusers) - that could modify system performance?
- ❑ After the change orders, will the system still be “right sized” to meet the demand (not over- or under-sized)?

- ❑ If these change orders are accepted, how will they impact the energy performance of the building and its life cycle cost?

CA ELECTRIC LIGHTING

- ❑ Is the electric lighting system being installed as designed to achieve high performance?
- ❑ Have any change orders been proposed – alternate lamps, ballasts, controls, etc. - that could impact the intended performance of the electric lighting system?
- ❑ Will these change orders provide the same level of visual comfort as the design calls for?
- ❑ Will they add any additional waste heat to the space?
- ❑ Will they work correctly with the specified control system?
- ❑ If these change orders are accepted, how will they affect energy performance and life cycle costs?

CA ENVIRONMENTALLY RESPONSIVE SITE PLANNING

- ❑ Is the site being constructed and landscaped in the environmentally responsive way it was designed?
- ❑ Have any change orders been proposed – different plants, alternate materials for parking lots or walkways, alternate exterior light fixtures – that could reduce the environmental quality of the site plan?
- ❑ Will any of these change orders impact the performance of the building (for example, fewer trees may mean less shade and more heat gain in daylit classrooms)?
- ❑ Have these impacts been analyzed? How will they affect the overall life cycle cost of the facility?

CA ENVIRONMENTALLY PREFERABLE MATERIALS AND PRODUCTS

- ❑ Are efforts being made to minimize construction waste?
- ❑ Is some percentage of demolition and/or land clearing waste being salvaged or recycled?
- ❑ Is the building being constructed using the environmentally preferable products specified?
- ❑ Are all proposed change orders equal to or better than the specified products in terms of environmental attributes?
- ❑ Are the change orders also functionally equivalent to the specified products? (In other words, if they are accepted they will not adversely affect the performance of the system or assembly in which they are used.)
- ❑ What analyses have been done to ensure change orders will not degrade environmental quality or system performance?

CA WATER EFFICIENCY

- ❑ Are the building and grounds being constructed as designed to conserve water?
- ❑ Have any change orders been proposed – alternate plumbing fixtures, different types of landscape vegetation, an alternate irrigation system - that could reduce the water efficiency of the school?
- ❑ If these change orders are accepted, how will they impact water use and overall life cycle costs at the facility?

CA COMMUNITY INVOLVEMENT

None

CA COMMUNITY USE

- ❑ Are any special reviews and/or inspections required by the shared use partners? If so, what are they and how are they implemented?

CA CATALYST FOR ECONOMIC DEVELOPMENT

- ❑ None

Design Consultant Signature **Date**

NJSCC Design Manual

Appendix B

LEED Checklist

SCOPE AND INTENT

Executive Order #24 by Governor James McGreevey states in paragraph 3 *'All new school designs shall incorporate the guidelines developed by the United States Green Building Council known as "Leadership in Energy & Design ("LEED™"), Version 2.0 to achieve maximum energy efficiency and environmental sustainability in the design of schools.'*

Each PMF shall be required to ensure that every Project under their responsibility meets or exceeds 26 points towards the LEED™ Rating System as described in the publications "LEED Version 2.0 RATING SYSTEM" and "LEED Version 2.0 DOCUMENTATION REQUIREMENTS (SUMMARY). These publications are available at the US Green Building Council website http://www.usgbc.org/LEED/publications.asp. By using the LEED™ 2.0 certification requirements as a guideline, the PMF shall document and certify on the NJSCC Checklist Form attached with backup required to validate that the Project shall meet or exceed 26 points on the LEED™ rating scale, wherever possible. The PMF shall be required to provide this certification to the New Jersey Schools Construction Corporation (NJSCC) at each phase of each Project, from Programming through Post Occupancy, as identified in the Building Commissioning process and the Scope of Work.

The PMF (as Commissioning Authority), shall lead, organize and work with the Design Consultant, Contractors and all involved parties to achieve the 26 LEED™ points required. Actual certification and evaluation from the US Green Building Council and LEED™ is not required. It shall, however, be used as a target. For clarification purposes, the NJSCC policy on LEED™ is stated below. This shall apply to projects that have not as of the date of this bulletin entered into Construction Document (CD) phase of design.

NJSCC Policy on LEED™

1. Adopt LEED™ version 2.0 as a benchmark for the design, evaluation and construction of NJSCC managed school facilities projects that involve new construction. Projects shall meet all LEED™ prerequisites and achieve sufficient criteria to score at least 26 points on the LEED™ rating scale, wherever possible. Although not required under LEED™, NJSCC shall adopt a best practices approach for the design process that involves a "charette" or series of brainstorming sessions in which all stakeholders (architect, engineer, PMF, NJSCC project officer, school district, contractor, in cases of design/build approach and the public*) meet to ensure that green design principles are integrated into the project at an early stage. A checklist completed by the project architect will document the LEED™ criteria incorporated and the overall score of the project. Third party review and verification through an audit process shall reside in NJSCC's Project Management Firms (PMF).

