DESIGN-BUILD
CONTRACT DOCUMENTS
Volume 2 of 3
PERFORMACE SPECIFICATIONS

The Elliott Street School
Newark, New Jersey
Essex County

NJSDA Project Number: NE-0067-B01

Prepared for:
The New Jersey School Development Authority
375 McCarter Highway
Newark, NJ 07114

and

Newark Public Schools
2 Cedar Street
Newark, NJ 07102

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GMP Bid Set
March 25, 2009

SDA

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PROJECT INFORMATION

REQUEST FOR PROPOSALS

A. These documents, prepared by the Bridging Architect constitute a Request for Technical and Price Proposals for the design and construction of the project described below.

1. The concept plans and elevations have been approved by the NJSDA and Newark Public Schools. The successful Design-Builder shall complete the necessary Design Phase Services, including Schematic Design Phase, Design Development Phase and Construction Document Phase, including Drawings and Specifications, in compliance with the NJSDA 21st Century Schools Design Manual and other criteria contained herein.

B. Project Name: The Elliott Street School, located at the site of the existing Elliott Street School at the site bound by Summer Ave, Grafton Ave. and Elliott Street, in Newark, NJ.

C. NJ SDA Project Number: NE-0067-B01.

D. Owner:.

1. New Jersey Schools Development Authority
2. Address: 375 McCarter Highway, Newark, NJ 07114
3. Phone: 973-648-8335 Fax: 973-824-7801
4. Project Manager: Michael Anselmo.

E. Facility User (Project School District):

1. Newark Public Schools
2. Address: 3 Cedar Street, Newark, New Jersey,
3. Phone: 973-648-8335
4. Project Manager: James Heywood.

F. Bridging Architect, (Developer of this RFP):

1. Einhorn Yaffee Prescott Architecture & Engineering, PC
2. Address: 412 Broadway, Albany, New York, 12207
3. Phone: 518-431-3300; Fax 519-431-3333
4. Project Manager: John Sobiecki.

PROJECT DESCRIPTION

A. Summary Project Description:.

1. The School Facilities Project shall consist of a new approximate 126,000 gross square foot Elementary and Middle School serving Pre-Kindergarten through Grade 8 for a target capacity of 632 students plus staff and a parking structure.

2. The School Facilities Project is located at the site bounded by Elliott Street, Summer Avenue and Grafton Avenue in Newark N.J., at the site of the former Elliot Street School that was damaged beyond repair in a 2005 fire.
3. The school shall accommodate approximately 83,000 net square feet as identified in the Model Program included in Design-Build Contract Documents Volume 3 - Appendices.
4. The new school shall be designed in accordance with the NJSDA 21st Century Schools Design Manual and will be required to achieve certification rating of LEED Silver through the United States Green Building Council (USGBC).
5. The existing Elliott Street School has been demolished by separate contract, along with a series of adjacent residential properties to allow for the construction of the new School Facilities Project.

B. Contract Scope: Design and construction.

SELECTION PROCESS

A. The selection process will be a two-stage RFQ/RFP process. Pre-qualification of proposers has already taken place.

B. Proposal Selection Process: Pre-qualified, by NJ Schools Development Authority's jury, based on proposal submitted and "weighted criteria" evaluation.

1. Proposals will be accepted only from pre-qualified proposers.
2. See Section "Instructions to Bidders" contained in the Design-Build Contract Documents Volume 1 - Front End Documents for more information.

END OF SECTION 00005

SECTION 00300

INFORMATION AVAILABLE TO PROPOSERS

PRELIMINARY DATA

A. Certain preliminary investigations and studies made by the NJSDA are available to the proposers; refer to the Design-Build Project Manual Volume 3 - Appendices.

EXISTING CONDITIONS

A. Site and Utility Survey: Included in the Design-Build Contract Documents.

B. Site Drawing: Included in the Design-Build Contract Documents .

C. Geotechnical Report: Included in Design-Build Project Manual Volume 3 - Appendices.

PERMIT INFORMATION

A. The following permits will be obtained by the NJSDA / NJSDA, at no cost to the Design-Builder:

   1. Uniform Construction Code Permit, New Jersey Department of Consumer Affairs.

B. All other permits are to be obtained by the Design-Builder.

C. Provide documents required for submission to agencies and authorities having jurisdiction to obtain permits.

END OF SECTION 00300

SECTION 00570

CONTRACT DEFINITIONS

APPLICABILITY: THESE DEFINITIONS ARE INTEGRAL TO THE AGREEMENT.

DOCUMENTS

A. Design-Build Contract Documents: Those documents identified in the Agreement.

B. See additional definitions in the NJSDA Design-Build Agreement.

C. Design-Builder: Where the term Design-Builder is used in these specifications, it shall mean the "Contractor".

D. Project Program: The Newark Public Schools' requirements for size, arrangement, organization, and location of functional spaces, description of space functions, identification of fittings, equipment, and furnishings, description of the physical and environmental requirements for each space, together with a description of the image, goals, or "mission" of the project. The Project Program is Contained the the Educational Specification prepared by Morris Boyd Associates and is contained in the Design-Build Contact Documents, Volume 3 - Appendices.

E. Technical and Price Proposal: The Proposal Form and Exhibits, which comprise the information prepared by the prospective Design-Builder to show their method of complying with the Design-Build Contract Documents.

DESIGN AND CONSTRUCTION PHASES OR STAGES

A. Preliminary Design (Schematic Design): The process of finalizing the design criteria and preparing preliminary drawings and written descriptions to illustrate the proposed design of the work or a portion of the work to the NJSDA, as described in the Conditions of the Contract.

B. Design Development: The process of determining the form, arrangement, size, and materials of the work or a portion of the work as described in the 21st Century Schools Design Manual.

   1. The end of Design Development occurs before the beginning of preparation of Construction Documents.

   2. The end of Design Development for the project as a whole is a Milestone.

C. Construction Documents: The process of preparing working drawings, specifications, and other documents describing the work or a portion of the work in sufficient detail to allow accurate and complete construction, as described in the 21st Century Schools Design Manual.

   1. The end of Construction Documents for the project as a whole is a Milestone.

D. Construction:

   1. The Construction period is the time from the beginning of work on the project site until final payment a as indicated in the Design-Build Agreement.

2. The end of the Construction period is a Milestone.

E. Substantial Completion: As defined in the Design-Build Agreement ; prerequisites are:

1. Compliance with requirements of governing authorities, for submittals, inspections, and permits.
2. Compliance with NJSDA' requirements for access to areas occupied by the NJSDA.
3. HVAC balance reports completed and submitted.
4. Final cleaning.
5. Maintenance manuals.
6. Warranties.
7. Spare parts and extra materials.
8. Maintenance supplies and tools.
9. Project record documents.
10. Training of Newark Public Schools personnel .
11. Maintenance plan.

F. Closeout: The process of completing all details of both construction and commissioning.

1. The Closeout period is the time from the Date of Substantial Completion until Final Completion.
2. Before and during the Closeout period, the NJSDA will ascertain whether the completed project complies with the the Contract Documents.
3. See Design-Build Contract Documents Volume 1 - Front End Documents, Section 01700 "Contract Closeout" for additional requirements.

G. Occupancy: The period during which the project is occupied for its intended purpose.

1. The Occupancy period begins at the Date of Substantial Completion as Defined in the Design-Build Agreement.
2. Newark Public Schools is responsible for operation and maintenance of the project during Occupancy, unless specifically indicated otherwise for certain items.

H. Correction Period (Warranty Period): Function and time frame as defined by Section 13.0 of the Design-Build Agreement .

END OF SECTION 00570

SECTION 00830

DESIGN AND CONSTRUCTION PROCEDURES

MANAGEMENT AND COORDINATION

A. Access to and Use of Site: Design -Builder will have access to the entire site for the duration of the Project.

B. Existing Building(s):

1. Demolition: NJSDA has contracted with separate entity for demolition of existing buildings on site; site will be filled to existing grade and leveled.

C. Progress Schedule: As specified in the Design-Build Agreement and Division 1 General Requirements.

1. Submit updated schedule whenever adjustments that change the Contract Times or Milestones are approved.

D. Progress Documentation for NJSDA Information:

1. During Construction and Closeout: Photographs and graphic displays sufficiently detailed to allow individual departments to identify the status of the construction of their new spaces.

E. Progress Documentation for NJSDA Project Record:

1. During Construction: Monthly digital photographic record of each portion of the work, taken from consistent locations, distances, and angles.

2. During Closeout: Detailed digital photographic record of each interior room and space, each exterior elevation, the roof, and all site areas.

3. Photographs and Videos: Include the date taken, a short title of the view, and the compass orientation in each view; data must be in the actual photograph or frame, rather than added after printing (hand-printed lettering on an erasable marker board is acceptable).

QUALITY REQUIREMENTS

A. Design Criteria: During Design Development, the design and performance criteria must be refined, finalized, and documented.

1. NJSDA will appoint representatives of the following departments to provide details of functional needs and review proposed solutions:
   a. User groups.
   b. Food service staff.
   c. Operations staff.
   d. Maintenance staff.
   e. NJSDA commissioning agent.

2. Design Documentation: Record all design and performance criteria that will be of use during occupancy and operation of the project, including all items specified for maintenance manuals, below.

a. Design Criteria Documentation Included in Construction Documents: Organized logically (from the point of view of operations staff) and placed in a prominent location in drawing sets.
b. If desired, documentation may consist of annotated modifications to and amplification of the Conceptual Documents, with changes that affect Contract Times or Contract Price documented as required for modifications.
c. Drawings: Prepared using AutoCAD 2008, using the National CAD Standard drawing and layering conventions.
d. Shop Drawings: Prepared using same CAD software.
e. Mock-Ups: Where necessary to clarify design intent and obtain approvals, construction full-scale mock-ups, including:

B. Substantiation Requirements: See Section 111 for definitions and basic requirements; see other Sections for specific items of substantiation required; see Section 00570 - Contract Definitions for time periods relating to submission times.

C. Design Phase Services Substantiation Submittal Procedures:

1. Time Frames: As specified. If there is a conflict between the degree of detail or completion specified and the progress of the design or construction, obtain a clarification before submitting.

2. Recipient: As indicated in the Design-Build Agreement, Section 4.0 for each Design Phase submission, at the addresses indicted in Section 00005 Project Information.

3. Number of Copies: 4 copies for to each use and records; a total of not more than one copy will be returned.

4. For time periods that constitute Milestones, all substantiation submittals required during that period must be complete and accepted before the Milestone can be considered achieved.

5. Submit complete sets of documents including all documents required by the NJSDA 21st Century Schools Design Manual and containing all substantiation at end of the following Phases:
   a. Preliminary (Schematic) Design.
   b. Design Development.
   c. 60% Construction Documents.
   d. Construction Documents.

6. Resubmissions: Clearly identified as such, with all changes made since the original submittal clearly marked.

D. NJSDA Review of Substantiation: Unless otherwise indicated, NJSDA will make formal acceptance of substantiation submittals through the Bridging Architect.

1. If a submittal is not acceptable Bridging Architect will notify Design-Builder promptly.

2. Allow minimum of 15 working days for review of major "end of phase" submittals.

3. Refer to Design-Build Contract Documents Volume 1- Front End Documents for Bridging Architect's review of Shop Drawings, Product Data and similar construction submittals.

E. Substantiation Schedule: Prepare and maintain a complete schedule of substantiation items, showing:

1. Contents, for each item:
   a. Anticipated and actual item, with Section and paragraph number and drawing identification, if any.
   b. Anticipated submittal date, or time period(s) during which submittal is required.
   c. Actual submittal date.
   d. Action taken or other status.
   e. Identification of future re-submission requirement, if any.

2. If desired, schedule may be incorporated into overall progress schedule, provided substantiation data can be reported separately from other progress information.

3. Submission: To Bridging Architect at the initial meeting described in the Agreement Section 3.2 after notice to proceed.

4. Form: Computer database format for use in tracking submittals; database structured so Architect's added information will not be overwritten or deleted by incorporation of updated data from Design-Builder.

5. Updates: To Bridging Architect , monthly in hard copy and electronic media.

F. Field Testing and Inspection: Perform all testing, observation, and inspection required by the Design-Build Contract Documents and the final approved Construction Documents. Code prescribed Special Inspection will be performed by NJSDA.

1. Exception: Tests and inspections indicated to be performed by NJSDA commissioning agent or other independent agency.

2. Qualifications of Testing/Inspection Agencies:
   a. Qualified and equipped to perform applicable tests/inspection.
   b. Regularly engaged in testing and inspection activities on a commercial basis.
   c. Independent of Design-Builder and his contractors' organizations.
   d. Employed by Design-Builder directly.
   e. Authorized to operate in the State in which the project is located.
   f. Acceptable to NJSDA, and Bridging Architect
   g. Substantiation: Submittal of qualifications, based on ASTM E 329 and ASTM E 548.

3. Reports: Written report of each test/inspection; including complete details of conditions, methods, and results, signed by responsible individual.

4. Refer to Design-Build Contract Documents Volume 1 - Front End Documents, Division 1 Sections for additional information.

5. Design-Builder shall coordinate and schedule all testing, including code prescribed Special Inspections through the Construction Manager.

G. Reference Standards: Where products or workmanship is specified by reference to a document not included in the Contract Documents, comply with the requirements of the document, except where more stringent requirements are specified.

1. Date of Issue: Latest edition published as of date of contract documents except where a specific date is specified herein or established by code.
2. Copies on Site: Keep copies of referenced standards that prescribe installation or workmanship standards on site until completion.

H. Quality Management Program

1. The Design-Builder shall develop a Quality Management Program to ensure compliance with the Design-Build Contract Documents and Construction Documents, comply with and cooperate with the Construction Manager in carrying out this program.

TEMPORARY FACILITIES AND CONTROLS

A. New permanent facilities may be used during construction in accordance with Design Build Contract Documents Volume 1 - Front End Documents, *Design-Build Agreement* and General Requirements.

B. Refer to Design-Build Contract Documents Volume 1 - Front End Documents, and General Requirements including but not limited to "Summary of Work" and "Temporary facilities" for additional requirements.

C. Refer to Design-Build Contract Documents Volume 1, Front End Documents and General Requirements "Summary of Work" for temporary field office and furnishing requirements.

D. Vehicular Access and Parking: Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.

1. Parking for Construction Workers: By Design-Builder.

E. Security: Protect the work and NJSDA operations from unauthorized entry, vandalism, and theft; by Design-Builder. Refer to Design-Build Contract Documents Volume 1, Front End Documents, Design-Build Agreement for security guard requirements.

F. Erosion and Sediment Control: See Volume G.

G. Dust Control:

1. Exterior: Minimize raising dust, preventing dispersal of air-borne dust into atmosphere and over adjacent property.

H. Noise Control:

1. At All Times: Excessively noisy tools and operations will not be tolerated inside the building at any time of day; excessively noisy includes jackhammers.
2. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.

I. Waste Control: Provide waste storage and removal as required to maintain site in clean and orderly condition.

1. Disposal of Waste Off-Site: Periodic.

2. Waste Removal Service: Daily; including dumpsters.
3. Prohibited: Open free-fall chutes; containers without lids.

J. Pollution Control: Comply with federal, State, and local regulations.

K. Project Identification Sign: By Design-Builder to NJSDA design.

1. No other signs allowed on site without NJSDA permission except those required by law.

L. Removal of Temporary Facilities, Utilities, and Controls: Prior to Substantial Completion; including clean up, restoration of existing facilities used to original condition, restoration of permanent facilities used to specified condition, and repair of damage.

PRODUCT REQUIREMENTS

A. See Section 111 for general requirements for product options and substitutions.

B. NJSDA-Furnished Products: NJSDA will arrange for and deliver shop drawings and other submittals, arrange and pay for delivery to site, perform joint inspection after delivery, submit claims for transportation damage, replace items damaged prior to delivery, replace defective items, and arrange for manufacturer inspections, service, and warranties, for the following:

1. Furniture.

EXECUTION

A. Pre-Construction Survey: To be prepared by the Bridging Architect ; control and reference points will be indicated.

B. Work by NJSDA : The NJSDA will perform the following work, with his own forces or using other contractors:

1. Hazardous waste remediation, including cleanup of contaminated soils.
2. Demolition of existing buildings on site; site will be filled to existing grade and leveled.

C. Work by Newark Public Schools : The NPS will perform the following work, with his own forces or using other contractors:

1. Installation of items identified as NIC; prepare spaces and provide applicable utility connections.

D. Do not enter, cross, infringe upon, or limit access to adjacent property without first obtaining written permission from the property owner.

E. Health and Safety:

1. Use of explosives is not permitted.
2. Construction operations will comply with NFPA 241-2000, including applicable recommendations in Appendix A.

3. Use physical barriers to prevent access to areas that could be hazardous to workers or the public. Provide 8 foot high fence to enclose site.

4. Substantiation:
   a. Design Development: Identification of hazards in existing structures and on site, with preliminary plan for abatement.
   b. Construction Documents: Detailed specifications for hazardous material removal, abatement, and disposal.

COMMISSIONING

A. Demonstration: For each equipment item or system for which functional performance testing by Design-Builder is not specified, demonstrate all operational modes to Newark Public Schools at time acceptable to NJSDA and Newark Public Schools; if defects occur during demonstration, demonstration must be rescheduled for a time acceptable to NJSDA.

B. Commissioning Plan: NJSDA's Commissioning Agent (CxA) will prepare a complete plan and schedule of all commissioning activities, including those by NJSDA and code authorities; include all field tests and inspections, functional performance tests, demonstrations, and permit inspections and tests.

   1. If desired, schedule may be incorporated into overall progress schedule or substantiation schedule, provided commissioning tasks can be reported separately from other progress information.

C. NJSDA-Conducted Commissioning Activities:

   1. NJSDA will engage an independent commissioning agent to manage the commissioning process beginning in the Schematic Design Phase and to perform the commissioning activities.

   2. Commissioning: As outlined / identified in the NJSDA - 21st Century Schools Design Manual. The Design-Builder shall include in the schedule (for design and construction) and the GMP Proposals the appropriate time and effort for providing testing and for participation in the Commissioning Plan to be developed by the Commissioning Agent. The plan developed will follow generally accepted standards (see SDA Design Manual) for such plans. As noted, this project shall achieve LEED Silver certification (per the Design Manual - Basic and Enhanced Commissioning are a requirement). Therefore, the commissioning plan will be developed based on the preliminary list of LEED Credits that the Design-Builder intends to pursue for the project in order to achieve this minimum level of certification.

   3. Design-Builder and each subcontractor and Professional Service Consultant shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:
      a. Design and sizing for systems, equipment and controls, recommend modifications.

b. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
c. Cooperate with the Commissioning Agent. for resolution of issues recorded in the Issues Log.
d. Attend commissioning team meetings held..
e. Integrate and coordinate commissioning process activities with construction schedule.
f. Review and accept construction checklists provided by the Commissioning Agent.
g. Complete construction checklists as Work is completed and provide to the Commissioning Agent on a daily basis.
h. Review and accept commissioning process test procedures provided by the Commissioning Agent.
i. Complete commissioning process test procedures required by the Commissioning Agent.

CLOSEOUT SUBMITTALS

A. Refer to Design-Build Contract Documents Volume 1 - Frontend Documents, Division 1 General Requirements for Closeout Submittals.

B. Spare Parts and Extra Materials: As specified for specific products; delivered to location on project site designated by NJSDA; with receipt from NJSDA.

C. Maintenance Supplies and Tools: As specified for specific products; delivered to location on project site designated by NJSDA; with receipt from NJSDA.

DEMONSTRATION AND TRAINING

A. Training: Perform training of Newark Public Schools' personnel in operation and maintenance of equipment, consisting of:

1. Training is required for all software-operated systems, HVAC systems and equipment, plumbing equipment, electrical systems and equipment, conveying systems, and other electrically-operated equipment.
   a. Provide supplemental training within 6 months for operations that are seasonal in nature.

2. Instruction in operation, control, adjustment, shut-down, servicing, troubleshooting, and maintenance, for each equipment item for which training is specified.

3. Instruction in care, cleaning, maintenance, and repair of materials, for:
   a. Each item for which training is specified.
   b. Roofing, waterproofing,,other weather-exposed or moisture protection products.
   c. Finishes, including flooring.
   d. Items as specified in other Sections.

4. Major Software-Operated Systems: Training by software manufacturer at their facility for minimum of one NJSDA staff members, with take-home training materials.

5. Training Location: If not otherwise specified, conduct training in a classroom on

site, with videotapes made for future use.

6. Minimum Qualifications of Trainers: Knowledgeable about the project and the equipment and trained by the manufacturers.

7. Maintenance Manuals: Ready for use in training.

OPERATION AND MAINTENANCE

A. Operation and Maintenance: Design-Builder is responsible for the following:

1. Preparation of maintenance plan for NJSDA use, including description of maintenance activities, tools, and supplies required.

2. Periodic maintenance service as specified, for one year from the date of Substantial Completion, for the following:
   a. Elevators.

3. Services will be included under Design-Builder's contract with NJSDA.

4. Maintenance Services: Examination at frequency consistent with reliable operation; cleaning, adjusting, and lubricating; replacement of parts whenever required, using parts produced by the original manufacturer.

END OF SECTION 00830

SECTION 00840

REFERENCED DOCUMENTS

APPLICABILITY

A. The following documents form a part of the Contract Documents to the extent they are referenced elsewhere herein.

GOVERNMENT REGULATIONS AND PUBLICATIONS

A. CFR - Code of Federal Regulations, United States Government:

1. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Consumer Product Safety Commission; current edition.
2. 28 CFR 35 - Nondiscrimination on the Basis of Disability in State and Local Government Services; Final Rule; Department of Justice; current edition.
3. 28 CFR 36 - Nondiscrimination by Public Accommodations and in Commercial Facilities; Final Rule; Department of Justice; current edition.
4. 29 CFR 1910 - Occupational Safety and Health Standards; Occupational Safety and Health Administration; current edition.
5. 36 CFR 1191 - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; Final Guidelines and Amendment to Final Guidelines (ADAAG); Architectural and Transportation Barriers Compliance Board; current edition; reprinted compiling all revisions, September 1994.
6. 49 CFR 27, 37, and 38 - Transportation for Individuals with Disabilities; Final Rule; Department of Transportation; current edition.

B. U.S. Government Standards:

1. CPSC Pub. No. 325 - Handbook for Public Playground Safety; Consumer Product Safety Commission; 2008.
2. EPA/625/R-92/016 - Radon Prevention in the Design and Construction of Schools and Other Large Buildings; 1994 w/ Addendum.

MODEL CODE ORGANIZATIONS

A. ICC - International Code Council, Inc.:

1. ICC (IBC) - International Building Code; 2006.
2. ICC (IECC) - International Energy Conservation Code; 2006.
3. ICC (IFC) - International Fire Code; 2006.
4. ICC (IFGC) - International Fuel Gas Code; 2006.
5. ICC (IMC) - International Mechanical Code; 2006.

NON-GOVERNMENTAL STANDARDS DEVELOPING ORGANIZATIONS

A. AAMA - American Architectural Manufacturers Association:

1. AAMA 501.2 - Field Check of Metal Storefronts, Curtain Walls, and Sloped Glazing Systems for Water Leakage; 2003.
2. AAMA 1503 - Voluntary Test Method for Thermal Transmission and Condensation Resistance of Windows, Doors, and Glazed Wall Sections; 1998.
3. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2005.
4. AAMA GDSG-1 - Glass Design for Sloped Glazing; 1987.
5. AAMA/WDMA/CSA 101/I.S.2/A440 - Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors; 2005
6. AAMA TSGG - Two-Sided Structural Glazing Guidelines for Aluminum Framed Skylights; 2004.

B. AASHTO - American Association of State Highway and Transportation Officials:

1. AASHTO GDPS - Guide for Design of Pavement Structures, Volume 1; 1993 with 1998 supplement.
2. AASHTO GDPSV2-3 - Guide for Design of Pavement Structures, Volume 2; 1986.
3. AASHTO GDHS - A Policy on Geometric Design of Highways and Streets; 2004.

C. ACI - American Concrete Institute International:

1. ACI 201.2R - Guide to Durable Concrete; 2001.
2. ACI 301 - Specifications for Structural Concrete; 2005.
3. ACI 302.1R - Guide for Concrete Floor and Slab Construction; 2004 (Errata 2007).
4. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000.
5. ACI 305R - Hot Weather Concreting; 1999.
6. ACI 306R - Cold Weather Concreting; 1988 (Reapproved 2002).
7. ACI 308R - Guide to Curing Concrete; 2001.
8. ACI 336.1 - Reference Specification for the Construction of Drilled Piers; 2001.
9. ACI 530.1/ASCE 6/TMS 602 - Specification for Masonry Structures; 2005.
10. ACI SP-66 - ACI Detailing Manual; 2004.

D. AGA - American Gas Association:

1. AGA (DIR) - Directory of Certified Appliances and Accessories; 1998.

E. AHA - American Hardboard Association:

1. AHA A135.4 - Basic Hardboard; 2004.

F. ANSI - American National Standards Institute (for documents designated ANSI/XXXX, see organization XXXX - i.e see ICC for ANSI/ICC and ASME for ANSI/ASME) :

1. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2002.
2. ANSI A108 Series/A118 Series/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile; 2005.
3. ANSI A108.1A - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2005.
4. ANSI A108.1B - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar; 1999 (R2005).
5. ANSI A108.1C - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex Portland Cement Mortar; 1999 (R2005).
6. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 1999 (R2005).
7. ANSI A118.1 - American National Standard Specifications for Dry-Set Portland Cement Mortar; 1999 (R2005).
8. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile Setting and Grouting Epoxy and Water Cleanable Tile Setting Epoxy Adhesive; 1999 (R2005).
9. ANSI A118.4 - American National Standard Specifications for Latex-Portland Cement Mortar; 1999 (R2005).
10. ANSI A118.5 - American National Standard Specifications for Chemical Resistant Furan Mortars and Grouts for Tile Installation; 1999 (R2005).
11. ANSI A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation; 1999 (R2005).
12. ANSI A118.7 - American National Standard Specifications for Polymer Modified Cement Grouts for Tile Installation; 1999 (R2005).
13. ANSI A118.8 - American National Standard Specifications for Modified Epoxy Emulsion Mortar Grout; 1999 (R2005).
14. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (R2005).
15. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes For Thin-Set Ceramic Tile And Dimension Stone Installation; 1999 (R2005).
16. ANSI A135.4 - American National Standard for Basic Hardboard; 2004.

17. ANSI A136.1 - American National Standard for Organic Adhesives for Installation of Ceramic Tile; 1999 (R2005).
18. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2008.
19. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use; 2002.
20. ANSI A250.4 - American National Standard Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcings; 2001.
21. ANSI A250.6 - Hardware on Steel Doors (Reinforcement--Application); 2003.
22. ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames; 2003.
23. ANSI A250.11 - Recommended Erection Instructions for Steel Frames; 2001.
24. ANSI Z21.10.1 - Gas Water Heaters - Volume I - Storage Water Heaters with Input Ratings of 75,000 Btu per Hour or Less; 2004 (with Addendum B).
25. ANSI Z359.1 - Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components; 2007

G. ASCE - American Society of Civil Engineers:

1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2005.

H. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers:

1. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; 2007.
2. ASHRAE Guideline 1 - The HVAC Commissioning Process; 1996
3. ASHRAE Std 15 - Safety Code for Mechanical Refrigeration; 2007.
4. ANSI/ASHRAE Std 55 - Thermal Environmental Conditions for Human Occupancy; 2004.
5. ANSI/ASHRAE Std 62.1 - Ventilation for Acceptable Indoor Air Quality; 2007 (errata 2008).
6. ASHRAE Std 90.1 - Energy Efficient Design of new Buildings Except Low-Rise Residential Buildings; 2004.

I. ASME - American Society of Mechanical Engineers:

1. ASME A17.1 - Safety Code for Elevators and Escalators; 2004.
2. ASME A112.6.3 - Floor and Trench Drains; 2001 (R2007).
3. ASME A112.6.4 - Roof, Deck, and Balcony Drains; 2003.
4. ASME A112.18.1 - Plumbing Supply Fittings; 2005.
5. ANSI/ASME A112.19.2 - Vitreous China Plumbing Fixtures and Hydraulic Requirements for Water Closets and Urinals; 2003.

6. ANSI/ASME A112.21.2M - Roof Drains; 1991 (R1998).
7. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2001 (R2005).
8. ANSI/ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; 2001 (R2005).
9. ANSI/ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; 2006.
10. ASME (BPV IV) - Boiler and Pressure Vessel Code, Section IV, Rules for Construction of Heating Boilers; 2007.
11. ASME (BPV VIII, 1) - Boiler and Pressure Vessel Code, Section VIII, Rules for the Construction of Pressure Vessels; 2004.

J. ASTM - ASTM International:

1. Any Standards referebced in the Building Codes.
2. ASTM A 74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2006.
3. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2007.
4. ASTM B 42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2002.
5. ASTM C 564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2003a.
6. ASTM C 635 - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2004.
7. ASTM C 755 - Standard Practice for Selection of Vapor Retarders for Thermal Insulation; 2003.
8. ASTM C 836 - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course; 2006.
9. ASTM C 864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005.
10. ASTM C 1028 - Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method; 2007.
11. ASTM C 1115 - Standard Specification for Dense Elastomeric Silicone Rubber Gaskets and Accessories; 2006.
12. ASTM C 1184 - Standard Specification for Structural Silicone Sealants; 2005.
13. ASTM D 1003 - Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics; 2007.
14. ASTM D 2047 - Standard Test Method for Static Coefficient of Friction of

Polish-Coated Floor Surfaces as Measured by the James Machine; 2004.

15. ASTM D 4434 - Standard Specification for Poly(Vinyl Chloride) Sheet Roofing; 2006.
16. ASTM D 4637 - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane; 2004.
17. ASTM D 5019 - Standard Specification for Reinforced CSM (Chlorosulfonated Polyethylene) Sheet Used in Single-Ply Roofing Membrane; 2007a.
18. ASTM E 84 - Standard Test Methods for Surface Burning Characteristics of Building Materials; 2008.
19. ASTM E 96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials; 2005.
20. ASTM E 108 - Standard Test Methods for Fire Tests of Roof Coverings; 2007a.
21. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2008a.
22. ASTM E 283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004.
23. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2002.
24. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls By Uniform Static Air Pressure Difference; 2000.
25. ASTM E 413 - Classification for Rating Sound Insulation; 2004.
26. ASTM E 760 - Standard Test Method for Effect of Impact on Bonding of Sprayed Fire Resistive Material Applied to Structural Members; 1992 (Reapproved 2005).
27. ASTM E 814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2006.
28. ASTM E 1155 - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers; 1996 (Reapproved 2008); or ASTM E 1155M; 1996 (Reapproved 2008).
29. ASTM E 1264 - Standard Classification for Acoustical Ceiling Products; 1998 (Reapproved 2005).
30. ASTM E 1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2007.
31. ASTM E 1352 - Standard Test Methods for Cigarette Ignition Resistance of Mock-Up Upholstered Furniture Assemblies; 2002.
32. ASTM E 1477 - Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers; 1998a (Reapproved 2003).

33. ASTM E 1537 - Standard Test Method for Fire Testing of Upholstered Furniture Items; 2007.
34. ASTM E 1677 - Standard Specification for Air Barrier (AB) Material or System for Low-Rise Framed Building Walls; 2005.
35. ASTM F 476 - Standard Test Methods for Security of Swinging Door Assemblies; 1984 (Reapproved 2002).
36. ASTM F 793 - Standard Classification of Wall Covering by Use Characteristics; 2007.
37. ASTM F 842 - Standard Test Methods for Measurement of Forced Entry Resistance of Horizontal Sliding Door Assemblies, Excluding Glazing Impact; 2004.
38. ASTM F 1292 - Standard Specification for Impact Attenuation of Surfacing Materials Within the Use Zone of Playground Equipment; 2004.
39. ASTM F 1487 - Standard Consumer Safety Performance Specification for Playground Equipment for Public Use; 2007a.

K. BHMA - Builders Hardware Manufacturers Association:

1. ANSI/BHMA A156.19 - American National Standard for Power Assist and Low Energy Power Operated Doors; 2007.

L. CISPI - Cast Iron Soil Pipe Institute:

1. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; 2005.

M. CRI - Carpet and Rug Institute:

1. CRI 104 - Standard for Installation of Commercial Textile Floorcovering Materials; 2002.

N. GA - Gypsum Association:

1. GA-600 - Fire Resistance Design Manual; 2006.

O. GANA - Glass Association of North America:

1. GANA (SM) - FGMA Sealant Manual; 1990.
2. GANA (GM) - GANA Glazing Manual; 2004.

P. HPVA - Hardwood Plywood & Veneer Association:

1. ANSI/HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2004.

Q. IEEE - The Institute of Electrical and Electronics Engineers:

1. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System (Part 1); 1983.
2. IEEE 241 - IEEE Recommended Practice for Electric Power Systems in

Commercial Buildings; 1990 (R1997).

3. IEEE 739 - IEEE Recommended Practice for Energy Management in Industrial and Commercial Facilities; 1995.
4. IEEE 1100 - IEEE Recommended Practice for Powering and Grounding Sensitive Electronic Equipment; 2005.

R. IESNA - Illuminating Engineering Society of North America:

1. IESNA (LH) - Lighting Handbook; 2000.
2. IESNA RP-5 - Recommended Practice of Daylighting; 1999.
3. ANSI/IESNA RP-8 - American National Standard Practice for Roadway Lighting; 2000(R2005).

S. LPI - Lightning Protection Institute:

1. LPI-175 - Standard of Practice; 2004.

T. NEMA - National Electrical Manufacturers Association:

1. NEMA 250 - Enclosures for Electrical Equipment; 2003

U. NFPA - National Fire Protection Association:

1. NFPA 10 - Standard for Portable Fire Extinguishers; 2007.
2. NFPA 11 - Standard for Low-, Medium, and High-Expansion Foam Systems; 2005.
3. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2007.
4. NFPA 14 - Standard for the Installation of Standpipe, Private Hydrant, and Hose Systems; 2007.
5. NFPA 16 - Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems; 2007.
6. NFPA 17 - Standard for Dry Chemical Extinguishing Systems; 2002.
7. NFPA 20 - Standard for the Installation of Stationary Pumps for Fire Protection; 2007.
8. NFPA 25 - Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems; 2008.
9. NFPA 70 - National Electrical Code 2005.
10. NFPA 72 - National Fire Alarm Code; 2002.
11. NFPA 80 - Standard for Fire Doors and Fire Windows; 199.
12. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2000.
13. NFPA 261 - Standard Method of Test for Determining Resistance of Mock-Up Upholstered Furniture Material Assemblies to Ignition by Smoldering Cigarettes; 2003.

14. NFPA 780 - Standard for the Installation of Lightning Protection Systems; 2008.

V. NFSMI - National Food Service Management Institute:

1. NFSMI EX11-95 - The New Design Handbook; 1997.

W. NTMA - The National Terrazzo and Mosaic Association:

1. NTMA (SPECS) - [NTMA Terrazzo Specifications]; current edition located at www.ntma.com.

X. PCI - Precast/Prestressed Concrete Institute:

1. PCI MNL-116 - Manual for Quality Control for Plants and Production of Structural Precast Concrete Products; 1999, Fourth Edition.
2. PCI MNL-120 - PCI Design Handbook - Precast and Prestressed Concrete; Precast/Prestressed Concrete Institute; Sixth Edition, 2004.
3. PCI MNL-123 - Design and Typical Details of Connections for Precast and Prestressed Concrete; 1988, Second Edition.

Y. SDI - Steel Deck Institute:

1. SDI (DM) - Publication No. 30, Design Manual for Composite Decks, Form Decks, Roof Decks and Cellular Deck Floor Systems with Electrical Distribution; 2007.
2. SDI MOC - Manual of Construction with Steel Deck; 2006.

Z. SDI - Steel Door Institute:

1. ANSI/SDI 100 - Recommended Specifications Standard Steel Doors and Frames; 1991.
2. SDI 105 - Recommended Erection Instructions for Steel Frames; 1998.
3. SDI 107 - Hardware on Steel Doors (Reinforcement - Application); 1984.
4. SDI 111 - Recommended Standard Details for Steel Doors & Frames; 2000.

AA. SJI - Steel Joist Institute:

1. SJI Technical Digest No. 8 - Welding of Open Web Steel Joists; 1983.
2. SJI Technical Digest No. 9 - Handling and Erection of Steel Joists and Joist Girders; Steel Joist Institute; 2006.
3. SJI (SPEC) - Catalog of Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders; 2005.

AB. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association, Inc.:

1. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2003.
2. SMACNA (DCS) - HVAC Duct Construction Standards; 2005.
3. SMACNA (KVS) - Kitchen Ventilation Systems and Food Service Equipment Fabrication & Installation Guidelines; 2001.

AC. TCA - Tile Council of America:

1. TCA (HB) - Handbook for Ceramic Tile Installation; 2007/2008.

AD. TIA - Telecommunications Industry Association:

1. ANSI/TIA/EIA-568 - Commercial Building Telecommunications Cabling Standard; Rev B, 2001, and latest addenda.

AE. USGBC - U. S. Green Buildings Council, www.usgbc.org

1. USGBC LEED-NC - LEED for Schools Green Rating Syatem, First Edition, updated Novermber 2007.

AF. WDMA - Window and Door Manufacturers Association (formerly National Wood Window and Door Association):

1. WDMA I.S.1-A - Architectural Wood Flush Doors; 2004.

PRIVATE EVALUATION ORGANIZATIONS

A. FM - Factory Mutual System:

B. NFRC - National Fenestration Rating Council

C. NSF - NSF International:

1. ANSI/NSF 2 - Food Equipment; 2008.

D. UL - Underwriters Laboratories Inc.:

1. UL (BMD) - Building Materials Directory; current edition.
2. UL (FRD) - Fire Resistance Directory; current edition.

END OF SECTION 00840

SECTION 1

PROGRAM SUMMARY

BASIC FUNCTION

A. Project: This project is an educational facility consisting of a Pre-K to 8 school with adjacent parking garage with athletic fields above.

SPACES

A. Interior Spaces: The project includes spaces of the types and size indicated in the *Educational Specification for the Proposed new Elliott Street School* prepared by Morris Boyd Associates, and *Model Program* included in the Design-Build Contract Documents Volume 3 - Appendices. .

1. "Customer" Contact (SP1 Spaces): Spaces where the occupants meet the public or their customers, including reception desks, display areas, and customer service desks.
2. Occupant Work (SP2 Spaces): Spaces intended primarily for one worker, including offices.
3. Equipment Utilization (SP3 Spaces): Spaces where more than one person may use common equipment, including copier rooms, work rooms, computer rooms, mail rooms, production kitchen, medical treatment rooms, and industrial spaces.
4. Audience (SP4 Spaces): Spaces with fixed seating and proscenium stage and projection rooms.
5. Assembly (SP5 Spaces): Spaces without fixed seating, including assembly halls, library reading rooms, multipurpose rooms, and Cafeteria.
6. Meeting and Instruction (SP6 Spaces): Spaces for meeting rooms, conference rooms, classrooms, practice rooms, laboratories, and learning laboratories.
7. Athletic (SP7 Spaces): Spaces used primarily for athletic activities, including gymnasium and basketball court.
8. Occupant Services (SR Spaces): Spaces for toilets, showers, changing and dressing, eating, cooking, and resting (lounges).
9. Storage (SS Spaces): Rooms devoted to storage, including closets, storage rooms, cold storage, secure storage, and heavy-weight storage.
10. Circulation (SC Spaces): Spaces functioning as corridors, lobbies, waiting areas, vestibules, stairs, and ramps.
11. Building Services (SU1 Spaces): Spaces for service sinks, maintenance equipment, trash collection, trash removal, maintenance shop, and loading dock.
12. Utility Equipment (SU2 Spaces): Spaces for mechanical equipment, heating equipment, electrical equipment, communications equipment, and elevator equipment.

13. Indoor Automotive (SV1 Spaces): Spaces for parking private vehicles, truck docks, and passenger loading zone.

B. Exterior Spaces: The project includes spaces of the following types:

1. Outdoor Athletic (SP7 Spaces): Spaces used primarily for athletic activities, including basketball court, softball field, baseball field, and soccer field.

2. Outdoor Building Services (SU1 Spaces): Spaces for trash collection, trash removal, maintenance equipment storage, and delivery and loading.

3. Automotive (SV2 Spaces): Spaces for parking private vehicles, access roads, driveways, and passenger loading zone.

PROGRAM

A. Project Program: The project program with designated spaces and sizes, entitled Newark Public Schools Elliott Street School SLT IV East (DOE Approved - Model Space Plan), and the *Educational Specification for the Proposed New Elliott Street School* prepared by Morris Boyd Associates is included in Design-Build Construction Documents Volume 3 - Appendices. The program also includes an adjacent parking garage with playing fields located above the garage, with parking for automobiles.

EXISTING CONDITIONS

A. The proposed project site is the location of the Existing Elliott Street School, Newark, NJ..

B. See external documents identified in Section 00300 for more information.

END OF SECTION 1

SECTION 111

FACILITY PERFORMANCE

PERFORMANCE

A. Basic Function:

1. Provide built elements and site modifications as required to fulfill needs described in the project program.

2. The complete project comprises the following elements:
   a. Substructure (A): Elements below grade and in contact with the ground.
   b. Shell (B): The superstructure, exterior enclosure, and the roofing.
   c. Interiors (C): Interior construction, stairs, finishes, and fixtures, except fixtures associated with services and specialized equipment.
   d. Services (D): Mechanized, artificial, automatic, and unattended means of supply, distribution, transport, removal, disposal, protection, control, and communication.
   e. Equipment and Furnishings (E): Fixed and movable elements operated or used by occupants in the functioning of the project.
   f. Sitework (G): Modifications to the site, site improvements, and utilities.

3. Code: Make all portions of the project comply with the code. The code referred to herein consists of all applicable local, State, and federal regulations, including those listed below:
   a. Federal Regulatory Requirements:
      1) Americans with Disabilities Act of 1990, as a public accommodation, as implemented in:
         a) 28 CFR 35, Department of Justice regulations relating to State and local governments, including ADAAG.
         b) 28 CFR 36, Department of Justice regulations, including ADAAG-1994.
         c) 49 CFR 27, 37, and 38, Department of Transportation regulations, including ADAAG-1994.
      2) 29 CFR 1910-1997, Occupational Safety and Health Standards, as a work place.
   b. State of New Jersey regulatory requirements, which incorporate and/or amend the following:
      1) N.J.A.C. 5:23 et seq. Uniform Construction Code regulations, State of New Jersey.
      2) ICC International Building Code, New Jersey Edition, 2006 and N.J.A.C. 5:23-3.14 et seq.
      3) ICC-ANSI A117.1 Accessible and Usable Buildings and Facilities, 2003 , and N.J.A.C. 5:23-7 et seq. 2007)
      4) NJ Fire Code N.J.A.C. 5:70-4, et seq.
      5) ICC International Mechanical Code, New Jersey Edition, 2006 and N.J.A.C. 5:23-3.20 et seq. .
      6) National Standard Plumbing Code PHCC Plumbing Code, 2006 and N.J.A.C. 5:23-3.15 et seq..

7) ICC International Energy Conservation Code, 2006, ASHRAE 90.1 2004 and N.J.A.C. 5:23-3.18 et seq.
8) ICC International Fuel Gas Code, New Jersey Edition, 2006 N.J.A.C. 5:23-3.22 et seq..
9) NFPA 70, National Electrical Code, 2005 and N.J.A.C. 5:23-3.16 et seq. .
10) Radon Hazard Subcode: N.J.A.C. 5:23-10 et seq. Applies regardless whether the project is located in a Tier 1 municipality, as defined in Appendix 10-A.
11) Elevator Subcode: ASME A17.1, 2004 with A17.1a addenda and A17.1 S Supplement; N.J.A.C. 5:23-12 et seq

4. Make all portions of the project comply with the following Standards and Standards referenced therein:
   a. N.J.A.C. 6A-26-6.3 et seq. "Educational Facility Planning Standards" and 6A-26-6.4 et seq. "Educational Facility Planning Standards for School Facilities Housing Preschool Students"
   b. State of New Jersey regulatory requirements, which incorporate and/or amend the following:
      1) 21st Century Schools Design Manual, New Jersey School Development Authority, including all Appendices (Document available at http://www.njsda.gov/business/Doc_Form/tab/forms.html); Edition current as the date of this RFP, with the following revisions:
         a) Any requirement indicated as "Proposed Requirement" is optional.
         b) Appendix B: Project shall achieve LEED for Schools Silver Rating

5. Make all portions of the project comply with the following Newark Public Schools (NPS) Standards included in the Appendix and Standards referenced therein:
   a. NPS Technology Standards
   b. NPS – List of Approved Proprietary Items
   c. NPS – Finishes Matrix

6. Environmentally Responsible Design: In addition to other requirements, provide design and construction that minimizes adverse effects on the exterior environment, enhances the quality of the indoor environment, and minimizes consumption of energy, water, construction materials, and other resources.
   a. The project is designed to achieve at least a Silver rating in accordance with U.S. Green Buildings Council LEED-For Schools (1st Edition, Updated November 2007), Green Building Rating System; selection of specific credits to achieve is the responsibility of Design-Builder unless otherwise indicated; comply with criteria specified in current Rating System documentation as well as related criteria specified in other Sections.
   b. Substantiation:
      1) GMP Proposal Stage: LEED Checklist annotated to show specific credits to be achieved with brief description of how they will be achieved.
      2) Design Development and Construction Documents Stages:
         a) LEED Checklist annotated to show specific credits status of design related to specific credits to be achieved.

b) Comprehensive checklist of certification documentation specified in LEED Reference Guide, annotated to show which forms of documentation have been submitted.
c) The documentation specified in LEED Reference Guide that is relevant to the degree of completion of the design; at subsequent design stages it will not be necessary to repeat submissions of the same documentation unless the design has changed.

3) At Completion: LEED Certification, by U.S. Green Buildings Council.
a) Design-Builder shall submit application and pay applicable fees.
b) Design-Builder shall provide all certification documentation and install certification plaque.
c) Design-Builder shall provide NJSDA a complete duplicate of certification documentation.

7. Food Preparation, Storage, and Serving Facilities: Located, designed, and constructed to allow efficient operations, to minimize contamination and spoilage of foods, to allow easy maintenance and cleaning, and to provide effective protection against the entrance and harborage of pests.
   a. Provide a facility that is flexible enough to allow changes and adjustments due to modification of production procedures from time to time.
   b. Provide a facility that complies with the applicable recommendations of NFSMI EX11-95, "The New Design Handbook", 1997 and the requirements of the Educational Specification pprepared by Morris Boyd Associates in assocuiation with Einhorn Yaffee Prescott.
   c. Substantiation:
      1) Design Development: Space allocations and detailed program, if not already established; analysis of traffic flow of users and supplies.
      2) Design Development: Layouts and work flow diagrams, including methods of protecting against contamination of foodstuffs.
      3) Construction Documents: Material and equipment specifications.

8. Athletic Spaces (SP7 Spaces):
   a. Court and Field Designs: In accordance with National Federation of State High School Associations (NFHS) Court and Field Diagram Guide, 2006.

9. In addition to the requirements of this section, comply with requirements of Section 1 - Program Summary and Section 00830 - Design and Construction Procedures.

B. Amenity and Comfort:

1. Thermal Performance: Construct to provide comfortable interior environment in accordance with the code.

C. Health and Safety:

1. Fire Resistance: Provide minimum Type II-A construction in accordance with NJ Edition, ICC International Building Code.

2. The School is not an Emergency Shelter

3. Prevention of Accidental Injury: As required by code and as follows:

a. Safety Glazing: As defined by 16 CFR 1201; provide in locations required by code, glazed areas subject to human impact, glazed areas at grade, and doors.
b. Substantiation:
1) Construction Documents: For load-resisting elements, structural design calculations and drawings sealed by licensed structural engineer.

4. Lightning Hazard: Construct to prevent damage to occupants, structure, services, and contents due to lightning strikes.
a. Provide protection equivalent to that specified in NFPA 780-1997; supplementary strike termination devices, ground conductors, and grounding electrodes are required only where the integral portions of the structure cannot perform those functions.
b. Ground Resistance Measurement Methods: As described in NFPA 780-1997, Appendix I, or IEEE 81-1983.
c. Substantiation:
1) Construction Documents: Drawings showing locations and sizes of conductors, bonding of metal bodies, and components; detailed installation specifications.

5. Health Hazards:
a. Prevent growth of fungus, mold, and bacteria on surfaces and in concealed spaces.
b. Hazardous Construction Materials: Construct to comply with the requirements of the code.
c. Indoor Air Quality: Construct to comply with the code and the following:
1) Acceptable air quality as defined by ANSI/ASHRAE 62.1-2004.
2) Substantiation:
a) Construction Documents: Specifications showing that construction materials are not contaminant sources and do not adversely affect air quality.
b) Commissioning: Field measured outside and supply air quantities for each space and its associated air handler.

6. Physical Security: In addition to any provisions that may be required by law or code, design and construct both exterior and interior spaces to incorporate the "Best Practices Standards For Schools Under Construction or Being Planned For Construction (Revisions as of 10 November 2008)" (available at http://www.state.nj.us/dca/codes/misc/pdf/ed_bp_stndrs_11_10_2008.pdf)

7. Electrically-Operated Equipment and Appliances: UL listed for application or purpose to which they are put; suitable for wet locations listing for exterior use.

D. Structure:

1. Capacity: Provide loadbearing substructure members as required by code and designed to distribute dead loads, live loads, and environmental loads so that bearing capacity of soil is not exceeded.

2. Dead Loads: Construct to accommodate loads from weights of building materials, construction itself, and all fixed service equipment.

3. Live Loads: Construct to accommodate loads from use and occupancy of the building, either uniformly distributed loads as prescribed by code or concentrated loads, whichever are more demanding structurally.

4. Environmental Loads: Construct to accommodate loads from all environmental forces in accordance with code and the following:
   a. Windloads, earthquake laods and soil loads.

5. Earthquake Loads: Construct to accommodate loads as prescribed by ASCE 7-2005.

6. Substantiation:
   a. Construction Documents: Identification of major structural materials and systems.
   b. Construction Documents: Detailed listing of design criteria and preliminary analysis, prepared by a licensed structural engineer.
   c. Construction Documents: Detailed design analysis by licensed structural engineer.
   d. Where design is delegated to the the manufacturer, provide detailed design analysis by licensed structural engineer

E. Durability:

1. Expected Service Life Span: Expected functional service life of the built portions of this project is 50 years.
   a. Service life spans of individual elements that differ from the overall project life span are defined in other Sections.
   b. Substantiation: Since actual service life cannot be proven, substantiation of actual service life is not required; however, the following are reasonable indicators of anticipatable service life:
      1) Design Development: Replacement cost, in today's dollars, for each major element that has a service life expectancy less than that of the project; include both material and labor cost, but not overhead or profit; base costs on installing in existing building, not as a new installation.
      2) Design Development: Life cycle cost of project, over the specified project service life, excluding operating staff costs; include costs of:
         a) Replacement of each element not expected to last the life of the project; identify the frequency of replacement.
         b) Energy for operation of equipment and systems, from energy analysis specified under "Operation and Maintenance".
         c) Routine maintenance of operating equipment, including replacement of worn parts before failure; identify frequency of maintenance.
         d) Routine cleaning of exposed materials; identify type of cleaning and frequency.
         e) Deduct salvage value of replaced elements.
         f) Calculate costs in today's dollars, disregarding the time value of money, inflation, taxes, and insurance.

F. Operation and Maintenance:

1. Space Efficiency: Minimize floor area required while providing specified spaces and space relationships, plus circulation and services areas required for functions.

2. Energy Efficiency: Minimize energy consumption while providing function, amenity, and comfort specified.
   a. Provide energy efficient design using procedures and values specified in ASHRAE 90.1-2004.
      1) Provide at least 15 percent less energy consumption than that of an equivalent minimally-complying baseline building, demonstrated by comparing the actual Design Energy Cost to the Energy Cost Budget of a prototype building, both calculated in accordance with ASHRAE 90.1.
   b. Substantiation:
      1) Design Development: Detailed listing of design criteria and design analysis showing compliance, prepared by a licensed mechanical engineer.
      2) Design Development: Energy cost of all energy-consuming equipment and systems over the first year of operation; include analysis of probable change in annual cost over time due to aging but disregarding inflation and rate changes.
      3) Construction Documents: Detailed listing of design criteria and design analysis showing compliance, prepared by a licensed mechanical engineer.

3. Water Consumption: Minimize water consumption.
   a. Substantiation:
      1) Design Development: Quantity of water that will be used in the first year of operation, divided into domestic water, HVAC water, and other water categories, with required storage capacity and quantity of water recycled, if any; include basis of calculations.
      2) Construction Documents: Updated water consumption, based on actual equipment selections and sizes.

4. Waste (Trash/Rubbish) Removal: As described in the project program.

5. Ease of Operation: Provide facility, equipment, and systems that are easily operated by personnel with a reasonable level of training for similar activities.
   a. Minimize the need for specialized training in operation of specific equipment or systems; identify all equipment and systems for which the manufacturer recommends or provides training programs.
   b. Train Newark Public Schools personnel in operation of equipment and systems; see Section 00830 for additional requirements.
   c. Substantiation:
      1) Design Development: Operating impact analysis, including identification of type and quantity of staff, tools, and supplies required; estimate of impact that aging materials will have on operating requirements; no cost calculations required; identify source of data.
      2) Construction Documents: Updated operating impact analysis, based on actual product selections.

6. Ease of Maintenance: Minimize the amount of maintenance required.
   a. Substantiation:

1) Design Development: Maintenance impact analysis, including identification of maintenance effort (type of staff, time required, and frequency), tools, and supplies required, over expected functional and aesthetic service life of project; including preventive maintenance, replacement of parts, and cleaning, but not energy for operation or replacement at end of service life; no cost calculations required; identify source of data.
2) Design Development: Maintenance cost for first year of operation, based on use of maintenance contracts; estimate of the impact that aging materials will have on maintenance costs; description of maintenance activities included in estimated cost.
3) Construction Documents: Updated maintenance cost for first year of operation, based on actual product selections.

7. Ease of Repair: Elements that do not meet the specified requirements for ease of repair may be used, provided they meet the specified requirements for ease of replacement of elements not required to have service life span equal to that specified for the project as a whole; the service life expectancy analysis and life cycle cost substantiation specified for service life are provided; and NJSDA' acceptance must be granted.

8. Ease of Replacement:
   a. Elements Not Required to have the Expected Service Life Span Equal to that Specified for the Project as a Whole: Make provisions for replacement without undue disruption of building operation.

ELEMENTS AND PRODUCTS

A. In addition to requirements specified in other Sections, provide products and elements that comply with the following.

B. Where "no substitutions is permitted" is indicated, use only the product (or one of the products) specified.

C. Elements Made Up of More Than One Product:

1. Where an element is specified by performance criteria, use construction either proven-in-use or proven-by-mock-up, unless otherwise indicated.
   a. Proven-In-Use: Proven to comply by having actually been built to the same or very similar design with the same materials as specified and functioning as specified.
   b. Proven-by-Mock-Up: Compliance reasonably predictable by having been tested in full-scale mock-up using the same materials and design as specified and functioning as specified. Testing need not have been accomplished specifically for this project; when published listings of independent agencies include details of testing and results, citation of test by listing number is sufficient (submittal of all test details is not required). where testing is specific for this project, NJSDA shall approve mock-up.
   c. The Design-Builder may choose whether to use elements proven-in-use or proven-by-mock-up, unless either option is indicated as specifically required.

d. Where test methods accompany performance requirements, use those test methods to test the mock-up.
e. Exception: Where a design analysis is specified, or allowed by the NJSDA, substantiation of proven-in-use or proven-by-mock up construction is not required.

2. Where a type of product is specified, without performance criteria specifically applicable to the element, use the type of product specified.

3. Where more than one type of product is specified, without performance criteria specifically applicable to the element, use one of the types of products specified.

4. Where a type of product is specified, with applicable performance criteria, use either the type of product specified or another type of product that meets the performance criteria as proven-in-use or proven-by-mock-up.

5. Where more than one type of product is specified, with applicable performance criteria, use either one of the types of products specified or another type of product that meets the performance criteria as proven-in-use or proven-by-mock-up.

6. Where neither types of products nor performance criteria are specified, use products that will perform well within the specified life span of the building.

D. Products:

1. Where a product is specified only by a manufacturer name and model number/brand name, use only that model/brand product.

2. Where the properties of a product are specified by description and/or with performance criteria, use products that comply with the description and/or performance criteria.

3. Where manufacturers are listed for a particular product, use a product made by one of those manufacturers that also complies with other requirements.

SUBSTANTIATION

A. Definition: Substantiation is any form of evidence that is used to predict whether the design will comply with the requirements or to verify that the construction based on the design actually does comply. During Preliminary Design, Design Development, and Construction Documents, requirements to submit substantiation are primarily intended to forestall use of designs or constructions that will not comply. At any time before completion of construction, substantiation is presumed to be only a prediction and may subsequently be invalidated by actual results.

1. Regardless of whether substantiation is specified or not, the actual construction must comply with the specified requirements and may, at the NJSDA discretion, be examined, inspected, or tested to determine compliance.

2. Substantiation submittals will not be approved or accepted, except to the extent that they are part of documents required to be approved or accepted in order to proceed to the next stage of design or construction. However, approval or acceptance of substantiation will not constitute approval or acceptance of deviations from the specified requirements unless those deviations are specifically identified as such on the submittal.

B. In addition to the requirements stated in other Sections, provide the following substantiation of compliance at each stage of the project:

1. If a substantiation requirement is specified without an indication of when it is to be submitted, submit or execute it before the end of Construction Documents.

C. Previous Construction: Where elements proven-in-use are used to comply with performance requirements:

1. During Design Development, identify proven-in-use elements proposed for use, including building name, location, date of construction, owner contact, and description of design and materials in sufficient detail to enable reproduction in this project.

D. Mock-Up Testing: Where elements proven-by-mock-up are used to comply with performance requirements:

1. During Design Development, identify proven-by-mock-up elements proposed for use, with test report including date and location of test, name of testing agency, and description of test and mock-up.

2. Mock-up testing need not have been performed specifically for this project, provided the mock-up is substantially similar in design and construction to the element proposed.

E. Design Analyses (including Engineering Calculations):

1. Where a design analysis or calculation is specified without identifying a particular method, perform analysis in accordance with accepted engineering or scientific principles to show compliance with specified requirements, and submit report that includes analysis methods used and the name and qualifications of the designer.

2. Where engineering design is allowed to be completed after commencement of construction, substantiation may be in the form of shop drawings or other data.

3. Submit design analyses at the end of Design Development unless otherwise indicated.

4. Where design analysis is specified to be performed by licensed design professional, use a design professional licensed in New Jersey.

F. Products:

1. Where actual brand name products are not identified by either the NJSDA or the Design-Builder, identify the products to be used.

2. During Preliminary Design or Design Development:

a. Where more than one product type is identified for a particular system, assembly, or element, identify exactly which type will be used.
b. For each product type, provide descriptive or performance specifications; early submittals may be brief specifications, but complete specifications are required prior to completion of construction documents.
c. For each product type, identify at least one manufacturer that will be used.
d. For major manufactured products that are commonly purchased by brand name, and any other products so indicated, provide manufacturer's product literature on at least one actual brand name product that meets the specifications, including performance data and sample warranty.

3. During Construction:
   a. Identify actual brand name products used for every product, except commodity products specified by performance or description.
   b. Where a product is specified by performance requirements with test methods, and if so specified, provide test reports showing compliance.
   c. Provide manufacturer's product literature for each brand name product.
   d. Provide the manufacturer's certification that the product used on the project complies with the contract documents.

4. Before End of Closeout:
   a. Provide copies of all manufacturer warranties that extend for more than one year after completion.

END OF SECTION 111

SECTION A

SUBSTRUCTURE

PERFORMANCE

A. Basic Function:

1. Provide substructure as required to support the completed and occupied building safely and without uncontrolled subsidence or other movement.

2. Substructure comprises the following elements:
   a. Foundations (A1): Structures responsible for transferring dead loads, live loads, and environmental loads of completed building to the earth in such a way that the building is supported evenly and without movement.
   b. Basements (A2): Space-enclosing elements below grade, including necessary excavation, structural walls and floor, and other elements of enclosure such as waterproofing and thermal insulation.

3. Where substructure is integral with elements defined within another element group, meet requirements of both element groups.

4. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance.

B. Amenity and Comfort:

1. Thermal Performance: Provide thermal resistance as necessary to maintain interior comfort levels specified and in accordance with code and the following:
   a. Energy Efficiency: As specified in Section 111 - Facility Performance.
   b. Condensation: None on interior surfaces under normal interior temperature and relative humidity conditions, during 98 percent of the days in the coldest 3 months of the year.
   c. Minimum thermal performance values for individual substructure elements are also specified in other Sections.
   d. Substantiation:
      1) Construction Documents: Identification of major thermal resistant materials and systems.
      2) Construction Documents: Detailed listing of design criteria and design analysis, prepared by licensed mechanical engineer.
      3) Construction Documents: Product data on thermal materials and details of continuous thermal barrier.

2. Water Penetration: Prevent ground water penetration into the interior of the building, under any circumstances.
   a. Substantiation:
      1) Construction Documents: Identification of major water resistant assemblies and drainage features.
      2) Construction Documents: Details of proven-in-use or proven-by-mock-up design.

3. Water Accumulation: Prevent accumulation of water in open areas adjacent to substructure.
   a. Substantiation:
      1) Construction Documents: Details of proven-in-use or proven-by-mock-up design.

C. Health and Safety:

1. Fire Resistance: Provide fire resistance in accordance with code.
   a. For all elements required to have a fire resistive rating and which are not made of materials and systems specified as acceptable by the code, use proven-by-mock-up construction.
   b. For proven-by-mock-up construction, acceptable testing agencies are Underwriters Laboratories Inc..
   c. Minimum performance values for individual substructure elements are also specified in other Sections.
   d. Substantiation:
      1) Construction Documents: Identification of assemblies required to have fire resistance rating and method to be used to achieve rating.
      2) Construction Documents: Identifying numbers on the construction drawings.

2. Substance Exclusion: Prevent accumulation of harmful chemicals and gases such as radon and methane in spaces below substructure and subsequent penetration into occupied spaces.
   a. Substantiation:
      1) Design Development: Identification of major radon resistant assemblies, chemical resistant assemblies, and ventilation features.
      2) Construction Documents: Details of proven-in-use or proven-by-mock-up design.
      3) Occupancy: Field testing to verify the absence of significant levels of harmful gases and chemicals after minimum of 6 months' occupancy.

3. Vermin Protection: Provide permanent protection against infestation of construction by ground dwelling termites and other vermin.

D. Structure:

1. Capacity: Provide loadbearing substructure members as required by code and designed to distribute dead loads, live loads, and environmental loads so that bearing capacity of soil is not exceeded.
   a. Extend bearing portions of substructure to levels below frostline at project location; not less than 3 ft below grade.
   b. Provide spread footings that do not exceed the allowable soil bearing capacity, piles that provide adequate friction to withstand loading, or other foundation systems acceptable to governing authorities.

2. Dead Loads: Construct to accommodate loads from weights of building materials, construction itself, and all fixed service equipment.

3. Live Loads: Construct to accommodate loads from use and occupancy of the building, either uniformly distributed loads as prescribed by code or concentrated loads, whichever are more demanding structurally.

4. Environmental Loads: Construct to accommodate loads from all environmental forces in accordance with code and the following:
   a. Lateral Soil Loads: Lateral pressure of soil adjacent to vertical substructure elements, including potential surcharge from fixed or moving loads and potential hydrostatic pressure.
   b. Vertical Soil Loads: Full hydrostatic pressure applied over entire substructure area.
   c. Earthquake: In accordance with requirements of Section 111 - Facility Performance.
   d. Wind: Overturning forces attributable to design wind speed at project location applied to full building height.

5. Substantiation:
   a. Construction Document: Identification of major structural materials and systems.
   b. Construction Documents: Detailed design analysis by licensed structural engineer.

E. Durability:

1. Corrosion Prevention: Provide supplementary protection for underground metal elements, sufficient to prevent corrosion completely for the service life of the element without maintenance.
   a. 3 inches of concrete cover is considered to be permanent protection.

F. Operation and Maintenance:

1. Provide substructure elements that will endure for the lifetime of the building with no maintenance.

PRODUCTS

A. Use the following: Products specified in Sections A1 and A2.

METHODS OF CONSTRUCTION

A. The following existing substructure elements shall be preserved:

1. Active utilities to remain.

B. The following existing substructure elements shall be removed to accomplish new construction:

1. Existing foundations and footings.

2. Abandoned utilities

END OF SECTION A

SECTION A1

FOUNDATIONS

PERFORMANCE

A. Basic Function:

1. Provide foundations as required to support the completed and occupied building safely and without uncontrolled subsidence or other movement.

2. Foundations comprise the following elements:
   a. Standard Foundations: Includes spread footings below columns, linear spread footings below loadbearing walls, foundation walls not part of basements, caisson (pier) caps, and pile caps.
   b. Other Foundations: All types of special foundation systems, including permanent shoring and underpinning, raft foundations, piles, drilled piers (caissons), cofferdams, and permanent dewatering systems.
   c. Floors on Grade (A13): All elements necessary for slab foundations, including trenches, pits, and sumps, equipment bases, integral thermal insulation, slab moisture protection, and subdrainage system.

3. Where foundations are integral with elements defined within another element group, meet requirements of both element groups.

4. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance and Section A - Substructure.

B. Amenity and Comfort:

1. Thermal Performance:
   a. Minimum thermal performance values for individual foundation elements are also specified in other Sections.

2. Water Protection:
   a. Waterproofing: Provide permanent waterproofing at portions of foundation that enclose building space and parking garage.
   b. Drainage: Provide method of collecting and draining water from below portions of foundation that enclose space or parking garage.
   c. Substantiation:
      1) Construction Documents: Product data on specific water protection materials and systems; details of construction to achieve permanent water protection.

C. Structure:

1. Capacity: Provide loadbearing foundation members as required by Section A - Substructure.

PRODUCTS

A. Use one of the following:

1. Concrete spread footings at bearing capacity indicated in the Geotechnical Report included in Section 6.0 of the "Design-Build Project Manual, Volume 3 - Appendices, " of the Design-Build Contract Documents.