2. LEED™ "certification" shall not be pursued. Documentation costs, together with registration and certification fees, and the bureaucracy and related time of another third party review of NJSCC projects, militate against formal certification through the USGBC at this time.

3. NJSCC will form a contractual alliance with an academic institution, such as the New Jersey Institute of Technology, to develop a methodology, data collection and "feedback loop" to verify the costs of LEED™ implementation, including design and engineering, construction, materials procurement, and resulting life cycle efficiencies, as well as overall effectiveness of the program. Following a set time frame, twelve to eighteen months, an assessment shall be conducted of the program and suggestions for changes/improvements made i.e., achieve higher LEED™ rating level, seek USGBC certification for all projects.

4. NJSCC shall avoid extracting individual criterion from LEED™ and imposing these as prescriptive design requirements. LEED™ is based on an integrated system of decision-making and evaluation. It is designed to encourage the design team to think holistically and in an integrated manner.

5. E.O. 24 does not differentiate between Abbott and non-Abbott school districts. If LEED™ is to be implemented by non-Abbott (non-NJSCC managed projects), and NJSCC grants conditioned on LEED™ compliance, then this requirement must be imposed through DOE rulemaking and the DOE, Facilities Division, must be appropriately staffed to evaluate and approve projects at the educational adequacy and final approval stages for incorporation of LEED™ criteria.

* Paragraph 3 of E.O. 24 "strongly encourage[s]" NJSCC "to provide opportunity for the community at large to have meaningful participation... in the design of the school facilities."

LEED™ Checklist Form

The PMF certifies to the NJSCC that the Project named herein is eligible to receive a minimum of 26 points, as identified below, in accordance with LEED™ 2.0 criteria and further described in Bulletin #24.

Abbott Early Childhood Center
Package Name:

1234-A12-34-1234
DOE Number:

ABCD Architects and Engineers
Design Consultant

John Smith
Name

Project Manager
Title

Smith Construction Management
Project Management Firm

Instructions:

The following checklist shall be completed at the conclusion of each designated project phase by the Design Consultant (DC) to denote credits anticipated to satisfy the USGBC LEED™ 2.0 Rating System criteria. The PMF shall review and submit this checklist to **leed.report@njit.edu** prior to authorizing the DC to proceed to the next phase. No other similar documentation shall be deemed to satisfy this requirement of the NJSCC.

SS	Sustainable Sites
WE	Water Efficiency
EA	Energy & Atmosphere
MR	Materials & Resources
EQ	Indoor Environmental Quality
ID	Innovation & Design Process

		LEED CREDITS	***Available Points***		***Program Phase***	***Schematic Design***	***Design Dev.***	***Construction Doc.***	***Construction Admin.***	***Project Closeout***
			PTS.		***PG***	***SD***	***DD***	***CD***	***CA***	***CO***
SS	Pr.1	Erosion and Sediment Control	0		0	0	0	0	0	0
SS	Cr.1	Site Selection	1							
SS	Cr.2	Urban Redevelopment	1		1	1	1	1	1	1

SS	Cr.3	Brownfield Redevelopment	1		1	1	1	1	1	1
SS	Cr.4.1	Public Transportation Access	1		1	1	1	1	1	1
SS	Cr.4.2	Bicycle Friendly	1		1	1	1	1	1	1
SS	Cr.4.3	Alternative Fuel Refueling Stations	1		1					
SS	Cr.4.4	Parking Capacity and Reductions	1		1	1				
SS	Cr.5.1	Protect and Restore Open Space	1		1	1				
SS	Cr.5.2	Maximize Open Space	1		1	1				
SS	Cr.6.1	Stormwater Management, Flow Reduction	1		1	1	1	1	1	1
SS	Cr.6.2	Stormwater Management, Flow Treatment	1		1	1				
SS	Cr.7.1	Reduce Heat Islands, Non-Roof Surfaces, Landscape & Exterior Design	1							
SS	Cr.7.2	Reduce Heat Islands, Roof Surfaces, Landscape & Exterior Design	1							
SS	Cr.8	Light Pollution Reduction	1							
WE	Cr.1.1	Water Efficient Landscaping, 50% Reduction	1							
WE	Cr.1.2	Water Efficient Landscaping, Potable Free System	1							
WE	Cr.2	Innovative Wastewater Technologies	1							
WE	Cr.3.1	Water Use Reduction, 20% Reduction*	1		1	1	1	1	1	1
WE	Cr.3.2	Water Use Reduction, 30% Reduction	1							
EA	Pr.1	Basic Building Commissioning	0		0	0	0	0	0	0
EA	Pr.2	Minimum Energy Performance	0		0	0	0	0	0	0
EA	Pr.3	CFC Reduction, HVAC&R Equipment	0		0	0	0	0	0	0
EA	Cr.1.1	Optimize Energy Performance, 20% New/ 10% Existing	2		2	2	2	2	2	2
EA	Cr.1.2	Optimize Energy Performance, 30% New/ 20% Existing	2		2	2				
EA	Cr.1.3	Optimize Energy Performance, 40% New/ 30% Existing	2							