B. Do not use any of the following:

1. Wood foundation systems.
2. Masonry footings.
3. Masonry foundation walls.

END OF SECTION A1

SECTION A13

FLOORS ON GRADE

PERFORMANCE

A. Basic Function:

1. Provide floors on grade as required to enclose habitable spaces and support interior functions without subsidence, structural cracking, or other uncontrolled movement.

2. Floors on grade comprise structural slabs that are installed over fill or at excavated and compacted grade, including all depressions in the floor, such as trenches, pits, and sumps. Floors on grade also include equipment bases, under floor and perimeter drainage, thermal insulation at floor edge, and moisture barriers installed integrally with floor system.
   a. Floor Flatness (FF): Provide floors on grade engineered and constructed to achieve degree of flatness as follows, when measured in accordance with ASTM E 1155-1996(R01):
      1) Specified Overall Value (SOV): 35.
      2) Minimum Localized Value (MLV): 24.
   b. Floor Levelness (FL): Provide floors on grade engineered and constructed to achieve degree of levelness as follows, when measured in accordance with ASTM E 1155-1996(R01):
      1) Specified Overall Value (SOV): 25.
      2) Minimum Localized Value (MLV): 17.
   c. Provide floor flatness and floor levelness as required by finish floor manufacturer's recommendations, when more stringent tolerances are required.

3. Where floors on grade are integral with elements defined within another element group, meet requirements of both element groups.

4. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section A - Substructure, and Section A1 - Foundations.

B. Amenity and Comfort:

1. Thermal Performance: Provide thermal properties at edges of floors on grade as necessary to maintain interior comfort levels specified and in accordance with code.
   a. Vapor Retardation: Limit vapor transmission through floor construction to maximum rate of 0.1 perms at locations where impermeable applied interior finishes such as resilient flooring, wood flooring, epoxy flooring or acrylic terrazzo are used.
      1) Use supplementary vapor retarder if necessary to meet requirements.
      2) Use method of sealing joints between vapor retarder elements that will be effective given available construction practices.
   b. Substantiation:
      1) Construction Documents: Product data on thermal materials and details of construction to achieve required thermal performance.

C. Health and Safety:

1. Radon Exclusion: Prevent accumulation of radon and subsequent penetration into building interior, in accordance with substance exclusion provisions of Section A - Substructure.
   a. Airtight floor construction.
   b. Impermeable seals at all service penetrations of floor construction.
   c. Active soil depressurization system in accordance with recommendations of EPA/625/R-92/016-1994.

D. Durability:

1. Floor Classifications: For concrete floors on grade, comply with composition and finishing recommendations of ACI 302.1R-2004 for floor classifications based on type of anticipated traffic and intended use.

2. Water-Cement Ratio: For concrete slabs on grade that are partly or completely exposed to freezing conditions, limit water-cementitious materials ratio as recommended by ACI 302.1R-2004.
   a. Moderate to Severe Exposure: Maximum 0.50.
   b. Exposure Subject to Deicing Chemicals: Maximum 0.45.
   c. Exposure to Salt Water: Maximum 0.40.

3. Air Content: For concrete slabs on grade that are partly or completely exposed to freezing conditions, provide air content in accordance with recommendations of ACI 201.2R-2001.

PRODUCTS

A. Use one of the following:

1. Concrete floor slabs throughout the project.

B. Do not use any of the following:

1. Masonry pavers on compacted fill.

2. Wood flooring on treated wood sleepers.

3. Bituminous concrete paving.

END OF SECTION A13

SECTION A2

BASEMENTS

PERFORMANCE

A. Basic Function:

1. Provide basements as required to enclose habitable space below grade and to support the completed and occupied building safely and without uncontrolled subsidence or other movement.

2. Basements comprise the following elements:
   a. Basement Excavation: Excavation, excavation supports that become a permanent part of substructure, backfill, and compaction of backfill for basement construction.
   b. Basement Walls: All elements of wall construction that occur below or partially below grade, including thermal insulation, waterproofing and dampproofing, and subdrainage.

3. Where basements are integral with elements defined within another element group, meet requirements of both element groups.

4. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance and Section A - Substructure.

B. Amenity and Comfort:

1. Thermal Performance: Provide thermal resistance as necessary to maintain interior comfort levels specified and in accordance with Section A - Substructure.

2. Water Protection:
   a. Waterproofing: Provide permanent waterproofing at portions of basement that enclose space and parking garage. Acceptable method:
      1) Permanent, waterproof barrier on exterior of basement construction, protected against damage from backfill.
   b. Drainage: Provide method of collecting and draining water from exterior areas in contact with basements that enclose space and parkign garage.
   c. Substantiation:
      1) Construction Documents: Subsurface investigation to identify location of water table and identification of basement areas requiring waterproofing systems.
      2) Construction Documents: Product data on water protection materials and systems; details of basement construction to achieve permanent water protection.

C. Health and Safety:

1. Radon Exclusion: Prevent accumulation of radon and subsequent penetration into basement spaces, in accordance with substance exclusion provisions of Section A - Substructure and as follows:
   a. Impermeable seals at all service penetrations of basement enclosure.

b. Active soil depressurization system in accordance with recommendations of EPA/625/R-92/016-1994.

D. Structure:

1. Capacity: Provide loadbearing basement elements as required by Section A - Substructure.
   a. Minimum Wall Thickness: Not less than thickness of superstructure walls supported by basement walls.

E. Durability:

1. Corrosion Prevention: Provide not less than 3 in of cover for metal reinforcing at any locations potentially exposed to ground water or surface water.

PRODUCTS

A. Use one of the following:

1. Reinforced concrete basements.

B. Do not use any of the following:

1. Non-reinforced masonry.
2. Reinforced masonry.
3. Treated wood.

METHODS OF CONSTRUCTION

A. Use the following methods and techniques:

1. Sheet Waterproofing:
   a. Composite Sheet Waterproofing: Self-adhering layer of rubberized asphalt laminated to polyethylene sheet.
      1) Total Thickness: Minimum 55 mils.

END OF SECTION A2

SECTION B

SHELL

PERFORMANCE

A. Basic Function:

1. Provide permanently enclosed spaces for all functional areas shown in the project program, unless otherwise indicated. Provide a physical enclosure that keeps out weather, unwelcome people, animals, and insects without requiring specific action by occupants, while providing convenient movement of occupants between inside and outside, desirable natural light, and views from inside to outside. Provide level floor areas, comfortable ceiling heights, and essentially vertical walls.

2. The elements forming usable enclosed space and separating that space from the external environment comprise the shell and consist of:
   a. Superstructure (B1): All elements forming floors and roofs above grade and within basements, and the elements required for their support, insulation, fireproofing, and firestopping.
   b. Exterior Enclosure (B2): All essentially vertical elements forming the separation between exterior and interior conditioned space, including exterior skin, components supporting weather barriers, and jointing and interfacing components; not including the interior skin unless an integral part of the enclosure.
   c. Roofing (B3): All elements forming weather and thermal barriers at horizontal and sloped roofs and decks, and roof fixtures.

3. Exterior Surfaces Exposed to View: Surfaces visible from street or ground level, plus surfaces visible from windows of same building.

4. Where shell elements also function as elements defined within another element group, meet requirements of both groups.

5. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance.

B. Amenity and Comfort:

1. Thermal Performance: Provide construction that will have thermal resistance as necessary to maintain interior comfort levels specified and in accordance with code and the following:
   a. Energy Efficiency: As specified in Section 111.
   b. Condensation: None on interior surfaces under normal interior temperature and relative humidity conditions, during 98 percent of the days in the coldest 3 months of the year.
   c. Components That Have Surfaces Facing Both Interior and Exterior Environment: Condensation Resistance Factor (CRF) as required to meet requirement above, when tested in accordance with AAMA 1503-1998.
   d. Substantiation:

1) Construction Documents: Identification of major thermal resistant materials and systems.
2) Construction Documents: Detailed listing of design criteria and design analysis, prepared by licensed mechanical engineer.
3) Construction Documents: Product data on thermal materials and details of continuous thermal barrier.

2. Air Infiltration: Maximum of 0.06 cfm per square foot of exterior surface area, measured in accordance with ASTM E 283-2004 at differential pressure of 6.24 psf.
   a. Use supplementary air barrier over entire shell.
   b. Use method of sealing joints between elements that will be effective given available construction practices.

3. Water Penetration: Provide materials to prevent water penetration into the interior of the building, under conditions of rain driven by 50 mph wind.
   a. Substantiation:
      1) Construction Documents: Identification of major water resistant assemblies.
      2) Construction Documents: Details of proven-in-use or proven-by-mock-up design.

4. Natural Light: Provide fenestration in shell as required to meet requirements for natural light as specified in Section C and in accordance with code and the following:
   a. 21st Century Schools Design Manual

5. Natural Ventilation: Provide for natural ventilation in accordance with code and the following:
   a. 21st Century Schools Design Manual
      1) Substantiation:
         a) Construction Documents: Drawings showing natural ventilation location, ventilation opening areas, and floor areas being served.
         b) Construction Documents: Engineering design calculations and drawings prepared by licensed engineer.

6. Acoustical Performance: Construct the shell to limit sound transmission as follows:
   a. 21st Century Schools Design Manual
      1) Exterior Noise Level: Maintain maximum average daytime and nighttime noise level from interior sound sources in accordance with local regulations, measured at the project property line.
      2) Vibration Control: Use shell elements that will not resonate at frequencies that are characteristic of ambient exterior sound sources at the project site.
      3) Minimum performance values for individual shell elements are also specified in other Sections.
      4) Substantiation:
         a) Construction Documents: Measurements of ambient site noise levels over full range of audible frequencies, identification of acoustic properties of major interior and exterior sound and vibration generators, and preliminary analysis prepared by an acoustical engineer.

b) Construction Documents: Drawings showing details required for acoustic performance.
c) Construction: Field tests of representative spaces to verify compliance with performance requirements.

7. Cleanliness of Exterior Surfaces: Provide materials that will:
   a. Prevent attraction and adherence of dust and air-borne dirt and soot, and minimize appearance of settled dust and dirt.
   b. Be washed reasonably clean by normal precipitation.
   c. Prevent precipitation from washing settled dust and dirt over surfaces exposed to view.

8. Appearance: Provide materials for exterior appearance with characteristics meeting the intent of the Design-Build Contract Documents Drawings.
   a. Matching NJSDA' approved elevations included in the Design-Build Contract Documents.
   b. Concealing mechanical equipment, plumbing equipment, electrical equipment, and piping, conduit, and ducts from view from the street.
   c. Concealing rooftop mechanical equipment, plumbing equipment, electrical equipment, and piping, conduit, and ducts from view from the street.
   d. Substantiation:
      1) Construction Documents: Drawings showing facade treatment for principal elevations identifying visible materials.
      2) Construction Documents: Details of building shell, annotated to show compliance with performance requirements.

C. Health and Safety:

1. Fire Resistance: Provide materials with fire resistance in accordance with code.
   a. For proven-by-mock-up construction, acceptable testing agencies are Underwriters Laboratories Inc., Inchcape Testing Services (Warnock-Hersey), and Factory Mutual
   b. Minimum performance values for individual shell elements are also specified in other Sections.
   c. Substantiation:
      1) Construction Documents: Identification of assemblies required to have fire resistance rating and method to be used to achieve rating.
      2) Construction Documents: Identifying numbers in the construction documents.

2. Accidental Injury: Provide materials to protect pedestrians and building occupants in accordance with code and the following:
   a. Prevent ice and snow from falling off building elements onto pedestrians, building occupants, and vehicles.
   b. Substantiation: As specified in Section 111 - Facility Performance.

3. Physical Security: Provide protection as follows:

a. Comply with DCA Best Practices Standards For Schools Under Construction or Being Planned For Construction (Revisions as of 10 November 2008) indicated in Section 111.
b. Opaque Elements at Ground Level: Use materials that give the impression of strength, for discouragement of opportunistic attempts at intrusion.
c. Opaque Elements at Ground Level: Resist penetration by chainsaw or 10 lb sledge hammer (10 blows) wielded by one individual.
d. Doors: ASTM F 476-1984(R02) or ASTM F 842-2004 as appropriate, Grade 10.
e. Windows: Different levels of protection for different locations; see Section B22.
   1) Substantiation:
      a) Construction Documents Identification of proposed methods of meeting security requirements.
      b) Construction Documents: Identification of materials to be used, the physical properties that accomplish the security requirements, and details of anchorage to the structure.

4. Ventilation of Special Spaces: Provide for outside air movement through enclosed shell volumes in accordance with code.

D. Structure:

1. Structural Performance: Support all loads without damage due to loads, in accordance with code.
   a. Special Components: If design method is not specifically prescribed by code, design in accordance with ASCE 7-2005.
   b. Provide shell elements to resist loosening or detachment in winds equivalent to the code design wind speed.
   c. Shell elements engineered by their manufacturer or fabricator, rather than by the engineer-of-record, shall comply with the following additional requirements:
      1) Manufacturer/fabricator employs licensed structural engineer to accomplish design of structural elements.
      2) Manufacturer/fabricator has minimum of 5 years experience in the design and manufacture of similar structures.
   d. Elements engineered by their manufacturer or fabricator, rather than by the engineer-of-record, shall not be provided for superstructure.
   e. Substantiation:
      1) Construction Documents: Identification of major structural materials and systems.
      2) Construction Documents: Detailed listing of design criteria and preliminary analysis, prepared by a licensed structural engineer.
      3) Construction Documents: Detailed design analysis by licensed structural engineer (for structures engineered by their manufacturer or fabricator, engineer-of-record will provide detailed design criteria, with design analysis postponed until construction stage).
      4) Construction: For structures engineered by their manufacturer or fabricator, detailed design analysis prepared by and shop drawings stamped by a licensed structural engineer, with approval of engineer-of-record recorded.

2. Construction Loads and Erection Stresses: Accommodate temporary construction loads and erection stresses during construction.

E. Durability:

1. Service Life Span: Same as building service life, except as follows:
   a. Load-Bearing Structural Members: Minimum of 100 years.
      1) No anticipated deterioration when protected as constructed.
      2) Protective Elements: Minimum 25 years.
   b. Wall Primary Weather-Barrier Elements: Minimum 50 years functional and aesthetic service life, excluding joint sealers.
   c. Transparent Elements (Glazing): Same as other wall primary weather-barrier elements, except accidental breakage is considered normal wear-and-tear.
   d. Joint Sealers: Minimum 20 years before replacement.
   e. Surfaces Exposed to View: Minimum 20 years aesthetic service life; in addition, deterioration includes color fading, crazing, and delamination of applied coatings.
   f. Roof Covering Weather-Barriers: Minimum 20 years, fully functional.
   g. Substantiation: As specified in Section 111 - Facility Performance, including service life analysis.

2. Water Penetration: Provide materials to prevent water penetration into the interior of shell assemblies, under conditions of rain driven by 50 mph wind.
   a. Exception: Controlled water penetration is allowed if materials will not be damaged by presence of water or freezing and thawing, if continuous drainage paths to the exterior are provided, and water passage to the building interior is prevented.
   b. Substantiation: In addition to requirements specified for proven-in-use and proven-by-mock-up construction, drawings showing paths of water movement, with particular attention to changes in direction or orientation and joints between different assemblies.

3. Weather Resistance: Select materials to minimize deterioration due to precipitation, sunlight, ozone, normal temperature changes, salt air, and atmospheric pollutants.
   a. Deterioration includes corrosion, shrinking, cracking, spalling, delamination, abnormal oxidation, decay and rot.
   b. Surfaces Exposed to View: Deterioration adversely affecting aesthetic life span includes color fading, crazing, and delamination of applied coatings.
      1) Coated Finishes: Minimize use of materials with separate coated finishes.
      2) Coating Performance: AAMA 2605-2005, minimum.
   c. Joint Components and Penetration Seals: Capable of resisting expected thermal expansion and contraction; use overlapping joints that shed water wherever possible.
   d. Transparent Elements (Glazing): No haze, loss of light transmission, or color change, during entire expected service life.

1) Test Criteria: Less than 1 percent change in haze, transmission, and color over 2 years exposure, when tested after natural exposure conditions or accelerated light and water conditions simulating natural exposure at project, in accordance with ASTM D 1003-2000; accelerated exposure documented with comparison to natural conditions.

e. Freeze-Thaw Resistance: Adequate for climate of project.

f. Corrosion Resistance: In locations exposed to the outdoor air or in potential contact with moisture inside shell assemblies, provide only corrosion-resistant metals as defined in this section.

g. Ozone Resistance: Do not use materials that are adversely affected by ozone.

h. Substantiation:

1) Construction Documents: Identification of weather-exposed elements and proposed materials.

2) Construction Documents: Details of proven-in-use materials and test reports.

4. Impact Resistance: Provide materials to resist damage due to impact in accordance with code.

a. Minimize damage due to potential vandalism.

b. Natural Hazards: Resist damage from perching, nesting, and feeding birds.

c. Substantiation:

1) Construction Documents: Identification of building elements required to resist impact damage, quantification of impact criteria, materials to be used, and methods of substantiation.

5. Moisture Vapor Transmission: Provide materials that prevent deterioration of materials due to condensation of moisture vapor inside assemblies.

a. Use supplementary vapor retarder to meet requirements.

b. Use method of sealing joints between elements that will be effective given available construction practices.

c. Substantiation:

1) Construction Documents: Identification of building elements providing moisture barrier, materials to be used, and data showing performance.

6. Wear Resistance: Provide materials with resistance to normal wear-and-tear in accordance with code and the following:

a. Elements Within Reach of Pedestrians: Minimize degradation from rubbing and scratching caused by pedestrians.

b. Substantiation:

1) Construction Documents: Identification of building elements required to resist wear, quantification of wear criteria, materials to be used, and methods of substantiation.

PRODUCTS

A. Corrosion-Resistant Metals:

1. Hot-dipped galvanized steel, with minimum zinc coating of 0.90 oz/sq ft total both sides.

2. Stainless steel, Type 304 or 316.
3. Aluminum.

B. Coated Finishes:

1. Provide the following:
   a. Fluoropolymer coating (70 percent Kynar 500 (tm) or Hylar 5000(tm)), minimum three coats.
2. Do not use:
   a. Baked enamel.
   b. Paint.

C. Do not use:

1. Pre-engineered metal building.
2. Air-supported structure.
3. Pre-engineered glazed structure.
4. Different metals subject to galvanic action in direct contact with each other.
5. Aluminum in direct contact with concrete or cementitious materials.
6. Materials and products that require field finishing on surfaces exposed to the weather.
7. Wood trim.

END OF SECTION B

SECTION B1

SUPERSTRUCTURE

PERFORMANCE

A. Basic Function:

1. Provide structural elements, above grade and within basements, capable of supporting all anticipated loads without failure or damage.
2. Do not use any electrically-operated or fuel-powered construction for support of floor or roof members.
3. The superstructure comprises:
   a. Elevated Floors (B11): Floor construction above grade and within basements, including balcony, mezzanine, and ramp floors, floors elevated for access, stair construction if part of the structure, and roof decks intended for occupant live load; and the elements required for their support, insulation, fireproofing, and firestopping.
   b. Roofs (B12): Roof construction, including canopies, and elements required for their support, insulation, fireproofing, and firestopping.
4. Where superstructure elements also must function as elements defined within another element group, comply with requirements of both element groups.
5. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance and Section B - Shell.

B. Amenity and Comfort:

1. Vibration: Isolate structure from sources of vibration.

C. Health and Safety:

1. Fire: Provide members with combustibility, flame spread, and smoke generation characteristics not greater than allowed by code.
2. Fire Resistance: Provide materials with fire resistance in accordance with code and the following:
   a. Determine fire resistance rating by testing in accordance with ASTM E 119-2007.
   b. Determine flame spread index by testing in accordance with ASTM E 84-2007.
   c. Determine smoke developed index by testing in accordance with ASTM E 84-2007.
   d. Where fire resistance integrity of superstructure assemblies is impaired by subsequent installation of other construction elements, restore fire resistance using identical materials or other materials tested under ASTM E 814-2006.
   e. Provide firestopping at openings in fire-rated superstructure elements that is rated at not less than the required fire resistance of the penetrated element.
   f. Substantiation:
      1) Construction Documents: Identification of major fire resistive materials and systems.

2) Construction Documents: Identification of laboratory test numbers on the construction drawings for fire resistive assemblies to be used.

3. Grounding: When grounding of electrical systems is accomplished using structural members, prevent shock to occupants.

D. Structure:

1. Capacity: Provide load-bearing structural members of capacities required by code.

2. Dead Loads: Construct to resist loads from weights of materials, construction, and fixed service equipment.

3. Live Loads:
   a. Floors: Resist uniformly distributed, concentrated, and impact loads with code permitted live load reductions.
   b. Roofs: Resist uniformly distributed, concentrated, and impact loads.

4. Environmental Loads:
   a. Wind: Basic wind speed of 110 mph, Importance Factor of 1.15, Exposure C.
   b. Snow: Ground snow load in accordance with code, snow exposure factor of 0.7, snow load importance factor of 1.1.
   c. Rain: Resist loads from ponding rainwater when the primary drainage system is blocked.
   d. Earthquake: In compliance with provisions of code.

5. Structural Design: In addition to the requirements of the code, construct to comply with ASCE 7-2005.

6. Structural Serviceability: Comply with requirements and recommended design procedures of ASCE 7-2005.

E. Durability:

1. Moisture Resistance of Load-Bearing Members: Use materials that are not damaged by contact with water or moisture vapor.

2. Impact Resistance of Load-Bearing Members: Use materials that are not easily damaged by common hand tools.

3. Applied Fireproofing Materials:
   a. In Locations where Concealed by Permanent Construction:
      1) Density: 10 lb/cu ft, minimum.
      2) Impact Strength: Passing ASTM E 760-1992(R05).
   b. Exterior Locations, Where Exposed to Air but Out of Reach of Occupants (Above 10 ft from Ground):
      1) Density: 21 lb/cu ft, minimum.
      2) Impact Strength: Passing ASTM E 760-1992(R05).
      3) Moisture Resistance: Not affected by precipitation or freeze-thaw.
   c. Exposed Locations on Exterior and Interior within Reach of Occupants 10 ft
      1) Density: 39 lb/cu ft, minimum.
      2) Impact Strength: Passing ASTM E 760-1992(R05).
      3) Moisture Resistance: Not affected by precipitation or freeze-thaw.

4. Portions of Superstructure Exposed on Exterior: Comply with requirements of Section B for water penetration, weather resistance, impact resistance, and wear resistance.

PRODUCTS

A. Superstructure: Use elements specified in Sections B11 and B12.

B. Do not use:

1. Modular building units.

END OF SECTION B1

SECTION B11

ELEVATED FLOORS

PERFORMANCE

A. Basic Function:

1. Provide all floor construction above grade and within basements, including balcony, mezzanine, and ramp floors, floors elevated for access, stair construction if part of the structure, and roof decks intended for occupant live load; and the elements required for their support, insulation, fireproofing, and firestopping, as well as finishing, if an integral part of the floor construction.
   a. Floor Flatness (FF): Provide suspended floors that are engineered and constructed to achieve degree of flatness as follows, when measured in accordance with ASTM E 1155-1996(R01):
      1) Specified Overall Value (SOV): 35.
      2) Minimum Localized Value (MLV): 24.
2. Where floor elements also must function as elements defined within another element group, meet requirements of both element groups.
3. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section B - Shell, and Section B1 - Superstructure.

B. Amenity and Comfort:

1. Impact Sound Transmission and Insulation: See Section C for requirements.

C. Health and Safety:

1. Column-Beam Fire Resistance: Per Code
2. Load-Bearing Wall Fire Resistance: Per Code.
3. Floor-Ceiling Fire Resistance: Per Code.
4. Other Members Fire Resistance: Per code.

D. Durability:

1. Exposed Interior Structural Floor Surfaces: Comply with requirements for floor finishes specified in Section C.
2. Exposed Exterior Structural Floor Surfaces: Comply with requirements for pavement finishes.

PRODUCTS

A. Structure Supporting Floors:

1. Provide one or more of the following:
   a. Structural steel beams, columns, girders, and wind-bracing.
   b. Cast-in-place reinforced concrete beams, columns, walls, and girders.
   c. Precast concrete hollow slabs.

d. Load-bearing concrete masonry walls.

2. Do not use:
   a. Wood structural members.
   b. Non-reinforced load-bearing masonry.
   c. Unfireproofed structural steel.
   d. Precast concrete structural frame.
   e. Open-web steel joists, or joist girders.

B. Elevated Floors:

1. Provide one or more of the following:
   a. Concrete-filled steel deck.
   b. Concrete-filled composite steel deck, minimum 3 inches concrete thickness from top of steel deck.
   c. Cast-in-place reinforced concrete slabs.
   d. Precast concrete tees or hollow core slabs covered with minimum 1-1/2 inches concrete.

2. Do not use:
   a. Any construction with openings to floor below.
   b. Wood structural members.

C. Mezzanine Floors:

1. Provide one of the following:
   a. Same construction as other floors.

D. Balcony Floors:

1. Provide one of the following:
   a. Same construction as other floors.

E. Ramp Floors:

1. Provide one of the following:
   a. Same construction as other floors.

F. Stairs and Stair Landings: See Section C15.

G. Interior Exposed Structural Floor Finish:

1. Provide one of the following:
   a. Any finish specified in or meeting performance requirements of Section C16 and allowed for interior space usage.

END OF SECTION B11

SECTION B12

ROOFS

PERFORMANCE

A. Basic Function:

1. Provide all roof construction, including canopies, and elements required for their support, insulation, fireproofing, and firestopping.
2. Where roof elements also must function as elements defined within another element group, meet requirements of both element groups.
3. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section B - Shell, and Section B1 - Superstructure.

B. Amenity and Comfort:

1. Thermal Performance, Including Elements on Top of Roof Deck: Per Code.

C. Health and Safety:

1. Column-Beam Fire Resistance: Per Code.
2. Load-Bearing Wall Fire Resistance: Per Code.
3. Roof-Ceiling Fire Resistance: Per Code.
4. Other Members Fire Resistance: Per Code.
5. Slip Resistance: Where roof structure is the finished roof weather surface, also comply with requirements of Section B3 for roofing.

D. Durability:

1. Exposed Roof Deck Surfaces: Comply with requirements for roofing weather barrier specified in Section B31.
2. Vapor Retarder Under Deck: Continuous separate membrane located on the warm side of the winter dew point.
   a. Vapor Permeance: 1 perm, maximum when tested in accordance with ASTM E 96/E 96M-2005.
   b. Provide materials in accordance with ASTM E 1677-2005, including appendices, and ASTM C 755-2003.

PRODUCTS

A. Structure Supporting Roofs:

1. Provide one or more of the following:
   a. Structural steel beams, columns, girders, joists, and wind-bracing.
   b. Cast-in-place reinforced concrete beams, columns, walls, girders, and joists.
   c. Precast concrete hollow slabs.
   d. Open-web steel joists or joist girders.

e. Load-bearing concrete masonry walls.

2. Do not use:
   a. Wood structural members.
   b. Non-reinforced load-bearing masonry.
   c. Unfireproofed structural steel.
   d. Precast concrete structural frame.

B. Roof Decks:

1. Provide one or more of the following:
   a. Steel deck without concrete fill.
   b. Acoustic Steel deck with perforations and sound absorbent insulation at Gymnasium.
   c. Concrete-filled steel deck.
   d. Concrete-filled composite steel deck, minimum 2-1/2 inches concrete thickness from top of steel deck.
   e. Cast-in-place reinforced concrete slabs.
   f. Precast concrete hollow core slabs with or without additional concrete covering.

2. Do not use:
   a. Any construction with openings to floor below.
   b. Wood structural members.

C. Insulation on Top of Decks: See Section B31.

D. Roof Deck Finish Surface: See Section B31.

END OF SECTION B12

SECTION B2

EXTERIOR ENCLOSURE

PERFORMANCE

A. Basic Function:

1. Provide an essentially vertical separation between exterior and interior conditioned space, that keeps out weather, uninvited people, and animals and insects, without unusual action by occupants, while providing convenient movement of occupants between inside and outside, desirable natural light, and views from inside to outside.
2. The elements forming the vertical separation comprise the exterior enclosure and consist of:
   a. Exterior Walls (B21).
   b. Exterior Windows and Other Openings (B22).
   c. Exterior Doors (B23).
   d. Exterior Wall Fixtures (B24).
3. Where exterior enclosure elements also must function as elements defined within another element group, meet requirements of both element groups.
4. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance and Section B - Shell.

B. Amenity and Comfort:

1. Glazing Appearance:
   a. Tint: Do not use tinted glazing.
   b. Reflectivity: Do not use glass that has been treated to increase its natural reflectivity.

C. Health and Safety:

1. Safety Glazing: Do not use fully tempered glass more than 25 feet above grade.
2. Fire Resistance:
   a. All Materials of Exterior Enclosure: Non-combustible, no exceptions.

D. Structure:

1. Structural Performance: No requirements in addition to those specified in Section B.

E. Durability:

1. Ambient Temperature Change: Allow for daily expansion and contraction within and between elements caused by temperature range from most extreme low temperature to 70 degrees F greater than the most extreme high temperature, in any year, without causing detrimental effect to components and anchorage.
2. Impact Resistance:
   a. Elements Adjacent to Traffic Lanes: Resist damage from accidental passenger vehicular impact at 5 mph maximum velocity.

3. Glass:
   a. Type and thickness in accordance with ASTM E 1300-2004 combined with other applicable factors; minimum thickness 6 mm for each lite of insulated units.

END OF SECTION B2

SECTION B21

EXTERIOR WALLS

PERFORMANCE

A. Basic Function:

1. Provide physical separation between exterior and interior conditioned space, that keeps out weather, uninvited people, and animals and insects.
2. The elements forming the physical separation comprise the exterior walls and consist of the supporting structure, the exterior skin, vapor retarders, air barriers, and insulation, the interior skin if an integral part of the wall, exterior screens and railings, balcony walls and parapets, exterior soffits unless they do not form a weather barrier, firestopping and draftstopping within wall and between wall and floors, and other exterior wall elements.
3. Where exterior wall elements also must function as elements defined within another element group, meet requirements of both element groups.
4. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section B - Shell, and Section B2 - Exterior Enclosure.

B. Amenity and Comfort:

1. Thermal Performance: Per Code.
   a. Provide continuous insulation over entire enclosure.
2. Air Barrier: Continuous separate membrane over entire exterior enclosure that allows moisture vapor transmission while preventing air infiltration in accordance with 21st Century Schools Design Manual.
3. Acoustical Isolation: Provide in accordance with 21st Century Schools Design Manual.
4. Appearance:
   a. Surface Texture: Provide exterior wall surfaces with multiple contrasting textures with visual interest consistent witht he RFP Drawings.

C. Structure:

1. Wind Design: No damage when tested in accordance with ASTM E 330-2002 at 1.5 times positive and negative design wind loads using 10 second duration of maximum load.
   a. Deflection: 1/240 of span, maximum, unless otherwise indicated.
   b. Unit Masonry: Maximum deflection of 1/360 of span.
   c. Unit Masonry Veneer: Maximum deflection of 1/720 of span.
   d. Members Supporting Glass: Maximum deflection of flexure limit of glass; with full recovery of glazing materials.

D. Durability:

1. Water Penetration: Drain water, moisture, and condensation entering assembly to the exterior.
2. Joint Sealers in Exterior Skin: Life span expectancy equal to that specified for primary weather barriers.
   a. Exception: Lesser life span, with minimum of 20 years, is acceptable providing the joint surface does not exceed 1 percent of the face surface of the jointed area and the joint design provides secondary water-shedding design.
3. Vapor Retarder: Continuous separate membrane over entire exterior enclosure, located on the warm side of the winter dew point.

PRODUCTS

A. Supporting Structure of Walls and Exterior Finish:

1. Provide:
   a. Load-bearing and non-load bearing unit masonry assemblies.
   b. Glazed aluminum curtain wall.
2. Do not use any of the of the following for the supporting structure of walls:
   a. Cold formed metal framing.

B. Exterior Skin of Exterior Walls: (Refer to Elevations and Sections included in the Design-Build Contract Documents.)

1. Provide:
   a. Face brick with field applied anti-grafitti coating. 3 colors, See below.
   b. Cast stone
   c. Metal (Aluminum) panels, prefinished, at locations indicated on Drawings .
   d. Glass at curtainwall and windows.
2. Do not use:
   a. Precast concrete.
   b. Exterior insulation and finish system.
   c. Siding panels.
   d. Portland cement plaster.
   e. Tile.

C. Joint Sealers in Exterior Skin:

1. Provide:
   a. Silicone sealant.

D. Air Barrier / Vapor Barrier :

1. Provide:
   a. High performance synthetic barrier complying with Design Manual referenced standard.
2. Do not use:
   a. Plastic sheet.
   b. Board materials.
   c. Cement parging.

E. Insulation:

1. Provide:
   a. Board insulation.

2. Do not use:
   a. Batt insulation.
   b. Foamed-in-place insulation.
   c. Loose fill insulation.
   d. Blown insulation.
   e. Sprayed insulation.

F. Exterior Screens:

1. Provide:
   a. Aluminum screens.

G. Exterior Railings:

1. Provide:
   a. Galvanized steel.
   b. Stainless steel.

2. Do not use:
   a. Concrete.
   b. Aluminum.
   c. Wood.
   d. Plastic.

H. Exterior Ceilings and Soffits:

1. Provide:
   a. Solid Phenolic Panels where indicated on Drawngs
   b. Metal panels where indicated on Drawings.

2. Do not use:
   a. Exterior insulation and finish system (EIFS).
   b. Gypsum exterior soffit board.
   c. Linear metal ceiling.

I. Glazing: Glass.

1. Use one of the following:
   a. Triple pane insulated glass units composed of:
      1) Heat-strengthened glass.
      2) Fully tempered glass.
      3) Low-E Glass
      4) Spandrel Glass

METHODS OF CONSTRUCTION

A. Construct using one or more of the following methods:

1. Load-bearing and non-load bearing unit masonry assemblies.

a. Concrete Masonry Units: ASTM C 90 with normal, medium or light weight.
b. Glazed Concrete Masonry Units: Normal weight concrete units with manufacturer's standard smooth resinous tile facing, complying with ASTM C 744 and ASTM C 90
c. Face Brick: ASTM C 216, Grade SW, Type FBX; Size modular.
   1) Basis of Design: Belden Brick:
      a) Brick Type 1: Colony Red (M)
      b) Brick Type 2: Alaska White Velour (M)
      c) Brick Type 3: Sienna (M)
   2) Glen Gery matching above colors.
   3) Endicott Clay Products matching above colors.
   4) Or accepted equivalent, matching above colors.
d. Flashings: Copper-Laminated Flashing, Rubberized Asphalt Sheet Flashing or stainless steel sheet flashing.
e. Cavity Insulation: ASTM C 578, Type X.
f. Mortar Colors: Provide colored mortar as indicated below.
   1) Face Brick for Veneer: Colored Mortars as selected by Bridging Architect. Provide separate color for each type and color of brick selected.
   2) Faced Concrete Masonry Units: Colored Mortars as selected by Bridging Architect. Provide separate color for each type and color selected.
   3) Concrete Masonry Units: Standard mortar.
g. Comply with all Brick Indusrty Association (BIA) Technical Notes

2. Metal Panels (for Walls and Canopies): Factory-formed and -assembled, metal-faced composite wall panels fabricated from two metal facings bonded, using no glues or adhesives, to solid, extruded thermoplastic core; formed into profile for installation method indicated. Include attachment system components and accessories required for weathertight system.
   a. Aluminum-Faced Composite Wall Panels: Formed with 0.020-inch- (0.50-mm-) thick, coil-coated aluminum sheet facings.
   b. Core: Fire retardant.
   c. Exterior Finish: 70% PVDF Mica fluoropolymer, or Metallic fluoropolymer, custom color to match “Weathered Zinc”.
   d. Alcan Composites USA Inc.; Alucobond Plus or Alcoa Inc.; Reynobond FR, or accepted equal

3. Solid Phenolic Soffit Panels: Provide flat panels based on thermosetting resins, homogeneously reinforced with cellulose fibers and manufactured under high pressure and temperature. The panels shall have a pigmented resin, decorative surface that is electron-beam cured for superior chemical and dirt resistance.
   a. Panel Core:Type FR fire retardant black core.
   b. Panel Thickness: 1/2-inch (13 mm).
   c. Montreaux Sunglow, Trespa North America (Basis of Design)
   d. Arpa USA
   e. Prodema
   f. Or accepted equal

END OF SECTION B21

SECTION B22

EXTERIOR WINDOWS AND OTHER OPENINGS

PERFORMANCE

A. Basic Function:

1. Fill, cover, close, or otherwise protect all openings in the exterior walls (other than doors) so that the entire exterior enclosure functions as specified, using windows and other opening elements as specified, without using components that must be installed at changes of season.
2. The elements comprising exterior windows and other openings include windows, fixed glazing other than glazed walls, ventilation openings, protection devices for openings, and elements that form or complete the openings, unless an integral part of another element.
3. See Section B21 for glazed walls and Section B23 for doors.
4. Where exterior window and other opening elements also must function as elements defined in another element group, meet requirements of both element groups.
   a. Air Intake and Exhaust Openings: See also Section D.
5. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section B - Shell, and Section B2 - Exterior Enclosure.

B. Amenity and Comfort:

1. Thermal Performance of Elements Forming Exterior/Interior Separation: Per Code.
   a. Substantiation:
      1) Construction: For standard manufactured products, certification of specified properties by NFRC or other testing agency acceptable to NJSDA; for custom-fabricated elements, test reports.
2. Air Infiltration: Per Code.
   a. Substantiation:
      1) Construction: For standard manufactured fenestration products, certification of specified properties by NFRC or other testing agency acceptable to NJSDA; for other elements, test reports.
3. Appearance:
   a. Sight Lines of Glazed Areas: Provide maximum glazing area with minimum interruption by framing members.
   b. Frames: Construct frames of openings to give a flush appearance without shadow lines.
   c. Exposed Blade Louvers: Concealed vertical mullions.

C. Health and Safety:

1. Fire Resistance: Rating as required to maintain fire resistance rating of exterior wall in which they occur.

2. Emergency Escape: Provide minimum opening size as required by NFPA 101-2006 for classroom windows and windows of other rooms occupied by students Provide labels visible from interior and exterior identifying rescue windows.

3. Openable Openings and Ventilation Openings: Equipped with means of keeping insects, birds, and animals out.

D. Structure:

1. Lintels: Constructed to span openings and support loads imposed by exterior wall; maximum deflection of 1/600 of span, vertically and horizontally.

2. Wind Design: No damage when tested in accordance with ASTM E 330-2002 at 1.5 times positive and negative design wind loads using 10 second duration of maximum load.

E. Durability:

1. Air Intake and Exhaust Openings: Minimize rainwater penetration and protect adjacent interior spaces from damage from water.
   a. Substantiation:
      1) Construction: Identify air velocity; show AMCA 511-1999(R2004) certified water penetration ratings.

2. Water Penetration: Construct openings and components of openings to positively drain water to exterior of the building.
   a. Top of Openings: If wall construction does not provide its own methods of drainage, use separate flashing to prevent water from entering opening components or the interior of the building.
   b. Bottom of Openings: Integral or separate sill or flashing to prevent water running over or draining out of opening components from entering the wall construction below or the interior of the building.

F. Operation and Maintenance:

1. Cleanability: Construct glazed openings to permit the exterior surface to be cleaned from inside or outside without removing window sash.

2. Operating Components: Remaining operable for 10 years under normal exposure conditions for the project site.

3. Mechanical Ventilation Openings: No moving parts on exterior of building or where accessible to occupants.

PRODUCTS

A. Windows (Operable and Fixed):

1. Window Operation: Use one of the following:
   a. Horizontal sliding windows.

2. Glazing: Double pane insulated units.

3. Provide integral window blinds between glazing lites at all locations.

4. Provide one of the following:
   a. Aluminum windows.
5. Do not use:
   a. Wood windows.
   b. Metal-clad wood windows.
   c. Plastic-clad wood windows.
   d. Tubular plastic windows.
   e. Composite windows.

B. Fixed Glazing:

1. Glazing: Double pane insulated units. Provide integral window blinds between glazing lites
2. Provide one of the following:
   a. Windows matching operable windows, but without operating sash, at "punched" openings not requiring operation.
   b. Aluminum-framed storefront.
   c. Curtainwall
3. Do not use:
   a. Metal windows.
   b. Wood windows.
   c. Metal-clad wood windows.
   d. Plastic-clad wood windows.
   e. Tubular plastic fixed windows.
   f. Composite windows.

C. Glazing:

1. Provide one of the following:
   a. Heat-strengthened glass.
   b. Fully tempered glass.
   c. Low E glass.
   d. Laminated glass.
   e. Spandrel glass.
2. Do not use:
   a. Tinted glass.
   b. Wired glass.
   c. Polycarbonate sheet.
   d. Acrylic sheet.

D. Ventilation Openings: Cover all natural and mechanical ventilation openings.

1. Material: Aluminum or stainless steel.
2. Provide one of the following:
   a. Stationary blade vents or louvers.
   b. Operable vents or louvers at elevators.

E. Other Exterior Opening Elements: All components required to complete the opening.

F. Lintels:

1. Use one of the following:
   a. Precast concrete.
   b. Galvanized Steel.

G. Sills:

1. Use one of the following:
   a. .

2. Do not use:
   a. Cast-in-place concrete.
   b. Precast concrete.
   c. Unit masonry.

H. Opaque Panels in Openings:

1. Use one of the following:
   a. Aluminum panels.

2. Do not use:
   a. Steel panels.

I. Concealed Flashings:

1. Use:
   a. Stainless steel flashing.

2. Do not use:
   a. Aluminum flashing.
   b. Galvanized steel flashing.
   c. Copper flashing.
   d. Plastic flashing.
   e. Paper flashing.
   f. Uncoated steel flashing.

J. Joint Sealers: As specified in Section B21.

METHODS OF CONSTRUCTION

A. Perform work in accordance with the following:

1. Curtainwall refer to Section B23.

2. Windows: Factory-assembled, fixed and operating units, of extruded aluminum, complete with thermally broken frame, weatherstripping, operating hardware, and anchors.
   a. Quality Grade: AAMA/WDMA/CSA 101/I.S.2/A440-2005 Performance Class AW 65, with hardware and anchorages compatible with frame/sash material.
   b. Operating Type: Sliding.
   c. Provide sill, jamb, and head extensions matching the window construction for full depth of exterior wall.

d. Finish: 70% PVDF Mica fluoropolymer, or Metallic fluoropolymer, custom color to match “Weathered Zinc”.
e. Screen: Aluminum screen mesh in matching frame; required at all operating sash.

3. Stationary Louvers: Extruded aluminum, with drainable blades, concealed vertical mullions.
   a. Exterior Finish: 70% PVDF Mica fluoropolymer, or Metallic fluoropolymer, custom color to match “Weathered Zinc”.
   b. Bird Screens: Provide on interior of intakes and exhausts.
   c. Blank-Off Panels: Insulated; provide on interior of intake louvers and exhaust louvers to close portion not required for ventilation.

4. Glazing: (Minimum performance)
   a. Clear, Sputter-Coated Float Glass: Float glass with metallic-oxide or metallic-nitride coating deposited by vacuum deposition process after manufacture and heat treatment (if any).
      1) Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites
   b. Products:
      1) Sun-Guard SN-68; Guardian Industries Corp.
      2) Solarban 60 Clear; PPG Industries, Inc.
      3) VE-1-2M; Viracon.
      4) Accepted equal.
   c. Performance Characteristics:
      1) Visible Light Transmittance: Minimum 69%.
      2) Winter Center Glass U-Value: Maximum 0.29.
      3) Summer Daytime U-Value: 0.29.
      4) Shading Coefficient: Maximum 0.44.
      5) Outdoor Visible Light Reflectance: Maximum 12%.
      6) Solar Heat Gain Coefficient (SHGC): 0.37.
   d. Spandrel Glass
      1) Same make up as other glazing with ceramic opacifier.

B. Do not use any of the following practices or procedures:

1. Tinted or reflective mirror coated glazing

END OF SECTION B22

SECTION B23

EXTERIOR DOORS

PERFORMANCE

A. Basic Function:

1. Secure all openings in the exterior wall that function to allow the entrance and exit of people, vehicles, and goods, so that the entire exterior enclosure functions as specified, using doors as specified, without using components that must be installed at changes of season.
2. The elements comprising exterior doors include doors of all sizes and uses, gates, and elements that form or complete the openings, unless an integral part of another element.
3. Where exterior door elements also must function as elements defined within another element group, meet requirements of both element groups.
4. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section B - Shell, and Section B2 - Exterior Enclosure.

B. Amenity and Comfort:

1. Thermal Performance: Per Code.
2. Air Infiltration: Maximum of 1.0 cfm/ft of crack length, measured in accordance with ASTM E 283-2004 at differential pressure of 1.57 psf.
3. Water Penetration: Door openings are exempt from water penetration requirements of Section B and B2.
4. Transparency:
   a. Provide fully glazed pedestrian doors at building entrances.
   b. Provide pedestrian doors at building exits and exits from stairways to exterior with vision panels of at least 5 percent of door area.
5. Convenience and Accessibility:
   a. Door Handles: As required by code; where code and other requirements allow an option exit devices must be provided.
   b. Mode of Operation: Self-closing, with manual hold-open, unless otherwise indicated.
      1) Main Entrances: Manual, or Power-operated.
   c. Power-Assisted and -Operated Door Control:
      1) Local actuators each side unless otherwise indicated.
      2) Use least obtrusive method of control/actuation possible.
      3) Access Control System: As specified in Section D92.
      4) Main Entrances: Local actuators only.
6. Appearance:
   a. Doors at Building Entrances: Match glazed wall framing.

C. Health and Safety:

1. Emergency Egress:
   a. Provide exit doors minimum 36 inches wide in quantity to accommodate occupant load per code..

2. Fire Resistance:
   a. Doors Required by Code to be Fire Resistive: Fire resistance rating as required by code, for fire resistance rating of exterior wall in which doors occur, tested in accordance with a method acceptable to local authorities.
   b. Doors into Stairs: Maximum 450 degrees F temperature rise rating at 30 minutes standard fire test exposure where required by Code.

3. Physical Security:
   a. Doors non-removable from outside without use of key.
   b. Secure each exterior door using a "fail-secure" method that allows entrance plus exit from inside using only one motion.
      1) Keys: Type as required to minimize unauthorized entry.
         a) Keying: New master keying system, with exterior doors on a separate "maintenance" master key.
         b) Key Changing: All locks changeable without disassembly of lock cylinders; acceptable methods include interchangeable removable core cylinders.
         c) Uniqueness of Key System: Unique in nation, enforced indefinitely by reputable manufacturer.
         d) Keymaking Restrictions: Key blanks and keymaking restricted to owner.

4. Glazing in Doors: Comply with requirements for safety glazing, security, and forced entry specified in Sections B and B2.

D. Structure:

1. Lintels: Constructed to span door openings and support loads imposed by exterior wall with maximum deflection vertically and horizontally of 1/600 of span.

2. Door Frames: Constructed to span door opening with maximum deflection vertically and horizontally of 1/600 of span.

E. Durability:

1. Water Penetration: Construct openings and components of openings to positively drain water to exterior of the building.
   a. Top of Openings: If wall construction does not provide its own methods of drainage, use separate flashing to prevent water from entering opening components or the interior of the building.
   b. Bottom of Openings: Integral or separate sill or flashing to prevent water running over or draining out of opening components from entering the wall construction below or the interior of the building.

2. Wear Resistance:

a. Door Surfaces: Scuff-resistant in areas where foot impact is likely; highly scratch-resistant in areas where hand contact is likely.
b. Door Handles and Knobs: Highly scratch-resistant and of finish that will minimize appearance changes due to wear; no plated or coated finishes.

3. Flexible Seal Materials: Minimize deterioration due to operation of doors and aging.

4. Swinging Doors: Control door swing to prevent damage due to impact, to either door or element impacted.

F. Operation and Maintenance:

1. Service Life Span of Operating Components: Remaining operable for service life of enclosure elements specified in Section B2 under normal exposure conditions for the project site.

2. Ease of Use and Repair: Provide doors that will be easy to use by occupants, easy to repair or service, and with operating components easy to replace.

PRODUCTS

A. Main Entrance Doors:

1. Provide one of the following:
   a. Wide stile glazed aluminum doors.

2. Do not use:
   a. Revolving doors.
   b. Sliding doors.
   c. Automatic doors.
   d. Folding doors.
   e. Bronze doors.
   f. Stainless steel doors.
   g. Wood doors.

B. Other Pedestrian Doors:

1. Provide weatherstripping and thresholds.

2. Provide removable mullions at double doors.

3. Provide:
   a. Insulated Fiberglass Reinforced Polyester faced doors.

4. Do not use:
   a. Metal doors and frames.
   b. Wood doors and frames.
   c. All-glass entrances.

C. Service Doors:

1. Provide:
   a. Overhead coiling steel doors.

2. Do not use:

a. Vertical lift doors.
b. Side coiling doors.
c. Wood doors.
d. Fiberglass doors.

D. Security Grilles: at the Parking Garage

1. Provide one of the following:
   a. Overhead coiling stainless steel grilles.
   b. Overhead coiling aluminum grilles.

2. Do not use:
   a. Side coiling grilles.
   b. Side sliding grilles.
   c. Folding grilles.
   d. Swinging gates.
   e. Steel grilles.

E. Lintels:

1. Use one of the following:
   a. Precast concrete.
   b. Galvanized Steel.

2. Do not use:
   a. Cast-in-place concrete.
   b. Unit masonry.

F. Sills:

1. Use one of the following:
   a. Precast concrete.
   b. .

G. Concealed Flashings:

1. Use:
   a. Stainless steel flashing.

2. Do not use:
   a. Aluminum flashing.
   b. Galvanized steel flashing.
   c. Copper flashing.

H. Joint Sealers: Same as specified in Section B21.

I. Glazing in Doors: Glass.

1. Type: Double pane insulated glass units.

2. Use one of the following:
   a. Fully tempered glass.
   b. Laminated glass.

3. Do not use:

a. Plain float or sheet glass.
b. Heat-strengthened glass.
c. Acrylic sheet.
d. Polycarbonate sheet.
e. Wired glass.

J. Hardware for Swinging Doors Refer to Section C12 for further information:

1. Use satin, stainless steel finish.

2. Hinges: Aluminum continuous hinges.

3. Exit Devices: Unless specifically indicated as one type, rim type with push pad.
   a. Electric latch control with removable mullions; break away exterior trim; cylinder type dogging and "push" indicated on touch pad

4. Locksets: Unless specifically indicated as one type, rim exit devices.
   a. Do not use rim type auxiliary locks, lock combinations requiring two hands for operation, interconnected locks, or bored (cylindrical locks).

5. Door Closers: Unless specifically indicated as one type, surface overhead frame-mounted type or surface overhead door-mounted type.
   a. Do not use concealed overhead type, floor mounted type, or spring hinges.

6. Door Stops: Unless specifically indicated as one type, overhead door/frame mounted type or integral to closer arm.
   a. Do not use floor-mounted type or wall-mounted type.

7. Door Hold-Opens: Unless specifically indicated as one type, integral to door closer arm.

K. Do not use:

1. Different metals subject to galvanic action in direct contact with each other.

2. Aluminum in direct contact with concrete or cementitious materials.

METHODS OF CONSTRUCTION

A. Perform work in accordance with the following:

1. Door Hardware: See Section C12.

2. Metal-Framed Storefront and Curtainwall: Extruded aluminum, factory-engineered, -fabricated, and -finished, fixed thermal framing supporting glazing, panels, and doors, complete with glazing, glazing seals, flashings, and anchors.
   a. Curtainwall Performance:
      1) Air Infiltration: not more than 0.06 cfm/sq. ft. (0.3 L/s/sq. m) of fixed wall area when tested according to ASTM E 283 at a static-air-pressure difference of 6.24 lbf/sq. ft. (299 Pa).
      2) Water Penetration: Comply with water penetration under static pressure and water penetration under dynamic pressure indicated below:
         a) Under Static Pressure: Does not evidence water leakage when tested according to ASTM E 331 at minimum differential pressure of 20

percent of inward acting wind-load design pressure as defined by ASCE 7, "Minimum Design Loads for Buildings and Other Structures," but not less than 10 lbf/sq. ft. (479 Pa).

b) Under Dynamic Pressure: Does not evidence water leakage when tested according to AAMA 501 and AAMA 501.1 under dynamic pressure equal to 20 percent of inward acting wind-load design pressure as defined by ASCE 7, "Minimum Design Loads for Buildings and Other Structures," but not less than 15 lbf/sq. ft. (718 Pa).

b. Storefront Performance:
   1) Air Infiltration: not more than 0.06 cfm/sq. ft. (0.3 L/s/sq. m) of fixed wall area when tested according to ASTM E 283 at a static-air-pressure difference of 6.24 lbf/sq. ft. (299 Pa).
   2) Water Penetration: Under Static Pressure: Does not evidence water leakage when tested according to ASTM E 331 at minimum differential pressure of 20 percent of inward acting wind-load design pressure as defined by ASCE 7, "Minimum Design Loads for Buildings and Other Structures," but not less than 8 lbf/sq. ft. (300 Pa).
c. Glazing Method: Glazing caps with gaskets; allow for reglazing individual panes from exterior without disturbing adjacent panes.
d. Gaskets and Setting Blocks: EPDM, ASTM C 864-2005; or silicone rubber, ASTM C 1115-2006.
e. Structural Glazing Sealant: ASTM C 1184-2005 silicone.
f. Finish: 70% PVDF Mica fluoropolymer, or Metallic fluoropolymer, custom color to match “Weathered Zinc”.
g. Designer Qualifications: Licensed professional engineer.

3. Insulated Fiberglass Reinforce Polyester faced Doors:
   a. Fiberglass Reinforced Polyester Face Material: 0.120-inch minimum thickness, with color integral through full thickness of face sheet and pebble-like embossed finish
   b. Core Material: Urethane foam of 5 pounds per cubic foot density for doors.
   c. Frames: Aluminum.
   d. Finish: 70% PVDF Mica fluoropolymer, or Metallic fluoropolymer, custom color to match “Weathered Zinc”.

4. Coiling Service Doors: Galvanized steel with factory finish coating, helical coil spring counterbalanced power operation.
   a. Slat Profile: Flat.
   b. Tracks and Guides: Galvanized steel.
   c. Galvanizing: ASTM A 653/A 653M-2006a G90/Z275 or equivalent.
   d. Exterior: U-value of per code; weatherstripping on both jambs, sill, and at head; no exposed insulation on either side.
   e. Exterior: Designed to withstand code prescribed positive and negative wind pressure without damage
   f. Power Operator Controls: Push button from each side.
   g. Exterior Finish: Powder coat or fluoropolymer (70% PVDF Mica fluoropolymer, or Metallic fluoropolymer), custom color to match “Weathered Zinc”.

5. Coiling Grilles:Stainless steel, helical coil spring counterbalanced power operation.
   a. Tracks and Guides: Galvanized steel.
   b. Galvanizing: ASTM A 653/A 653M-2006a G90/Z275 or equivalent.
   c. Exterior: Designed to withstand code prescribed positive and negative wind pressure without damage
   d. Power Operator Controls: card reader from each side.

END OF SECTION B23

SECTION B24

EXTERIOR WALL FIXTURES

PERFORMANCE

A. Basic Function:

1. Exterior wall fixtures include all elements attached to the outside of the exterior walls, unless consisting of equipment or services fixtures. Fixtures required are those made necessary by the design and the following:
   a. Main Building Identification Sign: Mounted on main elevation, for visibility from adjacent street; provide two.
2. See Section G22 for ground-mounted flagpoles and ground-mounted signs.
3. Where exterior wall fixtures also have a function defined in another element group, design such elements as specified for that element group, in addition to the requirements specified in this section.
4. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section B - Shell, and Section B2 - Exterior Enclosure.

B. Amenity and Comfort:

1. Noise Reduction:
   a. Signs Noise Level: Not detectable by pedestrian or building occupants 20 feet from the sign.
2. Appearance:
   a. Signs: Legible during daylight and nighttime hours by pedestrians, and motorists from distance specified.
   b. Flagpoles: Flag(s) to be visible during daylight hours by pedestrians.
3. Convenience: Flag raised and lowered using external halyard, manually-operated.

C. Structure:

1. Anchorage: Provide wall fixtures to be supported from building structural frame rather than from exterior wall.

D. Durability:

1. Water Penetration Resistance:
   a. Maintain integrity of exterior wall water penetration resistance at points of wall fixture attachment to supporting structure.
2. Weather:
   a. Surface Finish: Minimum service life of 10 years without color deterioration, except for flags.
3. Impact Resistance:
   a. Signs: For signs located at grade and the first floor of the building, constructed to resist damage from vandalism.

PRODUCTS

A. Signs:

1. Provide:
   a. Dimensional letter signs using stainless steel letters.

2. Do not use:
   a. Signs painted on the face of the exterior wall.
   b. Signs constructed of the same material as the exterior skin of the exterior wall.
   c. Box signs.
   d. Neon light signs.
   e. Electronic message boards.

METHODS OF CONSTRUCTION

A. Perform work in accordance with the following:

1. Message Sign: Provide power and computer data hook for sign that is N.I.C. .

2. Dimensional Letters:
   a. Sign Message:
      1) Typeface: As selected.
      2) Letter Height: 12 inches.
      3) Depth: 3 inches.
      4) Sign Message: ELLIOTT STREET SCHOOL.

END OF SECTION B24

SECTION B3

ROOFING

PERFORMANCE

A. Basic Function:

1. Provide a weather-proof enclosure over the entire "top-side" of building that also excludes unwelcome people, animals, and insects without requiring specific action by occupants, while shedding water and preventing uncontrolled water infiltration, withstanding anticipated loading conditions, providing required access, and permitting the entry of desirable natural light.

2. Provide all fixtures needed on the roof due to the design or indicated in the project program.

3. Roofing comprises the following elements:
   a. Roof Coverings (B31): Weather barriers, vapor retarders, insulation, wearing surfaces, water collectors and conductors; including coverings over plaza decks, balconies, and other exposed floors.
   b. Roof Openings (B32): Skylights, ventilation openings, access openings, and other roof opening elements.
   c. Roof Fixtures (B33): All elements attached to the roof, unless equipment or services.

4. Where roofing elements also must function as elements defined within another element group, meet requirements of both element groups.

5. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance and Section B - Shell.

6. Substantiation:
   a. Post-Construction: Roof inspection conducted in the first spring after completion of roofing, after chance of snow has passed.

B. Amenity and Comfort:

1. Noise of Precipitation: Use materials that dampen the sound of precipitation on the roof to maintain interior ambient sound levels as specified in Section B.

2. Appearance:
   a. Concealment of Services and Equipment: Provide permanent concealment of rooftop items using screens.
   b. Color: Compatible with energy efficiency design.
   c. Cleanliness: In addition to requirements of Section B for cleanliness of exterior surfaces, for roofing surfaces exposed to view, use surface materials that will conceal dirt.
   d. Ponding: Arrange drainage of roof so no ponding will occur, regardless of whether roofing material will withstand ponding of water or not.

C. Health and Safety:

1. Roof Worker Safety: Construct to provide safe design and safety measures as required by code and the following:
   a. Provide permanent access to all areas of the roof in the form of stairs.
2. Fire Resistance: In addition to fire resistance specified in Section B, provide materials that will prevent:
   a. Roof surface catching fire due to external fire sources.
   b. Roof coverings catching fire due to internal fire sources.
   c. Substantiation:
      1) Construction Documents: Fire rating identification numbers recognized by code authorities, on the construction drawings.
3. Fire/Smoke Ventilation: As required by code and the following:
   a. Upward Opening Units: Operating properly under specified structural snow load.

D. Structure:

1. Rainwater Load: As required by code.
2. Roof Component Wind Resistance:
   a. Uplift: Same pressure as specified in code for structural members, utilizing FM's recommended factor of safety.
   b. Substantiation:
      1) Design Development: Identification of assemblies or methods used.
      2) Construction Documents: Identifying numbers in the construction documents.
3. Snow Load:
   a. Roof Opening Elements: Exceed code requirements by 10 psf.

E. Durability:

1. Weather Resistance: Provide weather-exposed roof coverings and other components that comply with weather resistance specified in Section B and the following:
   a. Minimization of Deterioration Due to Weather: For weather-barrier materials, minimization means no deterioration that adversely affects water penetration resistance at any time during the specified service life span.
   b. Substantiation:
      1) Design Development: Identification of proven-in-use products and assemblies; in addition to substantiation items specified in Section 111, provide, for minimum of 3 existing applications, date of installation of roof covering; maintenance, repair, and replacement history; recommended inspection and maintenance program; detailed evaluation of similarities and differences of historical application from proposed application; estimated life span of similar assembly if constructed today.
2. Water Penetration: None, under conditions of rain driven at 50 mph, unless water paths are completely accessible.
   a. Substantiation:

1) Construction: Water flood tests of roof areas that can accumulate rainwater if primary drains are blocked, up to depth for which structure is designed.

3. Minimum Slope:
   a. Field of Roof: 1/4 inch per foot.
   b. Water Conductors: 1/8 inch per foot.

4. Grease, Chemical Resistance: Wherever there is a possibility of the introduction of grease, oils, or chemicals onto the roof, provide materials that are not damaged by such leakage.

5. Ice: Design to avoid damage due to ice formation and buildup on roofing and in water conductors.

6. Wear Resistance:
   a. Surfaces Subject Only to Maintenance Foot Traffic: Not punctured by ordinary materials or tools when stepped on.
   b. Substantiation:
      1) Design Development: Proven-in-use products, or demonstration using tests appropriate to materials used, over same type of substrates as will be used in construction.

F. Operation and Maintenance:

1. Ease of Service:
   a. All components of roofing (not just roof covering) easily accessible by maintenance persons on foot without the use of portable ladders or other portable devices.
   b. Rooftop fixtures serviceable by simple replacement of parts, minimizing time required on roof, and eliminating need for repair work in the weather.

2. Ease of Repair:
   a. Water Barrier Subject to Foot Traffic: Easily accessible for repair; if covered, covering must be removable by one person without the use of tools other than shovel and broom, with original covering materials replaceable to the same degree of coverage using the same tools.

3. Ease of Replacement: As specified in Section 111.
   a. Easily replaceable roof coverings include:
      1) Any membrane adhered to mechanically attached insulation.

END OF SECTION B3

SECTION B31

ROOF COVERINGS

PERFORMANCE

A. Basic Function:

1. Provide a weather-resistive covering over the top side of the roof superstructure and any exposed floor superstructure.
2. Roof covering comprises all weather-resistive components, including the primary weather barrier, vapor retarders, insulation, water collectors and conductors, wearing surfaces, trim and accessories, but not including roof opening elements or roof fixtures.
3. Where roof covering elements also must function as elements defined within another element group, meet requirements of both element groups.
4. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section B - Shell, and Section B3 - Roofing.

B. Amenity and Comfort:

1. Air Infiltration: If a jointless or completely sealed-seam or welded-seam membrane-type water barrier is not used, provide auxiliary method of complying with air infiltration requirements of Section B.

C. Health and Safety:

1. Fire Retardance: Per Code. A roof covering.

D. Structure:

1. Roof Covering Substrate: Sufficiently rigid or dense to support water barrier in a manner that prevents puncture due to traffic on roof.
2. Wind Uplift: Where roof covering has a lower air transmission rate than the roof superstructure, provide means of preventing blow-off or ballooning due to low negative pressure over roof. Comply with FM's recommended attachment for wind uplift at the Project SIte.

E. Durability:

1. Life Span: As specified in Section B, and the following:
   a. Aesthetic Life Span: Significant degradation of appearance during the functional life span is not acceptable.
   b. Manufacturer Approval of Design: Where roof covering manufacturer recommends or requires certain design features for satisfactory performance or for warranty, with manufacturer's requirements.
   c. Manufacturer Warranty:
      1) Materials: 20 years, minimum, for full replacement price without exclusions.
      2) Installation and Workmanship: 5 years, minimum, without exclusions.

d. Substantiation:
   1) Construction Documents: Quality assurance program to be implemented to ensure complete and correct installation of weather-barrier elements.
   2) Construction: Actual manufacturer warranty.

PRODUCTS

A. Essentially Flat Roofs:

1. Use one of the following:
   a. Elastomeric roofing membrane.
      1) White or light color made of EPDM, PVC, CSPE, or TPO.
      2) Installed over insulation and mechanically attached.

2. Do not use:
   a. Pitch pans or pockets.
   b. Built-up bituminous roofing membrane.
   c. Cold-applied bituminous roofing membrane.

B. Concealed Deck Roofing/Waterproofing for Parking Garage Roof pitched to drain:

1. Use one of the following with Garden type green roof:
   a. Fluid-applied elastomeric roofing/waterproofing membrane.
   b. Rubberized asphalt roofing/waterproofing membrane..
      1) Application: Fluid-applied or self adhering .

2. Do not use:
   a. Built-up bituminous roofing/waterproofing membrane.
   b. EPDM roofing/waterproofing membrane.
   c. PVC roofing/waterproofing membrane.
   d. CSPE roofing/waterproofing membrane.
   e. Loose-laid roofing/waterproofing membrane.

C. Flashing, Trim, and Accessories: Sheet metal.

1. Use one of the following:
   a. Sheet metal finish to match windows and curtainwall.

METHODS OF CONSTRUCTION

A. Use one of the following methods:

1. Elastomeric Membrane Roofing:
   a. Membrane Material: EPDM, ASTM D 4637-2004, non-reinforced, 0.060 inch, black with white coating.
   b. Membrane Material: PVC, ASTM D 4434-2006, internally reinforced with fabric, 0.045 inch thick, white.
   c. Membrane Material: CSPE, ASTM D 5019-2007, internally reinforced with fabric, white.
   d. Membrane Material: TPO, non-reinforced, 0.060 inch, light color or white.
   e. Seaming: As specified by membrane manufacturer; provide factory-seamed sheets as large as is possible.

f. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, felt or glass-fiber mat facer on both major surfaces
   1) Attachment: Mechanically fastened.
   2) Compressive Strength: Grade 3, 25 psi nominal (+/- 10%) compressive strength
   3) Maximum board size: 48 by 48 inches.
   4) Board thickness: 2 inches (51 mm) maximum. Provide multi layered insulation systems for thickness greater than 2 inches (51 mm) .

2. Sheet Waterproofing:
   a. Composite Sheet Waterproofing: Self-adhering layer of rubberized asphalt laminated to polyethylene sheet.
      1) Total Thickness: Minimum 70 mils.
      2) Temperature Range: Above 40 degrees F.