EA	Cr.1.4	Optimize Energy Performance, 50% New/ 40% Existing	2								
EA	Cr.1.5	Optimize Energy Performance, 60% New/ 50% Existing	2								
EA	Cr.2.1	Renewable Energy, 5% Contribution	1		1	1	1	1	1	1	
EA	Cr.2.2	Renewable Energy, 10% Contribution	1		1	1					
EA	Cr.2.3	Renewable Energy, 20% Contribution	1								
EA	Cr.3	Additional Commissioning*	1		1	1	1	1	1	1	
EA	Cr.4	Ozone Depletion	1		1	1	1	1	1	1	
EA	Cr.5	Measurement and Verification	1		1	1	1	1			
EA	Cr.6	Green Power	1		1	1	1	1	1		
MR	Pr.1	Storage & Collection of Recyclables	0		0	0	0	0	0	0	
MR	Cr.1.1	Building Reuse, Maintain75% of Shell and Structure	1								
MR	Cr.1.2	Building Reuse, Maintain Additional 25% of Shell and Structure	1								
MR	Cr.1.3	Building Reuse, Maintain 100% of Shell & 50% Non-Shell	1								
MR	Cr.2.1	Construction Waste Management, Divert 50%	1								
MR	Cr.2.2	Construction Waste Management, Divert 75%	1								
MR	Cr.3.1	Resource Reuse, Specify 5%	1								
MR	Cr.3.2	Resource Reuse, Specify 10%	1								
MR	Cr.4.1	Recycled Content, Specify 25%	1								
MR	Cr.4.2	Recycled Content, Specify 50%	1								
MR	Cr.5.1	Local/ Regional Materials, 20% Manufactured Locally	1		1	1	1	1	1	1	
MR	Cr.5.2	Local/ Regional Materials, of 20% abv, 50 % harvested locally	1		1	1					
MR	Cr.6	Rapidly Renewable Materials	1								
MR	Cr.7	Certified Wood	1		1	1	1	1	1	1	

EQ	Pr.1	Minimum IAQ Performance	0	0	0	0	0	0	0	0
EQ	Pr.2	Environmental Tobacco Smoke Control	0	0	0	0	0	0	0	0
EQ	Cr.1	Carbon Dioxide Monitoring	1	1	1	1	1	1	1	1
EQ	Cr.2	Increase Ventilation Effectiveness	1	1	1	1	1	1	1	1
EQ	Cr.3.1	Construction IAQ Management Plan, during Construction	1	1	1	1	1	1	1	
EQ	Cr.3.2	Construction IAQ Management Plan, before Occupancy	1	1	1	1	1	1	1	
EQ	Cr.4.1	Low Emitting Materials, Adhesives & Sealants	1	1	1	1	1	1	1	1
EQ	Cr.4.2	Low Emitting Materials, Paints	1	1	1	1	1	1	1	1
EQ	Cr.4.3	Low Emitting Materials, Carpet	1	1	1	1				
EQ	Cr.4.4	Low Emitting Materials, Composite Wood	1	1	1	1	1			
EQ	Cr.5	Indoor Chemical & Pollution control	1	1	1	1				
EQ	Cr.6.1	Controllability of Systems, Perimeter*	1	1	1	1	1	1	1	1
EQ	Cr.6.2	Controllability of Systems, Non-Perimeter	1	1						
EQ	Cr.7.1	Thermal Comfort, Comply with ASHRAE 55-1992	1							
EQ	Cr.7.2	Thermal Comfort, Permanent Monitoring System	1	1						
EQ	Cr.8.1	Daylight & Views, Daylight 75% of Spaces *	1							
EQ	Cr.8.2	Daylight & Views, Views for 90% of Spaces	1							
ID	Cr.1.1	Innovation in Design: Attach Description	1							
ID	Cr.1.2	Innovation in Design: Attach Description	1							
ID	Cr.1.3	Innovation in Design: Attach Description	1							
ID	Cr.1.4	Innovation in Design: Attach Description	1							
ID	Cr.2	LEED™ Accredited Professional	1	1	1	1	1	1	1	1
		Total	**69**	**50**	**47**	**36**	**34**	**29**	**26**	

Pr.	Prerequisite
Cr.	Credit
Req.	Required of LEED™ Certification
*	Required of NJSCC D&C Guidelines

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NJSCC Design Manual
Acknowledgements

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