3. Fluid-Applied Waterproofing:
   a. Waterproofing: Single-component bitumen-modified polyurethane complying with ASTM C 836-2006.
   b. Applied Thickness: Nominal thickness of 60 mils; minimum thickness at any point of 50 mils.
   c. Accessories: As recommended by sheet manufacturer.

END OF SECTION B31

SECTION B32

ROOF OPENINGS

PERFORMANCE

A. Basic Function:

1. Close all openings in the roof with elements that exclude unwelcome people, animals, and insects without requiring specific action by occupants, while shedding water and preventing uncontrolled water infiltration, withstanding anticipated loading conditions, providing required access, and permitting the entry of desirable natural light.
2. Roof opening elements include skylights, hatches, vents, and other elements necessary to close openings or elements associated with those openings.
3. Where roof opening elements also must function as elements defined within another element group, meet requirements of both element groups.
4. In addition to the requirements of this section, comply with all applicable requirements of Sections 111 - Facility Performance, Section B - Shell, and Section B3 - Roofing.

B. Amenity and Comfort:

1. Thermal Performance: As specified in Section B per code.
2. Water Penetration - Skylights Only:
   a. No uncontrolled water penetration at static pressure of 2.86 psf and 5.0 gal/sf/hr, when tested in accordance with ASTM E 331-2000.
   b. Substantiation: Static pressure test in accordance with ASTM E 331-2000; previous tests by manufacturer acceptable.
3. Natural Light:
   a. Skylights will be used to accomplish natural lighting specified in Section B.
4. Convenience:
   a. Provide a fixed stair leading to each hatch used for access to roof equipment or required by code.
   b. Access Hatches: Openable from outside, provided user unlocked from inside before exiting.
5. Appearance:
   a. Do not use screens below overhead glazing (for protection from falling glazing).
   b. Do not use glazing with embedded, visible reinforcement.
   c. Provide glazed elements so that rainwater runs off cleanly without trapping water or dirt in areas visible from the interior.

C. Health and Safety:

1. Fire Resistance of Elements Closing Openings: As required by code.
2. Heat and Smoke Vents in Roof: Comply with the code.

3. Ladder Safety: Comply with ANSI A14.3-2002.

D. Structure:

1. Self-Supporting Elements: Same requirements as for superstructure.

2. Glass Design: Type, size, and thickness as required to comply with ASTM E 1300-2004 and AAMA GDSG-1, "Glass Design for Sloped Glazing", 1987, as applicable.

3. Structural Sealant Glazing Systems: Comply with ASTM C 1184-2005, including non-mandatory Appendix, and AAMA TSGG-2004 "Two-Sided Structural Glazing Guidelines for Aluminum Framed Skylights."

E. Durability:

1. Life Span:
   a. Sealed Double Glazing Seal Durability: Minimum 15 years.
      1) Substantiation: Manufacturer warranty.

2. Weather Resistance:
   a. Minor Instances of Glazing Not Used for View: Haze, light transmission, and color change limitations specified in Section B are waived.

F. Operation and Maintenance:

1. Cleaning: Provide skylights to allow cleaning without the need for climbing or walking on either the structural members or the glazing, using cleaning tools with handles not longer than 10 feet.

2. Replacement: Provide glazed elements so that glazing can be replaced from outside without need for scaffolding or other temporary supports inside the building.

PRODUCTS

A. Transparent and Translucent Glazing in Roof Openings:

1. Provide one of the following:
   a. Laminated glass.

2. Do not use:
   a. Any plastic glazing.
   b. Fiberglass-reinforced plastic glazing sheet.
   c. Heat-strengthened glass.

B. Skylights:

1. Provide the following:
   a. Aluminum-framed skylights.

C. Heat and Smoke Vents:

1. Provide the following:
   a. Hinged heat-activated vents or louvers mounted in the wall.

2. Do not use:

a. "Drop out" heat-activated vents.

D. Access Openings:

1. Provide one of the following:
   a. Stairway enclosures with door to roof.
2. Do not use:
   a. Hinged roof hatches.

METHODS OF CONSTRUCTION

A. Use the following practices and procedures:

1. Metal-Framed Skylights: Extruded aluminum, factory-engineered, -fabricated, and -finished, fixed framing supporting glazing, complete with glazing seals, flashings, and anchors.
   a. Shape: As indicated on drawings.
   b. Frame Members: Tubular, with integral condensation gutters and weeps.
   c. Structural Supports: Building structure as indicated.
   d. Glazing: Insulated laminated
   e. Glazing Method: Glazing caps 2-sides, structural sealant glazing 2-sides; allow for reglazing individual panes from exterior without disturbing adjacent panes.
   f. Gaskets: EPDM, ASTM C 864-2005; or silicone rubber, ASTM C 1115-2000.
   g. Structural Glazing Sealant: ASTM C 1184-2005 silicone.
   h. Finish: 70% PVDF Mica fluoropolymer, or Metallic fluoropolymer, custom color to match “Weathered Zinc”.
   i. Size: As indicated on drawings.

END OF SECTION B32

SECTION B33

ROOF FIXTURES

PERFORMANCE

A. Basic Function:

1. Roof fixtures include all elements attached to the roof, except equipment and services. Fixtures required are those made necessary by the design and as defined in the project program
   a. Mounting brackets or frames for roof-mounted services and equipment; see applicable components for mounting requirements.
   b. Screens for concealment of services and equipment.
2. Where roof fixtures also have a function defined in another element group, design such elements as specified for that element group, in addition to the requirements specified in this section.
3. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section B - Shell, and Section B3 - Roofing.

B. Structure:

1. Mounting Brackets and Frames for Equipment and Services: Complying with design requirements for superstructure.
2. Screens: Complying with design requirements for exterior walls.
3. Anchorage: Provide roof fixtures to be supported from building structural frame or structural deck, but not sheet metal deck.

C. Durability:

1. Water Penetration Resistance:
   a. Maintain integrity of roofing water penetration resistance at points of fixture and mounting attachment to supporting structure.
2. Weather:
   a. Surface Finish: Minimum service life of 10 years without color deterioration, except for flags.
   b. Screens: Complying with durability requirements specified for exterior walls.
   c. Mounting Brackets and Frames for Services and Equipment: Complying with durability requirements specified for exterior walls.

PRODUCTS

A. Screens:

1. Provide the following:
   a. Aluminum pre-engineering equipment screens.

END OF SECTION B33

SECTION C

INTERIORS

PERFORMANCE

A. Basic Function:

1. Provide appropriately finished interiors for all spaces indicated in the program, equipped with interior fixtures as required to function properly for specific occupancies.

2. Interiors comprise the following assemblies:
   a. Interior Construction (C1): All elements necessary to subdivide and finish space enclosed within the shell, including applied interior surfaces of the exterior enclosure.
   b. Interior Fixtures (C2): All elements attached to interior construction that add functionality to enclosed spaces, except for elements classified as equipment or services fixtures.

3. Provide physical separation between spaces, constructed to achieve fire ratings required by code, appropriate security between adjacent spaces, and visual, acoustical, olfactory, and atmospheric isolation as necessary to maintain desirable conditions in each space.

4. Provide finishes for interior surfaces that are appropriate for the functions of each space.

5. Provide interior fixtures that are necessary for the proper functioning of each space.

6. Where interior elements also must function as elements defined within another element group, meet requirements of both element groups.

7. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance.

B. Amenity and Comfort:

1. Natural Ventilation: Construct facility to permit air movement between exterior openings positioned to enhance warm weather thermal comfort of occupants in all major spaces.
   a. SR1 (Sanitary Facilities), SS (Storage), SV (Vehicular), SC (Circulation), and SU (Utility, Building Services) spaces are exempt from natural ventilation requirements.
   b. Substantiation:
      1) Construction: Field test of natural air movement, verifying compliance with predicted design performance.

2. Access: Provide access to all primary interior spaces from Circulation spaces (SC Spaces) (no access to any primary interior space exclusively through another primary interior space).

3. View: Provide views to the building exterior or interior atria from most locations within primary interior spaces.
   a. View spaces include the following types:
      1) Customer Contact (SP1 Spaces).
      2) Assembly (SP5 Spaces).
      3) Meeting and Instruction (SP6 Spaces).

4. Natural Light:
   a. Daylighting: Provide ambient natural lighting in primary spaces that is of intensity adequate for essential tasks when measured on a typical overcast winter day in midafternoon at spaces indicated in the 21st Century Schools Design Manual.
      1) Spaces for daylighting include the following types:
         a) Customer Contact (SP1 Spaces).
         b) Occupant Work (SP2 Spaces).
         c) Meeting and Instruction (SP6 Spaces). All instructional spaces
         d) Athletic (SP7 Spaces).
      2) Light Levels: Provide minimum light levels for activities as indicated in the 21st Century Schools Design Manual.
   b. Visual Comfort: Provide ambient natural light in primary spaces that is free of excessive direct or reflected glare, as defined in IESNA RP-5, 1999, Recommended Practice of Daylighting.

5. Acoustical Performance:
   a. Background Noise: Provide interiors that maintain ambient sound levels within primary spaces at levels recommended in ANSI /ASA Standard S12.60-2002 and Amendments in the 21st Century Schools Design Manual.
   b. Substantiation:
      1) Construction Documents: Engineering design calculations and drawings sealed by licensed acoustical engineer.
      2) Construction: Field test of acoustical conditions, verifying compliance with performance requirements.

6. Odor Control: Prevent unpleasant odors generated within a space from affecting occupants of adjacent spaces, by providing physical isolation of the spaces, separate ventilation, or a combination of isolation and ventilation.
   a. Control odors from spaces of the following types:
      1) Commercial kitchen.
      2) Laboratory.
      3) Toilet rooms.
      4) Locker or changing rooms.
      5) Trash collection.

7. Appearance: Provide interiors that are pleasing in appearance and do not detract from the primary functions performed in each space.

8. Texture: Provide interior elements and surfaces that are textured appropriately for primary functions to be accommodated within each space.
   a. For surfaces that are within normal reach of occupants, provide textures that

are safe for occupants and require minimum maintenance.

b. For surfaces that are not within normal reach of occupants, provide textures that are comparable to those within normal reach.

C. Health and Safety:

1. Egress: Provide egress from all interior spaces in accordance with code.

2. Fire Resistance: Provide materials with fire resistance in accordance with code.
   a. For all elements required to have a fire resistive rating and which are not made of materials and systems specified as acceptable by the code, use proven-by-mock-up construction.
   b. For proven-by-mock-up construction, acceptable testing agencies are Underwriters Laboratories Inc., Inchcape Testing Services (Warnock-Hersey), and Factory Mutual
   c. Minimum performance values for individual interior elements are also specified in other Sections.
   d. Substantiation:
      1) Construction Documents: Identifying numbers placed on the construction drawings.

D. Structure:

1. Structural Performance: Provide interior construction and fixtures to support without damage all loads required by code.
   a. Special Loads: In addition to loads defined by code, provide for adequate support of wall-mounted or ceiling-mounted furnishings and equipment in spaces where such equipment is required by program or is likely to be installed after construction because of intended function.
   b. Substantiation:
      1) Construction Documents: Detailed design analysis by licensed structural engineer.

E. Durability:

1. Service Life Span: Same as building service life, except as follows:
   a. Interior Doors and Other Operable Elements: Minimum 20 years functional and aesthetic service life.
   b. Interior Ceiling Finishes: Minimum 20 years functional and aesthetic service life; including suspended ceilings.
   c. Interior Wall and Floor Finishes: Minimum 15 years functional and aesthetic service life.
   d. Other Interior Construction: Minimum 20 years functional and aesthetic service life.

2. Wear Resistance: Provide interior construction and fixtures that are suitable in durability for the degree and type of traffic to be anticipated in each space.

3. Water Resistance: At toilet rooms, trash collection rooms, and commercial garages, provide interior construction and fixtures that will not be damaged by water or high humidity.

4. Corrosion Resistance: At bathrooms, provide interior construction materials and fixtures that are inherently resistant to corrosion and rot.
5. Ultraviolet Resistance: In interior spaces exposed to direct sunlight, provide interior construction and fixtures that are inherently resistant to fading and discoloration.
6. Vandal Resistance: In spaces accessible to the public and not subject to continuous surveillance, provide interior construction and fixtures that are inherently vandal resistant or designed to be difficult to access or damage.

F. Operation and Maintenance:

1. Cleaning: Provide interior construction and fixtures that will not be damaged by ordinary cleaning and maintenance operations.

END OF SECTION C

SECTION C1

INTERIOR CONSTRUCTION

PERFORMANCE

A. Basic Function:

1. Provide physical separation between spaces required by the program, constructed to achieve fire ratings required by code, appropriate security between adjacent spaces, and visual, acoustical, olfactory, and atmospheric isolation as necessary to maintain desirable conditions in each space.

2. Provide appropriately finished interiors for all spaces required by the program.

3. Interior construction comprises the following elements:
   a. Partitions (C11): All types of space dividers, including demountable and operable partitions.
   b. Interior Doors (C12): All interior doors, including hardware and frames, except for elevator doors.
   c. Interior Windows (C13): All interior fixed and operable windows, including frames and casings.
   d. Other Interior Openings (C14): Interior utility openings such as hatches and access panels, louvers and vents.
   e. Stairs and Ramps (C15): Those interior and exterior stair and ramp elements not a part of superstructure or exterior enclosure.
   f. Interior Finishes (C16): All functional and decorative applied interior finishes, including secondary support structures.

4. Where interior construction elements also must function as elements defined within another element group, meet requirements of both element groups.

5. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance and Section C - Interiors.

B. Amenity and Comfort:

1. Airborne Sound Isolation: Design and construct interior construction to achieve criteria indicated in the 21st Century Schools Design Manual and Educational Specifications contained in Design-Build Contract Documents Volume 3 - Appendices.
   a. Substantiation:
      1) Construction Documents: Proven-in-use or proven-by-mock-up data substantiating STC values.
      2) Construction: Field tests of representative construction, conducted after all systems are in operation.

2. Cross Ventilation: Provide interior construction to facilitate natural cross ventilation required in Section B.

C. Health and Safety:

1. Fire Resistance: Provide interior construction to achieve fire resistance required by code.
   a. For all elements required to have a fire resistive rating, that are not made of materials and systems specified in the code, use proven-by-mock-up construction.
   b. For proven-by mock-up construction, acceptable testing agencies are Underwriters Laboratories Inc., Inchcape Testing Services (Warnock-Hersey), and Factory Mutual.
   c. Substantiation:
      1) Construction Documents: Identifying numbers on the construction drawings.

2. Safety: Provide interior construction to protect building occupants in accordance with code and the following:
   a. Heights: Protect building occupants from falling from elevated interior walkways.
   b. Tripping: Protect building occupants from tripping hazards due to uneven floor surfaces or abrupt changes in floor elevation of more than 1/8 inch.
   c. Minimum performance values for individual interior construction elements are specified in other Sections.

D. Structure:

1. Structural Performance: No requirements in addition to those specified in Section C.

E. Durability:

1. Dimensional Stability: At interior spaces exposed to high humidity, such as shower rooms, provide interior construction that will withstand continuous or intermittent exposure without significant changes in dimension.
   a. Substantiation:
      1) Construction Documents: Details of critical conditions.

F. Operation and Maintenance:

1. Cleaning: At toilet rooms, shower rooms, trash collection rooms, and janitorial closets, provide interior construction that will allow harsh chemical cleaning without damage.
   a. Substantiation:
      1) Construction Documents: Details of critical conditions.

END OF SECTION C1

SECTION C11

PARTITIONS

PERFORMANCE

A. Basic Function:

1. Provide physical separation between spaces included in the program, constructed to achieve fire ratings required by code, appropriate security between adjacent spaces, and visual, acoustical, olfactory, and atmospheric isolation as necessary to maintain desirable conditions in each space.

2. Partitions comprise the following elements:
   a. Fixed Partitions: Solid, stationary space dividers that are opaque and extend full height.
   b. Partial Height Partitions: Fixed, solid, opaque visual barriers, including toilet compartments.
   c. Operable Partitions: Movable barriers that form solid, visual and acoustical subdivisions of a space.

3. Where partition elements also must function as elements defined within another element group, meet requirements of both element groups.

4. In addition to requirements specified in this section, comply with all applicable requirements of Section 111 - Facility Performance, Section C - Interiors, and Section C1 - Interior Construction.

B. Amenity and Comfort:

1. Accessibility: Provide toilet compartments that are easily usable by disabled persons without outside assistance.
   a. Provide compartments that comply with ADAAG-1994 and ANSI A117.1 - 2003

2. Thermal Performance: Where adjacent spaces have differential required temperatures in excess of 10 degrees F, provide minimum U-value of 0.61 Btu/sq ft/hr/deg F.

3. Appearance:
   a. Provide partitions that are smooth in texture at all circulation routes (SC spaces).
   b. Provide operable partitions that are compatible in appearance with fixed partitions in the same space, employing similar materials, colors, and textures.

C. Health and Safety:

1. Fire Resistance: Provide fire ratings as required by code.

2. Sanitation: At spaces used for food preparation, provide smooth, impervious, and water-resistant partition surfaces and integral coved base that will allow chemical cleaning and sterilization without damage.

D. Structure:

1. Lintels: Constructed to span openings in partitions and support imposed loads with maximum deflection vertically and horizontally of 1/360 of span.
2. Vertical Loads: Provide partitions with sufficient strength to withstand anticipated Code prescribed vertical loads for wall-mounted handrails, equipment, and furnishings without excessive deflection or structural damage.
3. Horizontal Loads: Provide partitions with sufficient strength and rigidity to withstand anticipated Code prescribed horizontal loading conditions without excessive deflection or structural damage.
4. Railings: Provide railings with sufficient strength and rigidity to withstand Code prescribed loads.

PRODUCTS

A. Fixed Partitions:

1. Construct partitions using the following:
   a. Glazed concrete masonry units at locations indicated in the NPS Finish Matrix included in the Design-Build Contract Documents Volume 3 - Appendices.
   b. Concrete masonry sound absorbing units at locations indicated in the NPS Finish Matrix included in the Design-Build Contract Documents Volume 3 - Appendices.
   c. Concrete masonry units else where.
2. Do not use:
   a. Clay tile units.
   b. Gypsum plaster on metal lath over metal framing and furring.
   c. Gypsum board on metal framing.

B. Partial Height Partitions:

1. Construct partitions using the following:
   a. Concrete masonry units.
   b. Manufactured solid plastic toilet compartments and screens at mulit-stall toilet rooms.

C. Operable Partitions:

1. Provide the following:
   a. Individual panel systems.
   b. Paired panel systems.
2. Do not use:
   a. Continuously hinged panel systems, manually operated.
   b. Continuously hinged panel system, electrically operated.
   c. Accordion folding systems, manually operated.
   d. Accordion folding systems, electrically operated.

D. Interior Railings:

1. Provide the following:
   a. Pipe and tube railings of steel.

b. Pipe and tube railings of stainless steel.
c. Ornamental metal railings of steel.
d. Ornamental metal railings of stainless steel.

2. Do not use:
   a. Pipe and tube railings of aluminum.
   b. Glass-supported railings.

METHODS OF CONSTRUCTION

A. Construct partitions using the following methods and techniques:

1. Operable Panel Partitions:
   a. Type: Center opening, paired panels; side stacking, manually operated.
   b. Panels: Rigid panels with vinyl coated fabric finish, colors as scheduled.
      1) STC Rating: Minimum 53-57, calculated in accordance with ASTM E 413-2004.
   c. Track: Formed steel or aluminum, sized to support panels with maximum deflection of 1/360.

2. Toilet Compartments: Mounting: Floor-mounted headrail-braced and as follows:
   a. Plastic Doors, Panels, and Pilasters: Solid phenolic core; beveled corners and edges.
      1) Panels: Minimum 1 in thick.
      2) Doors: Minimum 1 in thick.
      3) Pilasters: Minimum 1-1/4 in thick.
   b. Accessories:
      1) Pilaster Shoes: Formed from chromed steel with polished finish.
      2) Head Rails: Hollow anodized aluminum tube; manufacturer's standard size; anti-grip configuration; cast socket wall brackets.
      3) Panel Brackets: Polished chrome-plated cast metal; manufacturer's standard configurations.
      4) Attachments, Screws, and Bolts: Stainless steel, tamper-resistant.
      5) Hardware: Polished chrome-plated cast metal.
         a) Pivot hinges; gravity type, adjustable, nylon bearings; minimum two per door.
         b) Thumb turn door latch with exterior emergency access feature.
         c) Door strike and keeper with rubber bumper.
         d) Coat hook with rubber bumper; one per compartment.
         e) Door pull for outswinging doors.

3.

END OF SECTION C11

SECTION C12

INTERIOR DOORS

PERFORMANCE

A. Basic Function:

1. Equip all openings in partitions that function to allow passage of people, vehicles, and goods, so that openings can be closed and secured when not in use, using components as specified.
2. The elements comprising interior doors include doors of all sizes and uses, gates, and elements that form or complete the openings, unless an integral part of another element.
3. Where interior door elements also must function as elements defined within another element group, meet requirements of both element groups; interior doors function as partition elements when doors are closed.
4. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section C - Interiors, and Section C1 - Interior Construction.

B. Amenity and Comfort:

1. Acoustical Performance:
   a. Provide in-place FSTC values for partitions with interior doors that are not less than NIC values specified for interior construction in Section C1.
2. Convenience:
   a. Dimensions: Provide interior doors that are sized appropriately for people, vehicles, and goods likely to move between adjacent spaces.
   b. Height: Not less than 84 inches in height.
   c. Width: Not less than 36 inches in width, except for doors to shallow closets.
   d. Closing Devices: Required on all doors; smooth closing motion, with slower latching speed than closing speed (no slamming).
3. Appearance:
   a. Provide interior doors coordinated with adjacent wall surfaces, using similar materials, colors, and textures.

C. Health and Safety:

1. Fire Safety: Protect door openings in fire-rated walls and partitions in accordance with the code and the following:
   a. Hold-Open Function: At locations indicated in program; any method that allows the door to swing freely and that automatically closes door upon detection of local fire or smoke.
   b. Closers: Sufficient closing force to close and latch door despite drafts and wind, but not more than that specified by code.

2. Emergency Egress: Where doors must be latched or locked, comply with the code and the following.
   a. Locking Devices Requiring a Key for Egress: Not allowed.
   b. Exit Doors Having Occupant Load of 50 or More (Regardless of Occupancy): Provide exit hardware that releases the locking/latching mechanism upon the application of a force in the direction of egress travel.

3. Physical Security:
   a. Locks: Secure each room door using a keyed lockset that allows exit from inside using only one motion.
      1) Exceptions:
         a) The following must not have any locking feature at all:
            (1) Doors into stairwells.
            (2) Doors across corridors where impeding exiting.
         b) The following may have privacy lock function (without key):
            (1) Doors to water closet compartments, shower compartments, or single person restrooms.
      2) Keys: As specified in Section B23.
         a) Keying: Key to the existing keying system.
         b) Key Changing: All locks changeable without disassembly of lock cylinders; acceptable methods include interchangeable removable core cylinders.
         c) Keymaking Restrictions: Key blanks and keymaking restricted to owner.
      3) Locking Functions: Appropriate to the space location and function. Provide the services of a Door and Hardware Institute AHC to schedule lock functions in accordance with Newark Public Schools preferred Hardware standards. Provide "Intruder" lock function at all classrooms and pupil occupied spaces. Provide panic - exit devices at all stairs and pairs of doors servicing occupied spaces.
         a) Exterior Doors: See Section B23
   b. Glazing in Doors: Comply with requirements for safety glazing, security, and forced entry specified in Sections C and C1.

D. Structure:

1. Door Frames: Constructed to span door opening with maximum deflection vertically and horizontally of 1/360 of span.

E. Durability:

1. Wear Resistance:
   a. Door Surfaces: Scuff-resistant in areas where foot impact is likely; highly scratch-resistant in areas where hand contact is likely; applied protective surfaces for vulnerable areas are acceptable.
   b. Door Handles and Knobs: Highly scratch-resistant and of finish that will minimize appearance changes due to wear; no plated or coated finishes.

2. Flexible Seal Materials: Minimize deterioration due to operation of doors and aging.

3. Swinging Doors: Control door swing to prevent damage due to impact, to either door or element impacted.

F. Operation and Maintenance:

1. Ease of Use and Repair: Provide doors that will be easy to use by occupants, easy to repair or service, and with operating components easy to replace.

2. Life Span of Operating Components: Remaining operable for service life of enclosure elements specified in Section B2 under normal exposure conditions for the project site.

PRODUCTS

A. Interior Pedestrian Doors:

1. Use one of the following:
   a. Hollow steel doors and frames at utility and maintenance areas .
   b. Solid Core Flush wood doors all other areas.
   c. Glazed aluminum doors of heavy wall design at entrance vestibules.

2. Do not use:
   a. Plastic laminate faced doors.
   b. Hollow core wood doors.

B. Security Grilles:

1. Do not use:
   a. Side coiling grilles.
   b. Side sliding grilles.
   c. Folding grilles.
   d. Swinging gates.
   e. Steel grilles.

C. Fire Separation Doors Not Used for Egress:

1. Use one of the following:
   a. Same type as for other doors.

2. Do not use:
   a. Coiling overhead doors.
   b. Folding accordion doors.

D. Closet Doors:

1. Use one of the following:
   a. Flush wood doors.

2. Do not use:
   a. Folding accordion doors.
   b. Sliding wood doors.

E. Door Frames:

1. Use one of the following:

a. Steel frames.

2. Do not use:
   a. Aluminum frames.
   b. Wood frames.

F. Sills:

1. Use one of the following:
   a. Stone at toilet rooms and locker rooms.

G. Glazing in Doors: Glass.

1. Use one of the following:
   a. Fully tempered glass.
   b. Laminated glass.
   c. ceramic glass meeting impact requirements at fire rated doors.

2. Do not use:
   a. Plain float or sheet glass.
   b. Heat-strengthened glass.
   c. Acrylic sheet.
   d. Polycarbonate sheet.
   e. Wired glass.
   f. Obscure glass.

H. Door Louvers:.

1. Louvers in Metal Doors: Same material as doors.

2. Louver in Wood Doors: Use one of the following:
   a. Steel louvers.
   b. Wood louvers.

I. Hardware for Swinging Doors:

1. Use satin, stainless steel finish.

2. Use fire rated hardware on fire rated doors.

3. Hinges: 5 Knuckle anti friction ANSI/BHMA A156.1 Grade 1 Ball-bearing butt hinges or continuous hinges- heavy duty.

4. Exit Devices: Unless specifically indicated as one type, mortise type, rim type, or exposed vertical rod type; ANSI/BHMA A156.3 Grade 1.

5. Locksets: Unless specifically indicated as one type, bored (cylindrical); ANSI/BHMA A156.2 Series 4000, Grade ,1with vandal resistant lever handle.
   a. Do not use rim type auxiliary locks, lock combinations requiring two hands for operation, or interconnected locks.

6. Door Closers: Unless specifically indicated as one type, surface overhead door-mounted type; ANSI/BHMA A156.4 Grade 1, with extat all parallel arm closers; mount onleast conspicuous side of door.
   a. Do not use concealed overhead type, floor mounted type, or spring hinges.

7. Door Stops: Unless specifically indicated as one type, floor-mounted type, wall-mounted type, or overhead door/frame mounted type.
   a. Do not use floor-mounted type where they represent a trip hazard.
8. Door Hold-Opens: Unless specifically indicated as one type,magnetic wall-mounted type; provide at all cross corrisor doors and stair doors.
   a. Do not use floor-mounted type, overhead-mounted type, or hold-open feature in closer alone without a separate stop.
9. Cylinder and Removable Cores with visual key control and concealed key control on cylinder and cores. Provide cylinders and cores for single manufacturer of keying system
10. Keys: Type as required to minimize unauthorized entry.
    a. Keying: New master keying system, with exterior doors on a separate "maintenance" master key.
    b. Key Changing: All locks changeable without disassembly of lock cylinders; acceptable methods include interchangeable removable core cylinders.
    c. Uniqueness of Key System: Unique in nation, enforced indefinitely by reputable manufacturer.
    d. Keymaking Restrictions: Key blanks and keymaking restricted to owner.
    e. Construction Keying: All exterior doors an select interior doors.
11. Removable mullions: 2 by 3 inch steel tubes with key locked operation for removal.
12. Lock Functions: Appropriate to the location and function.
13.

METHODS OF CONSTRUCTION

A. Use one of the following:

1. Aluminum Doors see Section B23
2. Steel Doors:
   a. Grade: ANSI A250.8-1998.
      1) Fire Doors and Stairwell Doors Doors: Level 3, Model 2, Seamless (16 gage).
      2) Interior Doors: Level 3, Model 1, Full Flush (16 gage).
   b. Finish: Prime painted, unless otherwise indicated.
      1) Doors at Kitchens and Other Wet Areas: Galvanized G60/Z180 per ASTM A 653/A 653M-2006a.
   c. Factory-prepare and reinforce for hardware specified in accordance with Standard; coordinate with Door Hardware Schedule.
   d. Install in accordance with ANSI A250.6-1997 and ANSI A250.11-2001.
3. Steel Door Frames: Welded corner type.
   a. Grade: ANSI A250.8-1998, gage as required by Standard for the grade steel door specified; provide anchors as specified by Standard.
   b. Finish: Prime painted, unless otherwise indicated.

1) Doors at Kitchens and Other Wet Areas: Galvanized G60/Z180 per ASTM A 653/A 653M-2006a.

c. Factory-prepare and reinforce for hardware specified in accordance with Standard; coordinate with Door Hardware Schedule.

d. Fire-Rated Frames: UL listed and labeled.

4. Wood-Veneered Flush Wood Doors:

a. Grade: AWI/AWMAC (QSI) -2006 Custom Grade.

b. Construction:

1) Fire Doors Rated Over 20 Minutes: FD-5.

2) 20 Minute Rated Doors: PC-5.

3) Other Interior Doors: PC-5.

4) Beveled meeting stiles.

c. Veneer: Oak, red.

1) Cut: Rift cut.

d. Hardware Reinforcement in Particleboard and Mineral Cores: Provide solid blocking for closers.

e. Finish: Factory-applied, TR-6 Catalyzed polyurethane.

f. Accessories: As indicated on drawings, including wood glazing stops.

g. Warranty: Lifetime.

5. Door Hardware:.

a. Door Closers: LCN or Norton, No substitution is permitted.

b. Exit Devices: VonDuprin or Precision Hardware (Div. of Stanley), No substitution is permitted.

c. Locksets: Schlage or Corbin, No substitution is permitted.

d. Keying: Schlage Primus or Corbin Pyramid, No substitution is permitted.

e. It is preferred to comply with Newark Public Schools Hardware Standards available from the Newark Public Schools.

END OF SECTION C12

SECTION C13

INTERIOR WINDOWS

PERFORMANCE

A. Basic Function:

1. Provide interior windows between adjacent spaces where required by the program or where proper functioning of adjacent spaces requires limited visual or physical connection between them.

2. Interior windows comprise the following elements:
   a. Operable windows.
   b. Fixed windows, but excluding glazed partitions.
   c. Window openings without glazing, including finished sills, head, and jambs.

3. Where interior windows are integral with elements defined within another element group, meet requirements of both element groups. Fixed interior windows and operable interior windows, when closed, function as partition elements and must not degrade performance of partitions below the levels specified.

4. In addition to requirements specified in this section, comply with all applicable requirements of Section 111 - Facility Performance, Section C - Interiors, and Section C1 - Interior Construction.

B. Amenity and Comfort:

1. Acoustical Performance:
   a. FSTC Values: Provide in-place FSTC values for partitions with interior windows that are not less than NIC values specified for interior construction in Section C1.

2. Appearance:
   a. Compatibility: Provide interior windows that are compatible in appearance with exterior windows in the same space, employing similar materials, colors, and textures.
   b. Frames: Designed and constructed to give a flush appearance with minimal shadow lines.
   c. Muntins: No muntins employed to subdivide interior windows.

C. Health and Safety:

1. Fire Resistance: Provide window rating as required to maintain fire resistance rating of partitions in which they occur.

D. Structure:

1. Lintels: Constructed to span openings and support loads imposed by partition, with maximum deflection of 1/600 of span, vertically and horizontally.

PRODUCTS

A. Fixed Glazing:

1. Glazing: Single pane glazing.
2. Provide:
   a. Windows matching operable windows, but without operating sash, at "punched" openings not requiring operation.
   b. Metal windows.
3. Do not use:
   a. Wood windows.
   b. Metal-clad wood windows.
   c. Plastic-clad wood windows.
   d. Tubular plastic windows.
   e. Composite windows.

B. Glazing:

1. Provide one of the following:
   a. Fully tempered glass.
   b. Laminated glass.
   c. Ceramic glass at fire rated openings.
2. Do not use:
   a. Heat-strengthened glass.
   b. Tinted glass.
   c. Heat absorbing glass.
   d. Spandrel glass.
   e. Patterned glass.
   f. Wired glass.
   g. Polycarbonate sheet.
   h. Acrylic sheet.

C. Other Interior Window Elements: All components required to complete the opening.

D. Lintels:

1. Use one of the following:
   a. Steel.

END OF SECTION C13

SECTION C14

OTHER INTERIOR OPENINGS

PERFORMANCE

A. Basic Function:

1. Provide interior openings between adjacent spaces when required for air movement, louvered where required for visual privacy and baffled where required for acoustical isolation.
2. Provide interior openings where required for maintenance access to mechanical services and other concealed systems, designed to be as unobtrusive as possible.
3. Provide covers for interior expansion joints that protect joints from debris and provide safe and durable support for anticipated traffic.
4. Other interior openings comprise the following elements:
   a. Louvers and vents.
   b. Access doors and panels.
   c. Hatches.
   d. Expansion joint covers.
   e. Elements forming or completing interior openings, including sills, jambs, heads, and operating hardware.
5. Where other interior openings are integral with elements defined within another element group, meet requirements of both element groups. Interior openings between adjacent spaces must not degrade performance of partitions and other interior construction elements below the levels specified.
6. In addition to requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section C - Interiors, and Section C1 - Interior Construction.

B. Health and Safety:

1. Fire Resistance of Elements Closing Openings: As required by code.
2. Tripping Hazard: Provide floor expansion joint covers and floor hatches that are flush with finished floor surface or lapped not more than 1/4 inch above finished surface with tapered edges to present minimal tripping hazard.

C. Structure:

1. Vehicular Expansion Joint Covers: Provide expansion joint covers for parking decks capable of supporting minimum 3000 lb/linear ft at fully expanded position without damage.
2. Pedestrian Expansion Joint Covers: Provide expansion joint covers for interior floors capable of supporting minimum 300 lb/linear ft at fully expanded position without damage.

END OF SECTION C14

SECTION C15

STAIRS

PERFORMANCE

A. Basic Function:

1. Provide interior stairs, and ramps as necessary for access to and egress from all occupied spaces required by the program, in compliance with code and as follows:
2. Provide not less than one stair to all unoccupied roofs, mechanical spaces, and equipment mezzanines.
3. Stairs comprise the following elements:
   a. Structure supporting stairs, unless an integral part of superstructure.
   b. Tread and riser construction, unless an integral part of superstructure.
   c. Railings for interior stairs.
4. Where stairs are integral with elements defined within another element group, meet requirements of both element groups.
5. In addition to requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section C - Interiors, and Section C1 - Interior Construction.

B. Amenity and Comfort:

1. Stair Comfort:
   a. Stair Steepness: Provide interior stairs with risers of not more than 7 inches and treads sized so that twice the riser height plus the tread depth totals 24 to 25 inches.
2. Appearance of Enclosed Stairs: Constructed to present a moderately finished appearance.
3. Appearance of Utility Stairs at Mechanical and Similar Spaces : Constructed to present a utilitarian appearance.
4. Appearance of Exterior Stairs: Constructed to present a moderately finished appearance.

C. Health and Safety:

1. Safety of Stairs:
   a. Slip Resistance: Construct exterior stairs so that treads have a minimum static coefficient of friction of 0.80, measured in accordance with ASTM D 2047-2004.
   b. Risers: Construct stairs with closed risers.
   c. Treads: Construct stairs with treads that have a maximum bevel or radius on leading edge of 1/2 inch.
   d. Guards or Guardrails: Construct stairs so that there are no openings in guards or guardrails required by code that are large enough for a sphere with a diameter of 4 inches to pass through.
   e. Winders: Construct stairs without winders, even if permitted by code.

f. Spiral Stairs: Do not employ spiral stairs, even if permitted by code.
g. Circular Stairs: Do not employ circular stairs, even if permitted by code.
h. Alternating Tread Stairs: Do not employ alternating tread stairs, even if permitted by code.

2. Fire Resistance: Construct stairs of noncombustible materials.

D. Structural:

1. Interior Stairs and Ramps: Provide stairways, ramps, platforms, and landings capable of supporting loads in excess of those required by code.

2. Exterior Stairs and Ramps: Provide stairways, ramps, platforms, and landings capable of supporting loads in excess of those required by code.

3. Handrails and Guardrails: Provide handrail and guardrail assemblies capable of resisting forces in excess of those required by code.

PRODUCTS

A. Construct stairs using the following materials and systems:

1. Custom fabricated metal stairs with pre-cast terrazzo treads at stairs designated for student and faculty use.

2. Preassembled metal stairs at stairs for mechanical and similar rooms.

3. Pipe railings.

B. Do not use:

1. Tempered glass railing assemblies.

2. Metal spiral stairs.

3. Wood stairs.

4. Ornamental wood stairs and railings.

METHODS OF CONSTRUCTION

A. Construct stairs using the following methods and techniques:

1. Site fabrication of metal stairs.

2. Shop fabrication of metal stairs.

B. Finish stairs in accordance with NPS - Finishes Matrix in Design-Build Project Manual Volume 3 - Appendices, and Section C16 Interior Finishes.

1.

END OF SECTION C15

SECTION C16

INTERIOR FINISHES

PERFORMANCE

A. Basic Function:

1. Provide appropriately finished interiors for all spaces required by the program.
2. Interior finishes comprise the following elements:
   a. Wall finishes, including those applied to the interior face of exterior walls and to the vertical faces of superstructure elements.
   b. Floor finishes, except for access floors.
   c. Suspended ceilings and soffits.
   d. Applied ceiling finishes.
   e. Stair finishes, except for integral stair surfaces.
   f. Finishes applied to other interior surfaces.
3. Where interior finishes are integral with elements defined within another element group, meet requirements of both element groups.
4. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section C - Interiors, and Section C1 - Interior Construction.

B. Amenity and Comfort:

1. Reflectivity:
   a. Glare: Provide interior finishes that will not result in discomfort glare due to excessive contrast with light sources.
      1) Ceiling Surfaces: Not less than 90 percent reflectivity, when measured in accordance with ASTM E 1477-1998a (Reapproved 2003).
      2) Wall Surfaces: Not less than 70 percent reflectivity.
      3) Floor Surfaces: Not less than 30 percent reflectivity.
2. Acoustical Performance:
   a. Sound Absorption: Provide acoustical absorption within interior spaces to achieve reverberation times within the limits specified in Section C - Interiors.
3. Cleanliness:
   a. For kitchens, provide wall, ceiling, and floor surfaces that are USDA approved.
   b. For spaces such as swimming pool and toilet rooms, provide wall, ceiling, and floor surfaces that are inherently resistant to moisture and that can be cleaned by caustic agents without damage.

C. Health and Safety:

1. Slip Resistance: For spaces subject to floor wetting, including entry lobbies, provide floor finishes with inherent slip resistance under wet conditions.
   a. At building entries, provide means for reducing or minimizing moisture and debris on shoe soles.

b. At spaces such as kitchens, wet areas in retail spaces, treatment rooms, laboratories, steam rooms, and toilets, provide floor surfaces with minimum static coefficient of friction of 0.60 when wet, measured in accordance with ASTM C 1028-2006 or ASTM D 2047-2004.

2. Slip Resistance: At stairs and corridors, provide floor finishes with minimum static coefficient of friction of 0.60, measured in accordance with ASTM D 2047-2004.

3. Slip Resistance: At ramps, showers, steam rooms, and sloped floor surfaces, provide floor finishes with minimum static coefficient of friction of 0.80, measured in accordance with ASTM D 2047-2004.

4. Tactile Warning Surfaces: Provide floor surfaces that comply with ADAAG-1994 detectable warning requirements at potentially hazardous locations, including top and bottom of stairs, top and bottom of escalators, top and bottom of ramps, and edge of loading dock.

5. Flammability:
   a. Ceilings in Primary Spaces, Exits and Corridors: Provide ceilings with ratings not greater than the permitted by code.
   b. Walls in Primary Spaces, Exits and Corridors: Provide ceilings with ratings not greater than the permitted by code.
   c. Floors in Primary Spaces, Exits and Corridors: Provide ceilings with ratings not greater than the permitted by code.

D. Durability:

1. Interior Wall Finishes at Exterior Walls: Provide surfaces that will not be damaged by incidental condensation from windows.

2. Wall Protection: In mail rooms and freight receiving rooms, provide impact resistant wall bumpers, and corner guards or wall surfaces that are inherently resistant to impact damage due to rolling carts, and hand trucks.

3. Opening Protection: At partition openings intended to accommodate pedestrian or vehicular traffic, provide protection of opening edges in the form of door frames (cased openings), or corner guards.

4. Flooring: Provide floor finishes that are appropriate for anticipated usage and traffic in each area, based on a 20 year replacement cycle.
   a. Substantiation:
      1) Design Development: As specified for service life span in Section 111, including service life analysis and life cycle cost analysis.

PRODUCTS

A. Design and construct interiors using the materials and systems indicated in the "NPS Finishes Matrix / Elliott Street Elementary School" included in the the Design-Build Project Manual Volume 3 - Appendices utilizing the following:

1. Ceramic mosaic tile.

2. Precast terrazzo.

3. Thinset epoxy terrazzo.
4. Acoustical tile ceilings.
5. Wood Athletic flooring.
6. Resilient sheet flooring.
7. Epoxy Flooring
8. Sheet carpet, glued-down.
9. Carpet tile.
10. Acoustical wall treatment.

B. Furnish extra materials equal to 5 percent of quantity installed for each finish.

METHODS OF CONSTRUCTION

A. Construct interior finishes using the following methods and techniques:

1. Ceiling Suspension System:
   a. Grid Suspension System: Manufactured, interlocking system formed from ASTM C 645-2007 steel, designed for screw application of gypsum panels.
      1) Install in accordance with manufacturers instructions.
      2) Level to 1/600.
   b. Metal Framing: Members formed from ASTM C 645-2007 galvanized steel sheet.
   c. Carrying Channels: Cold-rolled steel channels complying with ASTM C 754-2007.
   d. Ceiling Hangers: Comply with ASTM C 754-2007.
   e. Installation of Framing for Screw Application of Gypsum Panels: Comply with ASTM C 754-2007; level to 1/1200

2. Gypsum Board: ASTM C 1396/C 1396M-2006a.
   a. Gypsum Ceiling Board: Incombustible, non-sag core; 1/2 inch thick; tapered edge.

3. Wall and Floor Tile:
   a. Floor Installation: Cement Mortar Bed Installation Over Waterproofing Membrane: TCA F121. Wall installation: Installation Method: TCA W202. Shower Installation Method Similar to B415 with CMU walls.
      1) Waterproofing Membrane for Floors: Comply with ASTM C 836-2006.
      2) Mortar Bed and Reinforcing for Floors: ANSI A108.1A-2005.
      3) Bond Coat: Latex-portland cement mortar on cured bed.
      4) Tile: Unglazed ceramic mosaic tile.
      5) Grout: Polymer modified cement grout; color as selected.
   b. Ceramic Mosaic Tile:
      1) ANSI A137.1-2008; moisture absorption 0.5 percent or less.
      2) Size and Shape: 2 inch square; square edges.
      3) Finish: Unglazed, colors to be selected from manufacturers standard range.

4) Trim Units: Matching bead, cove, and surface bullnose shapes in sizes to coordinate with field tile.

c. Accessories
   1) Stone Thresholds: Marble complying with ASTM C 503-2008; color to coordinate with floor tile

4. Epoxy and Polyurethane Flooring: 3/16 or 1/4 inch system as recommended by manufacturer; Abrasion-, impact- and chemical-resistant, decorative-aggregate-filled, epoxy-resin-based, monolithic floor surfacing designed to produce a seamless floor and integral cove base
   a. System Physical Properties:
      1) Residual Indentation:1 percent of thickness maximum per ASTM F1914 at 140 pounds
      2) Resistance to Elevated Temperature: Delta E <8 per ASTM F1514, 7 days at 158 Deg F.MIL-D-3134.
      3) Abrasion Resistance: 0.01 gm maximum weight loss per ASTM D 3389.
      4) Flammability: Class 1 per ASTM D648
      5) Hardness: 85 after 7 days, Shore D per ASTM D 2240.
      6) Bond Strength: >400, 100 percent concrete failure per ASTM D4541.
   b. Products
      1) Stonblend RTZ, Stonhard
      2) SofTop, General Polymers
      3) or accepted equal.

5. Grid-Supported Acoustical Ceilings:
   a. Standards:
      1) Acoustical Products: Characteristics measured in conformance with classification system of ASTM E 1264-1998(R05).
      2) Suspension Systems: Comply with ASTM C 635-2004.
   b. Panel System:
      1) Acoustical Panels: Types as indicated in NPS Finishes Matrix, and as follows:
         a) Size: 24 by 48 in.
         b) Edge Detail: Square.
         c) Color: White.
      2) Suspension System:
         a) Type: Exposed, painted steel, non-fire rated, heavy duty, and as follows:
            (1) Construction: Double web.
            (2) Profile: Tee.
            (3) Width: 15/16 in.
            (4) Finish: White.
         b) Type: Exposed, extruded aluminum cap, heavy duty, with G60 galvanized coating, and as follows:
            (1) Profile: Tee.
            (2) Width: 15/16 in.
            (3) Finish: Painted white.

(4) Location: Commercial Kitchen

6. Unbacked Sheet Vinyl Floor Covering: ASTM F 1913, 0.080 inch (2.0 mm) thick.
   a. Fire Testing: ASTM E 648/NFPA 253 (Critical Radiant Flux)-Class 1
   b. Slip Resistance: Exceed A.D.A. recommendation of .6 for flat surfaces when tested in accordance with ASTM D 2047.
   c. Seaming Method: Heat welded.
   d. Integral-Flash-Cove-Base -(Where indicated on NPS Finish Matrix in Volume 3 Appendices): 1-inch (25-mm) radius provided or approved by floor covering manufacturer.

7. Resilient Base Standard: ASTM F 1861.
   a. Material Requirement: TS (rubber, vulcanized thermoset)
   b. Manufacturing Method: Group I (solid, homogeneous) .
   c. Provide straight (flat or toeless) for carpeted areas, and Cove Base elsewhere.
   d. Style: Straight (flat or toeless) for carpet, Cove (base with toe) elsewhere.
   e. Both types of rubber base are generally 0.125 inch (3.2 mm) thick; however, some manufacturers offer various thicknesses. Vinyl base is available in both thickness options in first paragraph below, but not from every manufacturer.
   f. Minimum Thickness: 0.125 inch (3.2 mm
   g. Height: 4 inches (102 mm

8. Wood Strip Flooring:
   a. Species: Northern hard maple; grade of Second and Better; flat grain.
   b. Moisture Content: 7 to 9 percent.
   c. Thickness: 25/32 in.
   d. Width: 2-1/4 in.
   e. Edge: Tongue and groove.
   f. Ends: Square.
   g. Length: Random, minimum of 12 in.
   h. Gymnasium Floating Floor:
      1) Floating Sleepers: Install sleepers made of softwood, 2 x 4 in size, at 12 in on center on resilient pads.
      2) Secondary Subfloor: Install layer of APA rated plywood sheathing, Exterior exposure class; span rating of 32/16 in, over sleepers.
      3) Flooring: Blind nail flooring to secondary subfloor, in accordance with manufacturer's instructions.
      4) Lines: Apply gym enamel, in colors selected .
         a) For game markings, use current rules of the National Federation of High School Association or other association having jurisdiction.
         b) Logo: Provide School district logo at center court
      5) Finishing: Sand to achieve smooth surface with no sander marks; apply finish in two coats.

9. Sheet Carpet:
   a. Surface Texture: Textured multi-colored loop
   b. Dye Method: Solution dyed/yarn dyed.
   c. Face Yarn: 6,6 Nylon.
   d. Face Weight: 24 oz/sq. yd.

e. Performance Characteristics: As follows:
   1) Dry Breaking Strength: Not less than 100 lbf (445 N) per ASTM D 2646.
   2) Retain subparagraph below for wool or wool blends only.
   3) Resistance to Insects: Comply with AATCC-24.
   4) Colorfastness to Crocking: Not less than 4, wet and dry, per AATCC-165.
   5) Colorfastness to Light: Not less than 4 after 40 AFU (AATCC fading units) per AATCC-16.
   6) Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria; not less than 1-mm halo of inhibition for gram-negative bacteria; no fungal growth; per AATCC-174.

10. Carpet Tile:
    a. Carpet Type: Modular.
    b. Size: As indicted on Finish Matrix (See Volume 3 - Appendices)
    c. Construction: Tufted Textured Loop.
    d. Yarn System: Type 6,6 Nylon.
    e. Yarn Weight: 20 oz./sq. yd.
    f. Performance Characteristics: As follows:
       1) Dry Breaking Strength: Not less than 100 lbf (445 N) per ASTM D 2646.
       2) Retain subparagraph below for wool or wool blends only.
       3) Resistance to Insects: Comply with AATCC-24.
       4) Colorfastness to Crocking: Not less than 4, wet and dry, per AATCC-165.
       5) Colorfastness to Light: Not less than 4 after 40 AFU (AATCC fading units) per AATCC-16.
       6) Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria; not less than 1-mm halo of inhibition for gram-negative bacteria; no fungal growth; per AATCC-174.

11. Adhesives: Premium water-resistant, mildew-resistant, nonstaining, type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed product and is recommended by the manufacturer of the floor goods.

12. Sealed Concrete: Commercial concrete sealer suitable for application

END OF SECTION C16

SECTION C2

INTERIOR FIXTURES

PERFORMANCE

A. Basic Function:

1. Provide elements fixed to interior construction that are necessary for complete and proper functioning of spaces required by the program.
2. Where interior fixtures are integral with elements defined within another element group, meet requirements of both element groups.
3. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance and Section C - Interiors.

B. Amenity and Comfort:

1. Accessibility: Provide interior fixtures that are easily usable by disabled persons without outside assistance.
   a. Provide interior fixtures that comply with ADAAG-1994 and ANSI A117.1 - 2003
2. Light and Glare: Provide interior fixtures that are not a source of direct or reflected glare.
3. Convenience: Provide interior fixtures with fittings and controls that are manageable without special instruction or the need for excessive force.
4. Appearance: Provide interior fixtures that are coordinated in design with other elements of interior construction, using compatible materials, colors, and textures.
5. Texture: Provide durable, low maintenance exposed surfaces for interior fixtures that are within reach of occupants engaged in activities normal for the particular space in which they are installed.
   a. Flat, Exposed Metal Surfaces: Finishes that are satin, that is, non-reflective rather than smooth polished surfaces.
   b. Flat Metal Surfaces: Coatings not permitted.
   c. Hardware and Other Rounded Metal Surfaces: Finishes that are satin.
   d. Hardware and Other Rounded Metal Surfaces: Coatings not permitted.
   e. Plastic Surfaces: Matte, rather than glossy or polished finishes.
   f. Flat Wood Surfaces: Low-gloss finishes, transparent.
   g. Curved Wood Surfaces: Finishes that are transparent, semi-gloss, or low-gloss.

C. Structure:

1. Live Loads: Provide suspended interior fixtures or portions of fixtures designed for storage or support of persons or objects that have been engineered and installed to withstand 1.5 times the anticipated live loads without excessive deflection or permanent distortion.
   a. Substantiation:
      1) Construction Documents: Engineering calculations or proven-in-use substantiation.

2. Seismic Loads: Provide interior fixtures or portions of fixtures designed for storage or support of persons or objects that have been engineered and installed to withstand seismic forces that are greater than those required by code.
   a. Application: For design purposes, apply the component seismic force at the center of gravity of the component nonconcurrently in any horizontal direction.

D. Operation and Maintenance:

1. Ease of Use:
   a. Language of Identifying Devices: All text in English.
   b. Interior Fixtures with Movable Components: Easy to use without special instruction and designed to prevent misuse.
   c. Hinges and Latches: Heavy duty hardware, easily adjustable, providing minimum anticipated service life of 20 years.
   d. Mechanical Controls: Movable cranks, rotors, pulleys, and levers designed for trouble-free operation over a minimum anticipated service life of 20 years.
   e. Substantiation:
      1) Construction Documents: Details of interior fixtures, documenting construction features.

2. Ease of Repair: Provide interior fixtures at all locations that are designed to permit repair or replacement of individual components without removal of fixture.

3. Ease of Replacement or Relocation: Provide interior fixtures at all locations that are modular in form, detachable from substrate without damage to fixtures, and relocatable.

4. Theft Resistance: Provide interior fixtures at all locations that are attached to substrates with concealed, tamper-resistant, or tamperproof fasteners to minimize theft and vandalism.

END OF SECTION C2

SECTION C21

IDENTIFYING DEVICES

PERFORMANCE

A. Basic Function:

1. Provide identifying devices fixed to interior construction that are necessary for direction to and identification of functions and spaces as required by the program.
   a. Room Label Signs: Provide room label signs for all spaces.
   b. Directional Signs: Provide directional signs at all building entrances.
   c. Building Directories: Provide adequately sized directories at public building entrances, elevator lobbies on each floor, and escalators on each floor.

2. Identifying devices comprise the following elements:
   a. Room or function labels applied to doors or walls immediately adjacent to doorways.
   b. Signs that provide guidance to, or information about, building functions or spaces, including directional signs, locator maps, and logotypes.
   c. Building directories with replaceable information strips.

3. Text/Content of Identifying Devices: Some content will be provided by NJSDA; remainder to be provided by Design-Builder for NJSDA' approval.

4. Where identifying devices are integral with elements defined within another element group, meet requirements of both element groups.

5. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section C - Interiors, and Section C2 - Interior Fixtures.

B. Amenity and Comfort:

1. Accessibility:
   a. Provide identification devices that comply with ADAAG-1994.
   b. Room Labels: Dual signage for visually handicapped and normally sighted.
   c. Function Labels: Graphic and Braille signs for the following building services and functions:
      1) Stairways.
      2) Escalators.
      3) Elevators.
      4) Telephones.
      5) Toilets.
   d. Building Directories: Accessible raised or recessed lettering in addition to listings protected by glass or plastic.

2. Visibility:
   a. Character Size: Provide signs with characters of adequate size to be seen comfortably by normally sighted persons at typical viewing distances.
      1) Wall-Mounted Corridor Signs or Signs Intended for Viewing at Less Than 5 feet: Minimum character height of 5/8 inch and maximum of 2 inch.

2) Signs Mounted Above Head Height or Intended for Viewing at More Than 10 feet: Minimum character height of 3 inches.
3) Building Directories: Minimum name strip height of 3/8 inch.

b. Reflectivity: Provide signs with matte surface measuring 11-19 degree gloss on 60 degree glossimeter.

c. Contrast: Provide signs with contrast between characters and background of not less than 70 percent.

1) Characters: Light on dark background throughout project.

3. Convenience:

a. Room Label Signs: Provide signs with feature allowing NJSDA to change information.

b. Directories: Provide directories with feature allowing NJSDA to prepare new listings directly, without involvement of sign company or other agency.

4. Appearance:

a. Provide signage for entire project that is consistent in design with other interior features and coordinated with overall color scheme.

b. Room Label Signs: Framed panel signs.

C. Health and Safety:

1. Emergency Signs: In addition to exit signs required by code, provide the following types of signs:

2. Safety Signs: In addition to signs required by code, provide danger signs with bright background color at the following locations:

D. Operation and Maintenance:

1. Vandalism Resistance: For signs in public areas that are within reach, provide signs that are positively attached to substrate by concealed mechanical devices and not by double-sided tape, sealant, or adhesive.

2. Ease of Replacement: For building directories, provide system with message strips that are easily replaceable by NJSDA' personnel.

3. Access to Lighting: For Illuminated signage, provide signage with system of quick access to lamps for NJSDA' maintenance personnel that will also prevent unauthorized tampering with lighting.

PRODUCTS

A. Room and Function Label Signs:

1. Use one of the following:

a. Framed plastic panel signs with raised characters and graphics.

b. Cast metal plaques at Main Lobby .

B. Directional Signs:

1. Use one of the following:

a. Framed plastic panel signs with raised characters and graphics.

2. Do not use:
   a. Framed metal panel signs with pre-applied characters and graphics.
   b. Cast metal plaques.
   c. Backlit metal box signs.

END OF SECTION C21

SECTION C22

STORAGE FIXTURES

PERFORMANCE

A. Basic Function:

1. Provide storage fixtures attached to interior construction that are necessary for proper functioning of spaces required by the project program.

2. Storage fixtures comprise the following elements:
   a. Closed Material and Utensils Storage: Provide modular storage cabinets and countertops with capacity adequate to accommodate required functions in spaces designated in the program.
   b. Display Storage: Provide cases and display shelving with capacity adequate for intended uses in spaces designated in the program.
   c. Temporary Clothing Storage: Provide open or semi-concealed wardrobe units with capacity adequate for anticipated occupancy in spaces designated in the program.
   d. Miscellaneous Storage Fixtures: Provide shelves, hooks, clothing hanger rods, and shoe racks with capacity adequate for anticipated occupancy in spaces designated in the program.
   e. Temporary Lockable Storage: Provide lockable transient storage units adequate for anticipated occupancy in spaces designated in the program.
   f. Open Material Storage: Provide storage racks or utility shelves for material storage adequate for anticipated needs in spaces designated in the program.
   g. Other Storage Fixtures: Provide for storage adequate for anticipated needs in spaces designated in the program.

3. Where storage fixtures are integral with elements defined within another element group, meet requirements of both element groups.

4. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section C - Interiors, and Section C2 - Interior Fixtures.

B. Amenity and Comfort:

1. Accessibility:
   a. Provide storage fixtures that comply with ADAAG-1994 and ANSI A117.1 2003
   b. Amounts of Storage: Provide accessible storage comprising not less than 10 percent of available storage fixtures of each type, but in no case less than one of each type.
   c. Clothing Storage: Where transient clothing storage is required, including closets, wardrobes, closet fixtures, and clothing lockers, provide shelves, clothes hooks, and hanging rods that are not more than 54 inches from the floor.
   d. Countertops: Where work surfaces or countertops over storage fixtures are required, provide wheelchair access to not less than 10 percent of surface at maximum height of 34 inches from the floor.

e. Storage Shelving: Where open or closed material storage is required, provide not less than 20 percent of shelving within a maximum height of 54 inches and a minimum height of 9 inches from the floor.

2. Convenience:
   a. Open Clothing Storage: Provide coat and hat racks and coat hooks throughout the project that are designed with rounded ends and edges to avoid damage to clothing items.
   b. Secured Clothing Storage: Provide individual lockable storage units for transient usage throughout the project that are equipped with hat shelf, clothes hanger rod, and wall hooks.
   c. Door Hardware: Provide hardware on not less than 5 percent of latching doors that complies with ADAAG-1994.

3. Stored Item Security:
   a. Locks: Provide locking capability at storage fixtures as follows:
      1) Lockers: Dial combination locksets.
      2) Cabinets: Keyed locks.
      3) Casework: Keyed locks.

4. Ventilation: For wardrobe lockers and athletic lockers, provide for air circulation through fixture by means of door louvers.

5. Appearance:
   a. Cabinetry: For closed storage fixtures, provide elements that are designed to complement interior finishes, with concealed hinges and door and drawer pulls integrated into cabinet fronts.
   b. Countertops and Work Surfaces: Provide light-colored or metallic surfaces that are seamless or tightly jointed.
   c. Lockers: Provide transient storage lockers that are color-coded to floor, department, or area.

C. Health and Safety:

1. Combustibility: Provide storage fixtures throughout the project that are made of totally incombustible or fire-retardant treated materials.

2. Fire Hazard: At locations intended for the storage of flammable or highly combustible materials, provide storage fixtures made of totally incombustible materials and doors that are lockable and airtight.

D. Structure:

1. Seismic Loads: Provide storage racks and shelving units that have been engineered and installed to withstand seismic forces as specified in Section C2.

PRODUCTS

A. Built-In Cabinetry and Casework:

1. Use one of the following:
   a. Custom-made wood cabinets with plastic laminate finish.

b. Manufactured wood cabinets with stain finish at Labs.
c. Manufactured plastic laminate clad cabinets and countertops elsewhere at .

B. Wardrobe Units:

1. Use one of the following:
   a. Wood and metal coat and hat racks.

C. Closet Specialties:

1. Use one of the following:
   a. Fixed wood shelving and metal hanger rods at coat closets.
   b. Adjustable wood shelving at storage closets.

D. Lockers:

1. Use one of the following:
   a. Metal frame and panel lockers with baked enamel finish at corridors and lockerrooms.
2. Do not use:
   a. Wood lockers with plastic laminate finish.
   b. Wood lockers with natural wood finish.

E. Utility Storage Shelving:

1. Use one of the following:
   a. Wood shelving with plastic laminate finish.
2. Do not use:
   a. Metal frame and panel shelving with baked enamel finish.
   b. Metal frame and expanded metal shelving with baked enamel finish.
   c. Modular metal pallet rack system.

METHODS OF CONSTRUCTION

A. Provide storage fixtures using the following methods and techniques:

1. Manufactured and factory-finished storage fixtures for field installation throughout the project.
2. Metal Lockers: Fabricate from galvanized steel sheet conforming to ASTM A 653/A653M-2006a, SS Grade 33 (230), G60/Z180 coating.
   a. Wardrobe Lockers: Minimum steel thickness of 0.024 in; frames of formed channel shapes; welded and ground flush; resilient latching mechanism for quiet operation.
      1) Width: 12 in.
      2) Depth: 18 in.
      3) Height: 72 in.
      4) Locking: Equip with built-in combination locks.
      5) Ventilation: Door louvers.
      6) Doors: Hollow construction, channel reinforced top and bottom, acoustical fill, smoothly ground and finished edges.
      7) Hinges: Minimum 2 hinges welded securely to body and door.

8) Number Plates: Rectangular aluminum plates, riveted to doors, color contrasting with doors.
9) Locker Colors: As selected from manufacturer's standards.
10) Accessories: Minimum two wall hooks, coat hanger bar, and hat shelf.

b. Athletic Lockers: Minimum steel thickness of 0.060 in; frames of formed channel shapes; welded and ground flush; resilient latching mechanism for quiet operation.
1) Width: 9 in.
2) Depth: 12 in.
3) Height: 48 in.
4) Locking: Equip with built-in combination locks.
5) Ventilation: Door of expanded metal, channel frame.
6) Hinges: Minimum 2 hinges welded securely to body and door.
7) Number Plates: Rectangular aluminum plates, riveted to doors, color contrasting with doors.
8) Locker Colors: As selected from manufacturer's standards.
9) Accessories: Minimum two wall hooks and ceiling hook.

END OF SECTION C22

SECTION C24

ACCESSORY FIXTURES

PERFORMANCE

A. Basic Function:

1. Provide accessory fixtures as required to accomplish the design as required by code and as indicated in the project program.
   a. Mirrors:
      1) One for each lavatory, unless otherwise indicated.
      2) Full length mirror at each multi-stall toilet room.
   b. Grab Bars: Wherever required for safety and assistance in use of toilet and bath fixtures, and at toilets designed for the disabled and showers.
   c. Waste receptacles.
      1) One for each paper towel dispenser.
      2) One for each two toilets in women's restrooms, for sanitary napkin disposal.
      3) Some other waste receptacles are specified in Section E2.
   d. Shower Fixtures:
      1) Closures that prevent water spillage onto floors and walls outside showers.
      2) Shower seats in each shower compartment.
   e. Baby Changing Station: One in each public restroom.
   f. Electric Hand Dryers: One for every 3 lavatories or less in a group at multi-stall toilet rooms.
   g. Holders and dispensers for toilet, sink, and bath supplies:
      1) Toilet Paper: Jumbo roll size; one dispenser per toilet.
      2) Towels: Paper, in rolls; one dispenser per single use toilet room
      3) Toilet Seat Covers: Paper; one dispenser per toilet.
      4) Hand Soap: Liquid, one dispenser for each lavatory.
      5) Women's Personal Supplies: Vending of sanitary napkins; for each group of 3 or more toilets.
   h. Hooks for temporary storage of occupants' property; one in each toilet compartment.
   i. Holders and dispensers for cleaning supplies, utensils, and tools furnished by Newark Public Schools .
      1) Mops and Brooms: 6 items to be hung up in each janitor's closet, plus shelf for supplies.
   j. Telecommunications Fixtures: Fixed mountings and enclosures for sound communications equipment and supplies.
      1) Public telephones, including telephone instrument, secured directories, and no seat, at location selected.
   k. Visual Display Fixtures: Provide at locations and sizes indicated in "Educational Specifications - For the Proposed New Elliott Street School" included in the Design-Build Contract Documents Volume 3 - Appendices (Ed Spec) and as follows:
      1) Erasable surfaces, which are identified in the program as chalkboards.

a) Abrasive, toothed surface for marking with chalk and erasure with and without using water.
b) Classrooms: 64 sq ft, minimum, usable area.
c) Erasable surface area must be calculated separately from other display surface types.
d) Holders for writing materials, below and full length of each area of erasable surface.

2) Tackable surfaces, which are identified in the program as tackboards, for standard push pin use.
a) Classrooms: 32 sq ft, minimum, usable area.
b) Tackable Strips: 1 inch wide strip above and full length of each area of erasable surface.

3) Magnetic surfaces, Where identified int he Ed Spec.

4) Projection surfaces.
a) Provide at locations and sizes indicated in "Educational Specifications - For the Proposed New Elliott Street School" included Design-Build Contract Documents Volume 3 - Appendices.
b) Projection equipment will be furnished by NJSDA.
c) Coordinate the surfaces and equipment provided with the room/space design, lighting, and sound reinforcement equipment, for optimum viewing at all normal seating locations, without hot spots, loss of resolution, excessive dimming of image, or difficulty of hearing.
d) Substantiation:
(1) Design Development: Audio-visual space layouts, showing normal seating locations, projection locations, and recommended projection equipment.
(2) Construction Documents: Certification of suitability of selected projection surfaces by manufacturer; identification of required projection equipment.

2. Where accessory fixtures also must function as elements defined within another element group, meet the requirements of both element groups.

3. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section C - Interiors, and Section C2 - Interior Fixtures.

B. Amenity and Comfort:

1. Visual Properties of Projection Surfaces:
a. Contrast and resolution sufficient to provide accurate viewing at all normal seating locations in the room or space.
b. Ambient light rejection as required to provide minimum gain specified under design lighting conditions.
c. Auditorium: Minimum gain of 1.0 at all locations within 30 degrees of viewing axis; minimum gain of 2.0 at all locations within 10 degrees of viewing axis.
d. Classrooms: Minimum gain of 1.0 at all locations within 30 degrees of viewing axis.

2. Convenience of Visual Display Surfaces:
   a. Except as otherwise indicated, required surface area must be accomplished within the "usable" areas as follows, although additional area is not objectionable:
      1) Erasable Surfaces: Not less than 30 inches above floor; not more than 72 inches above floor.
      2) Tackable Surfaces: Not less than 36 inches above floor; not more than 72 inches above floor.
      3) Magnetic Surfaces: Not less than 36 inches above floor; not more than 72 inches above floor.
      4) Projection Surfaces: Not less than 36 inches above floor; not more than 84 inches above floor.
   b. Projection Surface Access: Either permanently exposed in locations required or easily assembled or lowered without the use of tools.
      1) Surfaces Concealed When Not in Use: Access by up/down controls conveniently located near space entrance(s) and to session presenter location, if any, but minimizing likelihood of tampering by audience members.

3. Appearance of Visual Display Surfaces:
   a. Color: White surfaces are required.
   b. Tackable Surfaces: Self-healing material or surface finish that minimizes visibility of ordinary thumbtack holes.
   c. Flatness: Permanently flat, without warp or bow.

C. Health and Safety:

1. Slip Resistance:
   a. Fixtures Expected to Support or Assist in the Support of Persons: Touchable surfaces knurled, cross-hatched, or peened.

2. Broken Glass Hazard: Provide only fully tempered float glass for glass in fixtures.

3. Provide Antimicrobial finishes on touch surfaces of Toilet Accessories.

4. Physical Security of Users of Telecommunications Fixtures: Fixtures and environs designed and located so as to minimize theft and attacks on users, using principles specified in Section 111, and to create obvious impression of safety.

D. Structure:

1. Grab Bars: Strength, design, anchorage, and support as required to withstand 250 pounds-force applied vertically at the center between supports and 250 pounds-force tension applied at any support; supports of sufficient rigidity to prevent rotation of bars under load.

E. Durability:

1. Service Life Span:
   a. Erasable Surfaces: Minimum of 50 years, including appearance.

2. Outdoor Units: Finish and materials complying with specified requirements for exterior enclosure specified in Section B; leakproof enclosures, for protection of contents.

3. Indoor Units: Materials and finish complying with specified requirements for equivalent environments specified in Section C.

4. Wear Resistance:
   a. Visual Display Surfaces: Comply with requirements of Section C16 for wall finishes for the building spaces in which installed, as a minimum.
   b. Erasable Surfaces: Designed to withstand marking with the specified materials without permanent damage, imprint, or visibility of erased markings.
   c. Tackable Surfaces: Tackable material and surface finish durability not less than would be provided by applied wall coverings complying with ASTM F 793-2007 Category II-Decorative with Medium Serviceability.
   d. Projection Surfaces: Fragile surfaces protected from accidental damage by providing covering or concealment when not in use.

F. Operation and Maintenance:

1. Frequency of Servicing: NJSDA expects that refilling/emptying will occur at the following intervals; provide capacity appropriate to servicing interval and expected use, based on project occupancy:
   a. Paper Towel Dispensers: Daily.
   b. Toilet Paper Dispensers: Daily, with sufficient redundancy to prevent running out.
   c. Toilet Seat Cover Dispensers: Weekly.
   d. Hand Soap Dispensers: Weekly.
   e. Waste Receptacles: Daily.
   f. Personal Supplies Vendors: Daily.

2. Ease of Repair:
   a. Mirrors: Breakable glazing replaceable without disassembly of frame.

3. Theft Deterrence:
   a. Toilet Accessories:
      1) In Public Restrooms: Secure to substrates using tamperproof or concealed concealed fasteners.
   b. Telecommunications Fixtures: Secure equipment to fixtures and secure fixtures to structure using anchorages capable of resisting forced removal by vandals or thieves using common hand-held tools.

PRODUCTS

A. Comply with Newark Public Schools Standards included in Design-Build Contract Documents Volume 3 - Appendices.

B. Reflective Surfaces of Mirrors:

1. Provide one of the following:
   a. Glass.

C. Toilet and Bath Accessories:

1. Provide the following:
   a. Stainless steel commercial grade heavy-duty accessories and the following.
   b. Hand Soap Dispensers: Lockable impact resistant plastic unit capable of accepting Newark Public Schools' standard soap packet.
      1) NPS Standard Soap Packet: Inopak 1000 milliliters LLD polyethylene leak proof and drip proof packe
   c. Paper Towel Dispenser: Lockable impact resistant plastic unit with drop down roll mechanism dispensing new rolls; 12 by 11.813 by 9.75 inches (H by W by D) capable of accepting Newark Public Schools' standard 700 foot roll.
      1) NPS Standard Paper Roll: Georgia Pacific # 82765 Towlmastr Max 3000 y Series.
   d. Toilet Paper Dispenser: Lockable impact resistant plastic unit with drop down roll mechanism dispensing new rolls; capable of accepting Newark Public Schools' standard 2500 single sheet roll.
      1) NPS standard Paper Roll: Valay # 0304.
   e. Hand dryers: Green Seal Approved high efficiency units complying with the following:
      1) Enclosure Material: One piece, heavy duty, rust-resistant, rib-reinforced, die-cast zinc alloy.
      2) Performance Requirements
         a) Operating protocol: Hand drying shall be accomplished in two sequential phases:
            (1) Phase 1: Loose water droplets blown from hands with strong, controlled air blast:
               (a) Air velocity in linear feet per minute (LFM): At outlet: 16,000 LFM.
               (b) At average hand position of 4 inches below outlet: 14,000 LFM.
               (c) Approximate time: 3 to 4 seconds.
               (d) Water removed: 75 percent.
            (2) Phase 2: Residual moisture evaporated and hands warmed by heated air stream. F
               (a) Minimum air temperature at average hand position of 4 inches below air outlet: 130 degrees Fwhen room temperature is 72 degrees
               (b) Water removed: 25 percent.
      3) Total drying time required to remove 5 to 6 grams of water: Varies depending on conditions from 10 to 15 seconds.
      4) Maximum moisture remaining on hands at end of drying cycle: 0.2 grams.

D. Shower Closures:

1. Provide the following:
   a. Plastic shower curtains.

E. Erasable Surfaces:

1. Provide the following:

a. Porcelain enameled steel.

F. Visible Surfaces of Tackable Surfaces:

1. Provide one of the following:
   a. Natural cork.
   b. Linoleum.

2. Do not use:
   a. Synthetic woven fabric.
   b. Natural woven fabric.

G. Projection Surfaces:

1. Provide one of the following:
   a. Front projection screens manufactured for the purpose.

2. Do not use:
   a. White painted gypsum board or plaster.

END OF SECTION C24

SECTION C25

FIXED SEATING

PERFORMANCE

A. Basic Function:

1. Provide seats for occupants and visitors of the type and in the quantity required by the project program and in accordance with the code.
   a. Audience Seating:
      1) Application: In auditorium and theater.
      2) Theater: Seats of standard depth, standard width, standard height, and standard resilience; backs of standard height, standard resilience, and standard pitch; with arms; no tilt.
   b. Benches:
      1) Application: At gymnasiums (bleachers).
      2) Bleachers: Backless and armless seats of standard depth, standard width, standard height, and no resilience.
2. Where fixed seating also must function as elements defined within another element group, meet the requirements of both element groups.
3. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section C - Interiors, and Section C2 - Interior Fixtures.

B. Amenity and Comfort:

1. Comfort:
   a. Seat Width:
      1) Standard: 20 inches center-to-center, 17 inches minimum seat width.
   b. Seat Depth:
      1) Standard: 17 inches deep, minimum front edge to most forward point of back.
   c. Seat Height: Plus or minus 1/2 inch.
      1) Standard: 17 inches.
   d. Seat Contour: Accomplished using seat base or padding.
      1) Benches: Contoured front to back with rounded front edge.
      2) Molded, shaped, or contoured front-to-back and side-to-side, to fit body, with rounded or padded front edge.
   e. Seat Pitch:
      1) Benches: Flat (no pitch).
      2) Audience: 5 to 8 percent, front to back.
   f. Seat Resilience:
      1) Benches- None: Rigid.
      2) Audience Standard: Equivalent to 2 inches of polyurethane foam and springs.
   g. Back Height: Measured from top of seat at point at which straight line projection of surface of back intersects with seat; plus or minus 1/2 inch.

1) Audience - Standard: 17 inches.

h. Back Pitch: Slope back from seat, allowing minor contour of back, measured from intersection of straight line projection of surface of back with seat to top front edge of back.
   1) Audience - Standard: 20 degrees.

i. Back Contour: Accomplished using seat base or padding.
   1) Molded: Contoured side-to-side, to fit body.

j. Back Resilience:
   1) Audience - Standard: Equivalent to 2 inches of polyurethane foam.

k. Arm Height: 7 to 8 inches above seat.
   1) Audience: Level arms.

l. Arm Resilience:
   1) None: Rigid.

2. Convenience:
   a. Flip-Up Seats: Provide self-rising seats wherever appropriate to increase spacing between rows when exiting.

C. Health and Safety:

1. Fire Retardance:
   a. Seats and Backs: Self-extinguishing when mock-up is exposed to smoldering cigarettes in accordance with ASTM E 1352-2002 or NFPA 261-2003.
   b. Any Individual Seating Item: Maximum instantaneous net peak rate of heat release of 250 kW or less, and total energy released during first 5 minutes of 40 mJ or less, when tested in accordance with ASTM E 1537-2002a.
   c. Exception: Obviously non-combustible materials such as metals.

D. Durability:

1. Service Life Span: Same as for building; upholstery: minimum of 30 years.
   a. Substantiation:
      1) Design Development: Identification of actual products to be used, including fabric coverings, if any.

2. Vandal Resistance: Parts not easily removed without the use of tools.

E. Operation and Maintenance:

1. Ease of Maintenance: Not requiring any routine measures to maintain operation or finishes, other than washing with soap and water.

2. Ease of Repair:
   a. Seating Units: Modular units that can be replaced without removal of other units.
   b. Fabric and Other "Soft" Finishes: Easily replaced in case of damage.

PRODUCTS

A. Audience Seating:

1. Provide one of the following:
   a. Fixed auditorium-style seating at auditorium.

b. Padded seats and backs at auditorium

2. Do not use:
   a. Fixed ganged and beam-supported seating.
   b. Fixed paired pedestal-mounted one-piece chairs.
   c. Fixed one-piece chairs.
   d. Movable one-piece chairs.
   e. Pews.

B. Benches:

1. Provide one of the following:
   a. Telescoping bleachers at gymnasium with electricfied operation.
   b. Plastic seats.

2. Do not use:
   a. Ganged seats.
   b. Paired seats.
   c. Wood seats or backs.
   d. Metal seats or backs.

END OF SECTION C25

SECTION D

SERVICES

PERFORMANCE

A. Basic Function:

1. Provide the following services:
   a. Conveying Systems (D1): Mechanized means of conveying people and goods, as specified in the project program.
   b. Water and Drainage (D2): Means of delivery of water to points of utilization; automatic heating and conditioning of domestic water; and unattended removal of water, rainwater, and liquid waste.
   c. HVAC (D3): Artificial means of maintaining interior space comfort and air quality, including heating, cooling, ventilation, and energy supply.
   d. Fire Protection (D4): Automatic fire detection, suppression, and warning; automatic smoke control; and manual fire-fighting equipment.
   e. Electrical Power (D5): Energy to operate all electrically-operated devices, including those included under other services and those provided separately by the NJSDA.
   f. Artificial Lighting (D6): Means of illuminating spaces and tasks, both interior and exterior, independent of reliance on natural light.
   g. Telecommunications (D7): Services that include voice and data transmission, telephone equipment, sound reinforcement, television reception, and television distribution.
   h. Process Utilities: Services that include specially processed water, special waste removal or treatment, air and gases, fuels, HVAC, special fire protection, special telecommunications, and special measurement and control.
   i. Other Services (D9): Services that include integrated facility controls, surveillance and security controls, special grounding, and cathodic protection.

2. Utility Sources and Outlets:
   a. Water Source: Existing public utility.
   b. Sewage Disposal: Connect building sewer to the existing public sewage system.
   c. Rain Water Drainage Outlet: Existing public utility storm drainage system independent of sanitary sewer.
   d. Electrical Power Source: Existing public utility.

3. Equipment That is Not Part of Services Systems: Specified in the project program and in Sections E, E1, or E11 through E19.

4. Where services elements must also function as elements defined within another element group, meet the requirements of both element groups.
   a. Where services elements are located outside the building in the site area, meet applicable requirements of Sections G3, G31, G32, G33, and G34.

5. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance.

B. Amenity and Comfort:

1. Artificial Illumination: Provide illumination for all interior spaces that is adequate in level and quality for comfortable performance of tasks typical for each space, regardless of the availability of natural light.
   a. Light Levels: See Section D6.
   b. Substantiation:
      1) Construction Documents: Calculations of illuminance levels for representative spaces, prepared by a registered electrical engineer.

2. Equipment Producing By-Product Heat: Ventilate housings and cabinets as required by equipment manufacturer and rooms and spaces as required to maintain specified environmental conditions.

3. Moisture: Prevent condensation from forming on service elements.

4. Airborne Sound:
   a. Maintain the sound transmission characteristics of assemblies through which services must pass; comply with requirements of Section where penetrated assembly is specified.
   b. Prohibited Plumbing Noises: All sounds of flushing and of liquid running through pipes ("bathroom sounds") are prohibited outside of the rooms housing toilets, bathtubs, and showers, with the exception of when doors to those rooms are open.
   c. Equipment Noises: Noise level below that which will be objectionable, based on occupancy of spaces.
   d. When services are located within assemblies that perform sound isolation functions, consider the noise produced by the service itself as one of the external sound sources.

5. Structure-Borne Sound and Vibration: Prevent transmission of perceptible sound and vibration from services equipment that rotates, vibrates, or generates sound, by isolating such equipment from superstructure or by isolating equipment support foundations from building foundations.
   a. Substantiation:
      1) Construction Documents: Details of isolation methods.

6. Cleanliness: Prevent accumulation of debris and dirt at floor mounted equipment, such as air handlers, chillers, pumps, switchgear, and panelboards by one or more of the following methods.
   a. Provide 4 inch thick, concrete housekeeping pads.
   b. Provide corrosion-resistant equipment stands.

7. Odors: Eliminate, isolate, or exhaust odors produced by occupant functions and building services.

8. Appearance:
   a. Conceal services elements from view to greatest extent possible, with exposed portions of simple, neutral design and color.
      1) Exception: Standard designs of manufacturers, without consideration for appearance, may be used for fire suppression sprinkler heads.

2) Exception: Exposed portions are acceptable in areas without suspended ceilings.
3) Where exposed portions are acceptable, do not obstruct or diminish clear dimensions of doorways, windows, other operable openings, access panels and cabinet doors, or passageways, stairs, and other exitways.
4) Where exposed piping is acceptable, install it close to walls and overhead structure, parallel and square to finished construction, plumb and nominally horizontal (except where required to slope for drainage).

b. Cover spaces around pipes, ducts, and conduits, where they pass through walls, ceilings, and floors with escutcheons or cover plates.
c. Mountings: On finished surfaces, provide concealed attachments with cover plates, frames, or trim overlapping finishes.

C. Health and Safety:

1. Fire Safety:
   a. Maintain fire resistance of walls, floors, ceilings, and other fire-rated assemblies that services must pass through, in accordance with requirements of the Section in which the fire-rated assembly is specified.
   b. Provide fire-rated separations between equipment rooms and other spaces where required, and as specified by, the code.
   c. Substantiation for Combustible Materials, Where Allowed: UL listed or labeled, with flame spread and smoke developed ratings printed on product.
   d. Provide products which are fire rated for the specific locations where they are installed.

2. Safety Hazards: Avoid using products that create safety hazards wherever possible; where services must involve flammable materials or hazardous operations, comply with code.

3. Excess Pressure: Provide pressurized components that will withstand operational pressures without failure and to relieve or reduce excessive pressure to prevent failure.

4. Misuse: Minimize misuse that could result in damage to property, injury, or loss of life.

5. Electric Shock: Provide equipment which protects personnel from electrical shock.

6. Toxic Materials:
   a. Lead: Do not use lead or lead-containing materials in potable water systems.
   b. Lead: In non-potable solid materials (including pipe), maximum lead content of 8 percent; in solders and flux, maximum lead content of 0.2 percent.

D. Structure:

1. Supports for Piping, Conduit, Ducts, and Components: Attached to, and supported by, the superstructure, not to or by non-structural construction or sheet metal elements, so that they do not move or sag, using the following:
   a. Supports that allow movement of the rigid linear elements (pipe, etc.) without undue stress on the piping, tubes, fittings, components, or the superstructure.

b. Intermediate supports mounted between structural members to limit distance between supports.
c. Supports capable of handling seismic forces in accordance with the code.
d. Mounting frames, bases, or pads, designed for ease of anchorage or mounting.

2. Structural Design of Components and Their Supports: In accordance with code.
   a. Anchors: Securely and positively attach all services components to superstructure.

3. Concealed or Buried Components: Provide cover or concealment so that components are not subjected to damaging stresses due to applied loads.

E. Durability:

1. Expected Service Life Span: Same as the service life of the building.
   a. Conveying Systems: Minimum 20 years.
   b. Integrated Facility Controls: Minimum 15 years.

2. Weather Resistance:
   a. All components exposed to outdoor environment must comply with the requirements of Section B and Section B2; equipment enclosures are considered the equivalent of the exterior enclosure.
   b. Liquid Storage and Distribution Components: Prevent freezing during longest duration of low temperature anticipated, based on historical weather data; if necessary, provide automatically controlled supplemental heating.
   c. Buried Water Piping: Minimum of 6 inches below lowest recorded level at which the ground freezes.
   d. Services Passing From Inside to Outside: Openings through shell sealed as required to meet performance specified, and using materials specified, in Section B.

3. Condensation: Provide insulated drain pans and piping to remove condensation from cooling coils.

4. Moisture Resistance: Where components are mounted to surfaces that are required to be moisture-resistant, seal mounting surface of components to finish surface so that moisture cannot penetrate under or behind component, using material that is not affected by presence of water, that is mildew-growth resistant, and that has a minimum service life of 10 years.

5. Temperature and Humidity Endurance: Provide equipment that will endure temperature and humidity that will be encountered and to resist damage due to thermal expansion and contraction.

6. Corrosion Resistance: Prevent corrosion by using corrosion-resistant materials, by preventing galvanic action, by preventing contact between metals and concrete and masonry, and by preventing condensation on metals.
   a. Metals Considered Corrosion-Resistant: Aluminum, stainless steel, brass, bronze, cast iron, ductile iron, malleable iron, hot-dipped galvanized steel, chrome-plated steel, cadmium-plated steel, and steel coated with high-build epoxy or coal tar-based paint.

b. Piping Connections for Piping of Dissimilar Metals: Dielectric adapters.
c. Underground Elements: Provide supplementary protection for underground metal pipes, ducts, conduits, and tanks, sufficient to prevent corrosion completely, for the service life of the element without maintenance.

7. Accidental Water Leakage: Locate components that would be damaged by water leakage from pipes or through foundations or roof out of likely paths of water and at least 8 inches above floor level.

8. Abuse Resistance:
   a. Buried Components: Minimum of 12 inches below surface of ground.
   b. Underground Piping and Conduit: Watertight and rootproof.
   c. Finishes on Exposed Components Subject to Touching by Occupants: Durable enough to withstand regular scrubbing using ordinary methods.
   d. Provide equipment which has been designed to prevent tampering.

9. Accidental Damage: Protect equipment and piping from accidental damage.

10. Underground Piping Accidental Damage: Protect piping from accidental damage with a warning tape buried 12 inches above the pipe.

F. Operation and Maintenance:

1. Capacity:
   a. Conveying Systems: As specified in the project program.
   b. Water and Drainage: As required by code and as specified in Section D2.
   c. Heating, Cooling, and Ventilating: Maintain interior environment within ranges specified in Section 111.
      1) Design HVAC to provide partially redundant systems.
   d. Fire Suppression: As required by code and as specified in Section D4.
   e. Electrical: As required by code and as specified in Section D5.
   f. Substantiation:
      1) Construction Documents: Complete system details.

2. Efficiency:
   a. Energy efficiency as specified in Section 111.
   b. Water consumption as specified in Section 111.
   c. Substantiation: As specified in Section 111.

3. Ease of Use:
   a. Access: All mechanical and electrical equipment located to allow easy access. Provide access doors for equipment accessed through walls, partitions, or fixed ceilings.
   b. Valves and Other Control Devices: Accessible handles, switches, control buttons; valve handles on top/upper side; chain or other remote operators where located out of normal reach above floor level in mechanical spaces.
   c. Space Around Components: Working clearances and access routes as required by code and as recommended by component manufacturer.
   d. Testing: After completion of installation, prepare services for starting-up by testing appropriately for proper operation.

e. Commissioning: Prepare services for use by eliminating operational anomalies, adjusting control systems for optimum operation, and demonstrating proper functioning, as specified in Section 00830.
   1) Substantiation:
      a) Construction Documents: Complete commissioning plan.
      b) Construction and Closeout: Commissioning reports.
f. Preparation for Operation: Provide assistance for the NJSDA' preparations for operation, as specified in Section 00830 and as follows:
   1) Demonstration of all services to NJSDA personnel.
   2) Training NJSDA personnel in the operation of all service systems.
   3) Substantiation:
      a) Construction Documents: Schedule of demonstrations.
      b) Construction and Closeout: Documentation of training conducted.

4. Ease of Cleaning: Where not otherwise specified, provide equipment mountings that allow easy cleaning around, and under, equipment, if applicable, without crevices, cracks, and concealed spaces where dirt and grease can accumulate and with raised, closed bases for equipment mounted on the floor.
   a. Provide equipment with removable access panels to allow cleaning.

5. Ease of Maintenance and Repair:
   a. Piping Other Than Gravity Drains: Provide means of isolating convenient portions of piping system, so that small portions may be shut down leaving the remainder in operation and so that drainage of the entire system is not required to enable repair of a portion of it.
   b. Piping: Entire systems drainable without disassembly of piping.
   c. Above Ground Piping: Labeled to identify contents and direction of flow, at each shut-off valve, each piece of equipment, each branch take off, and at 20 ft maximum spacing on exposed straight pipe runs.
   d. Equipment in Piping Systems: Each unit provided with a union or flanged connector at each pipe connection to allow easy removal.

6. Ease of Equipment Service: As specified in Section 111 and the following:
   a. Lighting: Adequate for locating and operating equipment; emergency lighting for critical components.
   b. Rooftop Equipment: Of type that is serviceable by relatively quick replacement of parts, minimizing time required on roof, and eliminating need to perform repair work in the weather.
   c. Parts Having Service Life Less Than That Specified for Element: Easily replaceable, without de-installation or de-mounting of the entire element, component, or equipment item.
   d. Valves: Easily replaceable internal parts, eliminating necessity of removal of entire valve for repair.
   e. Substantiation:
      1) Construction Documents: Identification of parts normally replaced during routine maintenance and parts replaced only when damaged or unexpectedly worn out; location of stocking distributors.

7. Maintenance Service: Maintain services as specified in Section 00830, including periodic inspections, routine maintenance recommended by manufacturers, and repair and replacement of defective elements.

8. Ease of Equipment Removal: Provide doors, corridors, and pathways large enough for removal of major pieces of equipment, such as, air handlers, chillers, boilers, fans, coils, transformers, switchgear, water heaters, and storage tanks.
   a. Substantiation:
      1) Construction Documents: Indicate sizes of doors and corridors used for removal of equipment. Indicate equipment sizes.

PRODUCTS

A. Do not use:

1. CFC-based refrigerants.

2. HCFC's or Halon.

3. Plastic piping or conduit.

4. Aluminum electrical conductors.

END OF SECTION D

SECTION D1

CONVEYING SYSTEMS

PERFORMANCE

A. Basic Function:

1. Provide conveying systems required by the program or necessary to fulfill basic project functions.
2. Conveying systems are devices that move people or freight between levels or from one area to another, and comprise the following elements:
   a. Elevators (D11): All components for passenger and service elevators, including items such as shaft rails, pit ladders, exhaust louvers, and car and hoistway doors; see Section C16 for requirements for car finishes.
3. Comply with provisions of ASME A17.1-2004,unless otherwise indicated.
4. Provide conveying systems for moving people and matrials.
5. See Section E11 for lifts at loading docks.
6. Where conveying systems are integral with elements defined within another element group, meet requirements of both element groups.
7. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance and Section D - Services.

B. Amenity and Comfort:

1. Accessibility: Provide accessible passenger elevators complying with code that serves every habitable level.
2. Convenience: Location of vertical conveying system (when required by other requirements):
3. Sound Levels: Maintain ambient sound levels in spaces that include or are adjacent to operating conveying systems within levels specified in Section C - Interiors.

C. Health and Safety:

1. Fire Resistance: Where vertical conveying systems must pass through fire resistant floor construction, provide fire resistance in conformance with code.

D. Structure:

1. Comply with structural requirements of code.

E. Durability:

1. Expected Service Life Span: Provide conveying systems with functional service life of 25 years, assuming that they will have continuing professional maintenance and periodic replacement of wearing parts.

F. Operation and Maintenance:

1. Ease of Use: Provide conveying systems that operate automatically or in response to passenger input, without intervention by trained operators.
2. Minimization of Misuse: Provide conveying systems with features and mechanisms that will prevent or minimize unsafe conditions or inconvenience attributable to vandalism, pranks, or deliberate sabotage.
   a. Substantiation:
      1) Construction Documents: Detailed specifications for proposed features and mechanisms intended to minimize misuse of conveying systems.
      2) Construction: Product data from manufacturers that verifies the features and mechanisms intended to minimize misuse of conveying systems.
3. System Maintenance: Provide conveying systems designed to require minimum maintenance.
   a. Substantiation:
      1) Construction Documents: Proposed maintenance contract, for NJSDA' review.

PRODUCTS

A. Use the following:
   1. Passenger elevators.

B. Do not use any of the following:
   1. Dumbwaiters.
   2. Sidewalk elevators.
   3. Escalators.
   4. Moving walks.
   5. Wheelchair lifts.
   6. Stairway chairlifts.

METHODS OF CONSTRUCTION

A. Use the following methods and techniques:
   1. Dedicated construction elevators maintained in use until major construction has been completed.

B. Do not use any of the following methods and techniques:
   1. Building elevator systems used for moving construction materials or workers during construction of the project.

END OF SECTION D1

SECTION D11

ELEVATORS AND LIFTS

PERFORMANCE

A. Basic Function:

1. Provide elevators required by the program or necessary to fulfill basic project functions.
2. Elevators move passengers or freight vertically between levels and include the following elements:
   a. Machine Room less Electric Elevators: Hoisting machine, hoist belts, car frame and enclosure, counterweight, guide rails and roller guides, power and operational controls, signal fixtures, hoistway entrances, door operator equipment and safety devices.
   b. Hydraulic Elevators: Power unit and control valves, hydraulic cylinder and plunger, controller, car platform and frame, car enclosure, guide rails, signal fixtures, hoistway entrances, door operator equipment and safety devices.
3. Provide passenger elevators to provide access to every habitable floor.
4. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section D - Services, and Section D1 - Conveying Systems.

B. Amenity and Comfort:

1. Accessibility: Provide passenger elevators that comply with the Americans with Disabilities Act Accessibility Guidelines (ADAAG) and as follows:
   a. ICC/ ANSI/ A117.1-2003 , Accessible and Usable Buildings and Facilities
   b. International Building Code 2006, New Jersey Edition Section 3002.4 "Elevator car to accommodate ambulance stretcher."

C. Structure:

1. Comply with structural requirements of code and the following:
   a. Provide elevator car frames that are all welded construction.

D. Durability:

1. Car and Hoistway Door Finishes: Comply with requirements specified in Section C16.
2. Elevator Doors: Provide doors at passenger elevators that are clad with brushed stainless steel.
3. Control Panels: Provide control and annunciator panel surfaces at passenger elevators that are clad with brushed stainless steel.
4. Railings: Provide protective railings at sides of passenger elevators that are made of brushed stainless steel.

E. Operation and Maintenance:

1. Passenger Elevator Duty, Including Service Elevators: Operating characteristics as follows:
   a. Minimum Load Capacity: 3500 lb.
   b. Minimum Ultimate Elevator Speed:
      1) Up to 5 floors: 125 fpm.
2. Passenger Elevator Operating System: As follows:
   a. Single Elevators: Selective collective operation.
3. Operating Features for All Elevators:
   a. Key switch in each elevator car for independent operating service.
   b. Card reader controlled floor buttons in all elevator cars for access to particular floors.
   c. Key-controlled out of service feature.
   d. Emergency power operation of all cars in accordance with code.

PRODUCTS

A. Passenger Elevators:

1. Use one of the following:
   a. Hydraulic elevators.
   b. Electric MRL elevators.
2. Do not use any of the following:
   a. Electric overhead machine elevators.
   b. Electric basement machine elevators.
   c. Electric observation elevators.
   d. Hydraulic observation elevators.

METHODS OF CONSTRUCTION

A. Use the following methods and techniques:

1. Pre-engineered with:
   a. Walls with applied plastic laminate panels at School passenger elevator, steel walls at service elevator and stainless steel walls at parking structure elevator.
   b. Stainless steel doors
   c. Brushed stainless steel front panel.
   d. Suspended eggcrate ceiling with baked enamel finish suspension system,
   e. Battery lowering or emergency power lowering.
   f. Solid state start-up
   g. Hand free audio/visual communications.
   h. Vandal proof fixtures.
   i. Floor FInishes to match adjacent corridor;

END OF SECTION D11

SECTION D2

WATER AND DRAINAGE

PERFORMANCE

A. Basic Function:

1. Provide delivery of hot and cold domestic water to points of utilization and the removal of water, rainwater, and liquid waste.

2. Water and drainage elements comprise the following:
   a. Water Supply (D21): Water sources and storage.
   b. Plumbing Fixtures (D22): All fixtures necessary for sanitation, occupancy, and use, that are connected to water supply or drainage; not including water heating or conditioning equipment or kitchen appliances.
   c. Domestic Water (D23): All elements required to distribute water to fixtures, including piping and equipment for water cooling, heating and storage.
   d. Sanitary Waste (D24): All elements required for removal of sanitary waste, including piping, venting, discharge and disposal, and equipment.
   e. Rain Water Drainage (D25): All elements required for drainage of rain water from building areas in which it may accumulate and drainage of clear wastes from building services; not including gutters and downspouts (B31) or subdrainage (A).

3. Where plumbing elements also must function as elements defined within another element group, meet the requirements of both element groups.

4. In addition to the requirements of this section, comply with requirements specified in Section 111 - Facility Performance and Section D - Services.

B. Amenity and Comfort:

1. Hot Water Supply:
   a. Provide a master thermostatic mixing valve which limits the hot water supply temperature to 110 deg F.

2. Noise:
   a. Provide devices to prevent noise due to air trapped in piping systems.
   b. Locate risers in dedicated and sound attenuated chases.
   c. Provide fixtures that produce the minimum noise possible.

3. Convenience:
   a. Fixture Heights: As specified in code.
   b. Fixture Configurations: As specified in code.
   c. Water Connections: Hot water on the left side of fixtures and cold water on the right side of fixtures.

4. Odors:

5. Appearance:
   a. Vents: Conceal vents from view.

C. Health and Safety:

1. Health: Provide potable water.
   a. Public utility water can be considered to be potable.

2. Waste Disposal: Connect each fixture to sanitary drainage system for proper disposal of waste and harmful materials.

END OF SECTION D2

SECTION D21

WATER SUPPLY

PERFORMANCE

A. Basic Function:

1. Provide water supply necessary for building occupancy and use.
2. Capacity: Size the water supply to exceed code by 10 percent.
3. Where water supply elements must also function as elements defined within another element group, meet requirements of both element groups.
4. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section D - Services, and Section D2 - Water and Drainage.

B. Health and Safety:

1. Fire Prevention: Provide water supply for fire sprinkler system and standpipes with backflow preventer.
2. Disease Prevention: Provide potable water supply with backflow preventers in accordance with code and filtration to remove polutants.

C. Durability:

1. Expected Service Life Span: 30 years.
2. Wear Resistance: Provide shutoff valves that are resistant to corrosion, breakage, and scratching due to continual contact with water, human usage, and cleaning with abrasive materials.
3. Freeze Protection: Protect piping from freezing with heat tracing and insulation.

D. Operation and Maintenance:

1. Water Pressure: 60 psi, minimum, except as otherwise required by code.
2. Ease of Service: Provide a shutoff valve at the utility service main and the service entry point.
3. Ease of Repair: Do not locate underground piping beneath electrical service, equipment, or footings.

PRODUCTS

A. Pipe:

1. Use one or more of the following:
   a. Ductile iron.
   b. Copper.
2. Do not use:
   a. Galvanized steel.

b. Polybutylene (PB)
c. Polyethylene (PE).
d. Polyvinyl chloride (PVC).
e. Acrylonitrile butadiene styrene (ABS).

METHODS OF CONSTRUCTION

A. Construct using the following practices and procedures:

1. Arrange for pipe spaces and openings in the building structure to allow for mechanical installations.
2. Coordinate requirements for access panels and doors.
3. Install piping in concealed locations except in equipment rooms and service areas.
4. Install exposed piping in equipment room and service areas at right angles or parallel to building walls.
5. Install piping above accessible ceilings to allow sufficient space for ceiling removal.
6. Install piping to permit valve servicing.
7. Install piping free of sags or bends.
8. Install fittings for changes in direction.
9. Install piping to allow application of insulation.
10. Install escutcheons for penetrations of walls, ceilings, and floors.
11. Install sleeves for piping passing through concrete and masonry walls and concrete floors.
12. Maintain indicated fire rating of walls, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.
13. Remove scale, slag, dirt and debris from inside and outside of pipe and fittings before assembly.
14. Install unions in piping 2 inch and smaller adjacent to each valve and at final connection to each piece of equipment: a) Install flanges in piping 2-1/2 inch and larger.
15. Install dielectric coupling and nipple fittings to connect piping of dissimilar metals.

B. Do not use:

1. Ground joints.
2. Extruded tee connections.
3. Enclose, cover or put piping into operation until it has been inspected and approved by the authorities having jurisdiction

END OF SECTION D21

SECTION D22

PLUMBING FIXTURES

PERFORMANCE

A. Basic Function:

1. Provide plumbing fixtures necessary for occupancy, use, and sanitation.
2. Fixtures Required: As specified by code, the project program, and as follows:
   a. Lavatories: At public and private restrooms and bathrooms.
   b. Utility Sinks: One in each janitor's closet.
   c. Showers: One in each shower compartment.
   d. Drinking Fountains: Minimum of one on each floor and within 10 feet of each restroom provide bubblers at each classroom sink.
   e. Utility Water Supply: One in each SU1 space.
      1) Outdoor Supplies: Flush mounted, loose key lockable,not more than 100 feet apart on building facade and one on each facade of building.
      2) Indoor Supplies: Flush mounted, loose key, beneath counters at each gang toilet
3. Where plumbing fixture elements must also function as elements defined within another element group, meet requirements of both element groups.
4. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section D - Services, and Section D2 - Water and Drainage.

B. Amenity and Comfort:

1. Convenience:
   a. Provide space between and around fixtures as required by code.
2. Appearance:
   a. Smooth, corrosion-resistant, non-absorbent, with no crevices to collect dirt.
   b. Aesthetically pleasing and easy and comfortable to use; high style appearance is very important.
   c. Color: White, except where metal fixtures are required.

C. Health and Safety:

1. Burning Hazard: Protect wheelchair occupants from hot water pipes and drains.
2. Disease and Infection:
   a. All openings and edges around the sides and bottom of each fixture permanently sealed with waterproof material.

D. Structure:

1. Anchor fixtures to support weight of fixtures and a minimum of 400 pounds without failure or stress on the connecting pipes.
2. Wall Mounted Fixtures: Carriers concealed inside fixture and in wall or floor.

E. Durability:

1. Expected Service Life Span of Faucet Valves: 20 years.
   a. Substantiation: Manufacturer's unconditional warranty.
2. Expected Service Life Span of Flushing Mechanisms: 20 years.
   a. Substantiation: Manufacturer's unconditional warranty.
3. Wear Resistance: Provide fixtures, trim and accessories that are resistant to corrosion, breakage, scratching, burning, fading and chipping due to continual contact with water, human usage, and cleaning with abrasive materials.

F. Operation and Maintenance:

1. Fixture Functions:
   a. Lavatories: Standard spout, with integral overflow.
   b. Urinals: Waterless with mechanical cartridge .
   c. Showers: With single-action hot-cold mixing valve.
   d. Kitchen / Classroom Sinks: Swivel spout, water spray nozzle.
   e. Drinking Fountains: With hand operation,; chilled water service; room temperature water service at gymnaiums.
   f. Utility (Mop or Janitor's) Sinks: Filling of standard rolling mop bucket required; spout designed to support full bucket of water.
2. Water Pressure/Flow At Fixtures: 8 psi, minimum, except as otherwise required by code.
   a. Showers: 20 psi, minimum.
   b. Flush Valves at Water Closets and Urinals: 15 psi, minimum.
3. Water Consumption:
   a. Water Closets: 1.6 gallons per flush, maximum, with complete waste removal in one flush.
   b. Lavatory Faucets in Public Restrooms: 0.25 gallon per use.
   c. Shower Heads: 2.5 gallons per minute, maximum.
   d. Drinking Fountains: 2.5 gallons per minute.
4. Maintenance Service:
   a. Electrically-Powered Fixtures with battery back-up: Battery-power operation not allowed.
5. Ease of Cleaning:
   a. Use wall-mounted fixtures in public restrooms, for ease of cleaning floors.
   b. Provide adequate access for cleaning each fixture and the areas around it.
6. Ease of Repair:
   a. Faucet valves easily removable and replaceable as a single unit.
   b. Each pipe connection to each fixture provided with a stop valve, for easy disconnection from water service.
   c. Provide access to all concealed connections, such as floor and wall cleanouts and slip-joint connections.

PRODUCTS

A. Water Closets:

1. Use one of the following:
   a. Flush valve type with external sensor, hard wired with battery back-up..
   b. Vitreous china.
   c. Wall mounted fixtures.

2. Do not use:
   a. Tank type.
   b. Solid plastic resin.
   c. Stainless steel.
   d. Floor mounted fixtures.

B. Urinals:

1. Use one of the following:
   a. Vitreous china.
   b. Waterless with mechanical cartridge.
   c. Wall mounted fixtures.

2. Do not use:
   a. Enameled cast iron.
   b. Solid plastic resin.
   c. Floor mounted, stall type.

C. Lavatories:

1. Use one or more of the following:
   a. Vitreous china.
   b. Wall-hung fixtures.

2. Do not use:
   a. Ceramic, non-vitreous china.
   b. Enameled cast iron.
   c. Enameled steel.
   d. Solid plastic resin.
   e. Stainless Steel.
   f. Countertop-mounted fixtures.
   g. Undercounter-mounted fixtures.
   h. Pedestal-mounted fixtures.

D. Kitchenette and Classroom Sinks:

1. Use one of the following:
   a. Stainless steel.
   b. Countertop-mounted fixtures.

2. Do not use:
   a. Vitreous china.
   b. Plastic.
   c. Enameled steel.
   d. Solid plastic resin.

e. Enameled cast iron.
f. Pedestal-mounted fixtures.
g. Wall-hung fixtures.

E. Showers:

1. Use one or more of the following:
   a. Precast terrazzo receptors.
   b. Ceramic tile.

2. Do not use:
   a. Fiberglass reinforced acrylic resin receptors.
   b. Solid plastic resin receptors.
   c. Fiberglass reinforced acrylic resin walls.
   d. Solid plastic resin walls.

F. Faucets and Trim:

1. Use one of the following:
   a. Polished chrome-plated finish.

2. Do not use:
   a. Polished brass finish.
   b. Colored coated finishes.

G. Drinking Fountains:

1. Use one or more of the following:
   a. Non-refrigerated drinking water fountains at Gymnasiums .
   b. Electric water coolers at other locations .
   c. Stainless steel finished units.

2. Do not use:
   a. Enameled steel units.

H. Utility (Mop or Janitor's) Sinks:

1. Use one or more of the following:
   a. Precast terrazzo.
   b. Floor-mounted fixtures.

2. Do not use:
   a. Stainless steel.
   b. Enameled cast iron.
   c. Wall-hung fixtures.

METHODS OF CONSTRUCTION

A. Construct using the following practices and procedures:

1. Assemble fixtures, trim, fittings, and other components according to manufacturer's written instructions.

2. For wall-hanging fixtures, Provide off-floor supports affixed to building substrate.
   a. Use carrier supports with waste fitting and seal for back-outlet fixtures;

b. Use carrier supports without waste fitting for fixtures with tubular waste piping;
c. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

3. Provide back-outlet, wall-hanging fixtures onto waste fitting seals and attach to supports.
4. Provide wall-hanging fixtures with tubular waste piping attached to supports.
5. Provide counter-mounting fixtures in and attached to casework.
6. Provide fixture level and plumb according to manufacturer's written instructions and roughing-in drawings.
7. Provide water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attached supplies to supports or substrate within pipe spaces behind fixtures. Provide stops in locations where they can be easily reached for operation.
8. Provide trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.
9. Provide tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.
10. Provide concealed flushometer valves for water closets and urinals in easily accessible utility spaces directly behind the fixtures. Provide other actuators in locations that are easy for people with disabilities to reach.
11. Provide toilet seats on water closets.
12. Provide faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
13. Provide faucet, flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
14. Provide traps on fixture outlets. Omit trap on fixtures with integral traps.
15. Provide escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings.
16. Set service basins in leveling bed of cement grout.
17. Seal joints between fixtures and walls, floors, and counters using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color.
18. Connect water supplies from water distribution piping to fixtures.
19. Connect drain piping from fixtures to drainage piping.

20. Supply and Waste Connections to Plumbing Fixtures: Connect fixtures with water supplies, stops, risers, traps, and waste piping. Use size fittings required to match fixtures. Connect to plumbing piping.

B. Do not use:

1. Vitreous-china fixtures other than standard ASME Al 12.192M.
2. Water closet, flushometer tank trim other than standard ASSE 1037.
3. Faucets other than standard ASME A112.18.1 M.

END OF SECTION D22

SECTION D23

DOMESTIC WATER

PERFORMANCE

A. Basic Function:

1. Provide hot and cold domestic water to plumbing fixtures as required.
2. Domestic water elements comprise the following:
   a. Water Distribution: Piping within the building, serving fixtures and equipment.
   b. Plumbing Equipment: Pumps, tanks, filters, and treatment equipment.
   c. Utility water supply fittings (hose bibbs, wall hydrants) are specified in Section D22.
3. Where domestic water elements must also function as elements defined within another element group, meet requirements of both element groups.
4. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section D - Services, and Section D2 - Water and Drainage.

B. Amenity and Comfort:

1. Location:
   a. Locate water heaters in utility room or boiler room.
   b. Do not locate water heaters above ceilings or where the public has access to them.
2. Water Conditioning: Provide water supply with conditioning equipment to remove odors and hardness.
3. Noise:
   a. Provide devices to prevent noise due to water hammer.
   b. Provide water hammer arrestors on each fixture branch to eliminate noise produced by the domestic water fixtures.

C. Health and Safety:

1. Excess Pressure Hazard: Provide devices to reduce accidental excess pressure to acceptable level, with maximum overpressure of 10 percent over specified system operating pressure, for the following items:
   a. Water heaters.
   b. Hot water storage tanks.
   c. Booster pumps.
   d. Hot water recirculating pumps.
2. Water Contaminants: Provide lead filtration device on water supply to drinking fountains, breakroom sinks, and kitchen sinks.

D. Durability:

1. Shock Resistance: Do not use cast iron fittings, valve bodies, materials, and components where thermal or mechanical shock is expected.
2. Moisture: Do not locate water heaters where leakage would cause damage to surrounding building materials.
3. Condensation: Provide insulation on cold water pipes, fittings, valves, and equipment to limit condensation.
4. Temperature Changes: Provide method of allowing thermal expansion of domestic water in the hot water system.
   a. Provide expansion tanks with bladders.

E. Operation and Maintenance:

1. Pressure Classification: Provide pipe, pipe components, and equipment with a pressure classification of 125 psi.
2. Energy Efficiency:
   a. Heat Loss: Provide insulation to limit heat loss of domestic hot water to a maximum of 2 degrees F in any 100 feet of pipe, when water is running, and maximum of 2 degrees F per hour, when water is standing.
   b. Heat Loss: Provide recirculating pumps to limit the domestic hot water temperature drop to 2 degrees F within 100 feet of fixtures requiring domestic hot water.
   c. Equipment Heat Loss: Provide insulation on the following equipment to limit domestic hot water heat loss to maximum of 2 deg F per hour, without energy input:
      1) Storage tanks.
      2) Water heaters.
3. Method of Removing Air:
   a. Provide one of the following:
      1) Manual air vents.
   b. Do not use:
      1) Automatic air vents.
4. Water Heating Method:
   a. Provide one of the following:
      1) Gas-fired water heaters.
      2) Hot water storage tanks.
   b. Do not use:
      1) Electric water heaters.
5. Ease of Service and Maintenance:
   a. Fixture Shut-Off: As specified in Section D22.
   b. Equipment Isolation: Valves on both supply and discharge sides.

PRODUCTS

A. Water Piping, Buried:

1. Provide one of the following:
   a. Copper pipe (ASTM B 42-2002), with brazed or soldered cast copper or wrought copper or bronze fittings, or flared cast bronze fittings.
   b. Ductile iron water pipe, cement lined, with ductile iron or gray iron fittings and gasketed joints.

2. Do not use:
   a. Plastic pipe of any type.
   b. Acrylonitrile butadiene styrene (ABS) plastic pipe.
   c. Brass pipe.
   d. Chlorinated polyvinyl chloride (CPVC) plastic pipe.
   e. Galvanized steel pipe.
   f. Polybutylene (PB) plastic pipe or tubing.
   g. Polyvinyl chloride (PVC) plastic pipe.
   h. Polyethylene/aluminum composite pipe, with brass compression joints.
   i. Concrete, clay, or asbestos cement pipe.
   j. Lead pipe or fittings (bends, traps, caps and plugs).

B. Water Piping, Not Buried:

1. Provide one of the following:
   a. Copper tube, cast copper, wrought copper, or bronze fittings, and soldered joints.

2. Do not use:
   a. Plastic pipe of any type.
   b. Acrylonitrile butadiene styrene (ABS) plastic pipe.
   c. Brass pipe.
   d. Galvanized steel pipe.
   e. Chlorinated polyvinyl chloride (CPVC) plastic pipe or tubing.
   f. Polyvinyl chloride (PVC) plastic pipe or tubing.
   g. Polybutylene (PB) plastic pipe or tubing.
   h. Cross-linked polyethylene (PEX) plastic pipe or tubing.
   i. Cross-linked polyethylene/aluminum/cross-linked polyethylene (PEX/AL/PEX) pipe or tubing.
   j. Polyethylene/aluminum/polyethylene (PE/AL/PE) pipe or tubing.
   k. Concrete, clay, or asbestos cement pipe.
   l. Lead pipe or fittings (bends, traps, caps and plugs).

C. Insulating Materials:

1. Provide one of the following:
   a. Mineral fiber.
   b. Cellular glass.

2. Do not use:
   a. Calcium silicate.
   b. Fiberglass.
   c. Cellular elastomeric.

D. Valves For Shut-Off or Isolation of Equipment, Fixtures, and Parts of Systems:

1. Provide one of the following:
   a. Ball valves.

2. Do not use:
   a. Gate valves.
   b. Butterfly valves.
   c. Globe valves.
   d. Plug valves.

E. Valves For Flow Control, Throttling, or Bypass:

1. Provide one of the following:
   a. Ball valves.

2. Do not use:
   a. Gate valves.
   b. Butterfly valves.
   c. Globe valves.
   d. Plug valves.

METHODS OF CONSTRUCTION

A. Use one of the following methods:

1. Install piping adjacent to equipment to allow service and maintenance.

2. Connect domestic wayeter piping to exterior water service piping with code approved transition fittings.

B. Do not use:

1. Soft copper tube.

2. Extruded tee fittings

3. Grooved end piping for 3 inches or smaller.

END OF SECTION D23

SECTION D24

SANITARY WASTE

PERFORMANCE

A. Basic Function:

1. Provide drainage for disposal of waste as required by the code and for the following:
   a. Fixtures and equipment which have a waste connection or a domestic water connection.
      1) Waste connections are not required on exterior hose bibbs and coffee makers.
   b. Emergency Drainage: Floor drains located in:
      1) Basements.
      2) HVAC closets
      3) Rooms where waterproof membrane is specified or installed under floor finish.
   c. Cleaning Drainage: Floor drains located in:
      1) Kitchens.
      2) Gang toilet rooms
      3) Hose-down areas.
   d. Indirect Drainage: Floor drains to receive piping from:
      1) Equipment drain pans.
      2) Condensate drains.
      3) Other equipment that produces clear wastes.
      4) Other equipment specified to have indirect drain.
2. Where sanitary waste and vent elements must also function as elements defined within another element group, meet requirements of both element groups.
3. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section D - Services, and Section D2 - Water and Drainage.

B. Amenity and Comfort:

1. Convenience:
   a. Do not locate floor drains and floor cleanouts in doorways or directly in traffic paths.
2. Odors:
   a. Do not terminate vents within 10 feet horizontally of doors, windows, air intake or exhaust openings, or other openings in the exterior enclosure, unless vent termination is at least 3 feet above the top of the opening.
   b. Do not locate vent openings under overhangs.
   c. Do not locate vent openings closer than 10 feet to lot line.
   d. Extend vent pipes at least 18 inches above the surface of roofs.
   e. Extend vent pipes at least 12 inches above overflow level of the highest fixture served by the vent.

f. Provide an automatic means of priming traps which may evaporate enough water to break the trap seal allowing sewer gases to enter the building on floor drains.

C. Health and Safety:

1. Disease and Infection:
   a. Do not locate indirect drains in toilet rooms, unventilated or inaccessible rooms, or in air distribution or return plenums.
   b. Provide a backflow prevention device in the sewer discharge to prevent back-up into plumbing fixtures and floor drains.

D. Structure:

1. Hub-and-Spigot Joint Support: Support joints so they do not separate under weight of pipe or live loads.

E. Durability:

1. Corrosion Resistance:
   a. Where corrosive wastes can be neutralized or diluted below harmful levels, removal is not required; otherwise, provide appropriate interceptors to remove corrosive wastes, including solids.
   b. Neutralizing Devices: Automatically operating, using water or neutralizing medium to render basic materials, acidic materials, and other chemical wastes harmless.
      1) Construct the drainage system upstream of the neutralizing devices using materials which are resistant to the specific corrosive elements entering the system.
      2) Corrosive agents entering the sanitary drainage system which must be neutralized or removed:
         a) Hydrochloric acid.
         b) Sulfuric acid.
         c) Caustic solutions.
   c. Sediment Interceptors: Located at each floor drain where significant amount of sand is likely to be tracked in by occupants or blown in by wind.

2. Condensation:
   a. Prevent condensation from forming on or dripping from sanitary drain piping, floor drain bodies, drinking fountain or water cooler waste piping, condensate piping, and p-traps.

F. Operation and Maintenance:

1. Maintenance of Drainage:
   a. Fittings, Joints, and Offsets: As required to ensure optimal flow through horizontal and vertical piping and at changes of direction.
   b. Transitions Between Horizontal Piping and Vertical Risers:
      1) Sanitary Waste: Sanitary tees, wyes, or wyes and eighth bends.
      2) Vents: Wyes, wyes and eighth bends, and short radius fittings.

2. Ease of Cleaning:
   a. Floor Drains: At low points in floor and flush with finish floor surface.
   b. Cleanout Plugs: Flush with floor surface.
   c. Drain equipment which produces or collects clear waste, such as condensation from cooling coils. Provide piping for the clear waste to the nearest floor drain.
   d. Indirect Waste Pipes Over 1 inch Diameter: Provide a means to catch and remove solid materials 1/2 inch and larger, such as a strainer.

3. Minimization of Cleaning:
   a. Grease Interceptors: Located at drains specifically intended for disposal of grease, in kitchen and in accordance with Code.

4. Ease of Maintenance:
   a. Interceptors That Must be Manually Cleaned:
      1) Designed for minimum of 2 months operation between cleanings.
      2) Located close to or in the same area as drains that receive the harmful wastes, for supervision and maintenance by occupants creating the waste.
      3) Removable waste container, with spare.
      4) Substantiation:
         a) Design Development: Manufacturer's maintenance schedule and recommended methods.

PRODUCTS

A. Sanitary Waste and Vent Piping, Buried:

1. Use one or more of the following:
   a. Cast iron pipe and fittings, hub-and-spigot, with neoprene or lead/oakum joint seals.
   b. Polyvinyl chloride (PVC) DWV pipe and fittings, with solvent welded or gasketed joints.

2. Do not use:
   a. Acrylonitrile butadiene styrene (ABS) plastic pipe.
   b. Asbestos-cement sewer pipe.
   c. Reinforced concrete pipe.
   d. Non-reinforced concrete pipe.
   e. Copper pipe or tube.
   f. Fiberglass pipe.
   g. Vitrified clay pipe.
   h. Lead pipe.

B. Sanitary Waste and Vent Piping, Not Buried:

1. Use one or more of the following:
   a. Cast iron pipe and fittings, hub-and-spigot, with neoprene or lead/oakum joint seals.
   b. Cast iron pipe and fittings, hubless, with neoprene gaskets and stainless steel clamps.
   c. Copper tubing (DWV), with cast bronze or wrought copper fittings and soldered joints.

2. Do not use:
   a. Acrylonitrile butadiene styrene (ABS) plastic piping and fittings.
   b. Brass pipe.
   c. Polyvinyl chloride (PVC) pipe.
   d. Galvanized steel pipe.
   e. Aluminum (DWV) pipe.
   f. Fiberglass pipe and fittings.
   g. Lead pipe.
   h. Glass pipe.

C. Cleanout Plugs:

1. Provide one or more of the following:
   a. Brass.

2. Do not use:
   a. Plastic.
   b. Stainless steel.

D. Cleanout Caps:

1. Provide one or more of the following:
   a. Brass.
   b. Cast iron.

2. Do not use:
   a. Plastic.
   b. Reinforced neoprene.

E. Floor Drains:

1. Provide the following:
   a. Cast iron.

2. Do not use:
   a. Copper.
   b. Lead.
   c. Plastic.

METHODS OF CONSTRUCTION

A. Construct using the following methods:

1. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings".

2. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected.
3. Do not reduce size of drainage piping in direction of flow.
4. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
5. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
6. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings". a) Gasketed Joints: Make with rubber gasket matching class of pipe and fittings; b) Hubless Joints: Make with rubber gasket and sleeve or clamp.
7. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
8. Connect drainage and vent piping to the following:
   a. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code;
   b. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction;
   c. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code;
   d. Equipment: Connect drainage piping as indicated. Provide shutoff valve. Use flanges instead of unions for connections NPS 2-1/2 (DN 65) and larger.

END OF SECTION D24

SECTION D25

RAIN WATER DRAINAGE

PERFORMANCE

A. Basic Function:

1. Provide and install drainage for disposal of rain water and clear wastes, as required by the code and as follows:
   a. Drainage of roofs must be accomplished with the use of roof drains.
   b. Clear wastes include condensate drainage and HVAC cooling water.
   c. Drainage for outdoor areas that are completely surrounded by construction that prevents natural drainage (e.g. areaways) or that are so sloped as to result in accumulation of water or ponding.
   d. Drainage of interior areas where ground water may accumulate naturally, including sump pits and elevator pits where permited by Code.
2. Where rain water drainage elements must also function as elements defined within another element group, meet requirements of both element groups.
3. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section D - Services, and Section D2 - Water and Drainage.

B. Amenity and Comfort:

1. Condensation:
   a. Insulate horizontal and vertical rain water piping, including the underbody of roof drains, using material of sufficient insulating value to prevent condensation.
2. Convenience:
   a. Install floor drains flush with the surface on which they are installed, out of pedestrian traffic patterns wherever possible.
3. Odors:
   a. Provide traps for all indoor drains connected to rain water drainage system.
   b. If rain water drainage system connects to sanitary sewer system, provide a trap at the connection.
4. Appearance:
   a. Do not locate rain water leaders or downspouts where they are visible from the outside of the building.

C. Health and Safety:

1. Vermin Resistance: Provide grated coverings for drains to prevent entry of rodents, insects, birds, and miscellaneous foliage.

D. Structure:

1. Locate drains to avoid ponding loads in excess of structural capacity.

2. Prevent inadvertent ponding by protecting drain openings from clogging, using raised strainers with minimum height of 4 inches wherever possible and flat gratings in all other locations.

E. Durability:

1. Water Penetration: Provide reinforcement for weather barrier around drains using extremely durable, permanently watertight materia

2. Abuse: Protect drainage conductors and leaders by placing in dedicated locations.

F. Operation and Maintenance:

1. Maintenance of Drainage: Pipes sloped at 1/8 inch per foot, minimum, downward in direction of flow.

2. Drainage Outlets: As specified in Section D and as follows:
   a. Secondary Drainage: Drain to completely redundant drain piping system.
   b. Areaways and Courtyards: Drain to rain water drainage system, sump pit with pump, dry well located in landscaped area, or water retention pond.

3. Capacity:
   a. Roof Areas of 10,000 sq ft and Less: Minimum of two roof drains.
   b. Roof Areas of 10,000 sq ft or More: Minimum of four roof drains.
   c. Areaways and Courtyards: Drainage is not required for areas with less than 100 square feet open to the sky.

PRODUCTS

A. Rain Water Piping, Not Buried:

1. Use one or more of the following:
   a. Cast iron pipe, hubless, with neoprene gaskets and stainless steel clamps.

2. Do not use:
   a. Acrylonitrile butadiene styrene (ABS) plastic pipe.
   b. Brass pipe.
   c. Polyvinyl chloride (PVC) pipe.
   d. Copper pipe.
   e. Copper tube.
   f. Galvanized steel pipe.
   g. Aluminum pipe.
   h. Fiberglass pipe.
   i. Lead pipe.

B. Rain Water Piping, Buried:

1. Use one or more of the following:
   a. Cast iron pipe, hub and spigot, with neoprene or lead/oakum joint seals.
   b. Polyvinyl chloride (PVC) pipe and fittings, with solvent welded or gasketed joints.

2. Do not use:
   a. Acrylonitrile butadiene styrene (ABS) plastic pipe.

b. Concrete pipe.
c. Copper pipe.
d. Copper tube.
e. Fiberglass pipe.
f. Vitrified clay pipe.

C. Roof Drains, Area Drains, and Floor Drains:

1. Use one of the following:
   a. Bronze, Area drains and floor drains.
   b. Cast Iron, Roof Drains

2. Do not use:
   a. Galvanized cast iron.
   b. Plastic.
   c. Stainless steel.

METHODS OF CONSTRUCTION

A. Construct using the following methods:

1. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings:
   a. Storm Drainage Piping: 10-foot head of water;
   b. b) Storm Drainage, Force-Main Piping: 50 psig.

2. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight.

3. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings".

4. Make changes in direction for storm piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected.

5. Do not reduce size of drainage piping in direction of flow.

6. Lay buried building drain piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

7. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

8. Make joints in cast iron pipe according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings"

B. Do not construct using any of the following methods:

1. Engineered controlled flow drainage system.

2. Grooved joints

END OF SECTION D25

SECTION D3

HVAC - HEATING, VENTILATING, AND AIR CONDITIONING

PERFORMANCE

A. Basic Function:

1. Provide artificial means of controlling temperature, relative humidity, velocity, and direction of air motion in the interior spaces enclosed by the shell, and rereduction of airborne odors, particulates, and contaminant gases.

2. The HVAC system consists of the following elements:
   a. Energy Supply (D31): Elements which provide energy used to maintain building comfort.
   b. Heat Generation (D32): Elements required to heat building to maintain space comfort.
   c. Refrigeration (D33): Elements necessary to generate the cooling required to maintain building comfort.
   d. Air Distribution (D34): Elements required to distribute air to maintain building comfort.
   e. Hydronic Distribution (D35): Elements required to distribute chilled water, heating water, and water to maintain building comfort.
   f. HVAC Controls (D36): Elements required to control equipment which maintains building comfort.

3. Special-Purpose Exhaust: See Sections E12 and E15.

4. Where HVAC elements also must function as elements defined within another element group, meet the requirements of both element groups.

5. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance and Section D - Services.

B. The HVAC systems descriptions for the building are as follows:

1. Geothermal Systems:
   a. The air conditioning and heating demands for the building, except for those spaces described otherwise, shall be served by a ground source heat pump system. Individual heat pumps shall typically be provided for each space. In instances where individual spaces are too small for an individual heat pump, spaces with the same exposures and functions can be grouped and served from a heat pump (i.e. Nurses suite, Clinic area, Principal's suite, CST area, Vice Principal suite).
   b. Horizontal heat pumps located above ceilings are to be avoided. Vertical heat pumps with ducted supply air, and return air where appropriate, are to be used. Vertical heat pumps are to be located within “mechanical closets” sized appropriately to allow routine maintenance functions to be performed without dismantling the heat pump or requiring it to be removed from the closet. Mechanical closets have been shown on floor plans for some locations, but not all. Additional mechanical closets, as appropriate for the Design Builder's

design, must be incorporated into the plans. Access into closets shall be through a hinged door. The door shall be sound rated door and provided with a tight seal suitable to prevent objectionable noise transmission from the heat pump to the adjacent spaces. Each mechanical closet shall include a floor drain for cooling coil condensate drainage. Do not use condensate pumps.

c. An additional number of drilled wells equal to 15 percent of the design load for the geothermal system shall be provided in the geothermal well field. The ability to individually isolate geothermal wells from the distribution system shall be provided for each well.
d. a valved cross connection between the geothermal well field main supply and return lines to allow for bypassing the well field based on geothermal loop fluid temperature or manually as necessary.
e. Use of the building chilled water system and heating hot water system (described below) is not expected to be necessary to supplement the geothermal system. It is the responsibility of the Design-Builder to confirm this.

2. Rooftop Units:
   a. The air conditioning and heating demands for the Gymnasium, Auditorium, and Cafeteria shall be met by constant volume rooftop units. One unit for each space shall be provided. Each unit shall consist of, at a minimum, supply fan, return or relief fan, 30% prefilter+85% final filter, hot water heating coil with freeze protection pump, chilled water cooling coil, heat recovery, variable speed drives for soft starting of all fans. The basis of design shall be equipment manufactured by Temptrol or Ventrol, or accpeted equal. .
   b. The rooftop unit serving the Cafeteria may also be used to serve the Kitchen. Minimizing the amount of outside air that is heated and cooled necessary to meet the ventilation requirements for the Cafeteria as well as providing make-up air for exhaust from the kitchen must be considered when deciding how to serve both the Cafeteria and Kitchen.
   c. Outside air ventilation for spaces conditioned by heat pumps shall be provided by 100% outside air rooftop units. The units shall be sized to meet the ventilation requirements for the various spaces served. Unit components, basis of design manufacturers described above for the Gymnasium, Auditorium, and Cafeteria.

3. Chilled Water System
   a. Chilled water will be necessary for distribution to and use in all rooftop units. Chilled water shall be produced by roof mounted air-cooled chiller(s). If a single chiller is utilized, the chiller shall contain a minimum of two scroll or rotary compressors. If multiple chillers are utilized, a single scroll or rotary compressor in each chiller is acceptable. Do not use reciprocating compressors. Propylene glycol shall be used to provide freeze protection for the chilled water loop down to the outdoor winter design condition listed in the code. Distribution pumps shall be located within the building; do not locate pumps outside the building.
   b. Chilled water piping located exterior to the building shall be kept to a minimum. Chilled water piping to cooling coils in rooftop units shall be run from inside the building to the coils within the rooftop unit's curb. Do not use fiberglass

insulation on exterior chilled water piping. Provide aluminum protective jacket over insulation on all exterior chilled water piping.

4. Heating Hot Water System
   a. Heating hot water will be necessary for distribution to and use in all rooftop units, and various terminal devices such as unit heaters, cabinet heaters, etc. Hot water shall be produced by natural gas-fired modular condensing boilers. A boiler control system shall be provided to stage boiler operation to achieve maximum operating efficiency in meeting the heating demands. Glycol is not necessary in the heating hot water loop. Boilers and distribution pumps shall be located within the boiler room on the Basement Level.
   b. Heating hot water piping to heating coils in rooftop units shall be run from inside the building to the coils within the rooftop unit's curb, or within weatherproof and insulated pipe chases/enclosures if alternate for commercial grade rooftop units is selected. Do not use fiberglass insulation on exterior hot water piping. Provide aluminum protective jacket over insulation on all exterior hot water piping.
   c. Hot water cabinet heaters shall be provided at each exterior door. Hot water unit heaters shall be provided in all mechanical rooms and other utility type spaces.

5. Miscellaneous: Equipment shall be selected and provided to meet the requirements of all applicable available utility rebate programs. The Design-Builder shall assist NJSDA with submitting for all rebates and incentive money available.

6. Emergency/Standby Power: See Section D51 for requirements for HVAC equipment.

C. Amenity and Comfort:

1. Space Temperature Setpoint: In accordance with Code requirements specified in Section 111

2. Relative Humidity Range: In accordance with Code requirements specified in Section 111

3. Substantiation:
   a. Closeout: Measurement of temperature and humidity in spaces with unacceptable temperature and humidity fluctuations.

D. Health and Safety:

1. Emergency Power: Provide emergency power in accordance with code.

2. Electrical Shock Prevention:
   a. Provide a means of disconnecting power at each piece of equipment.

3. Smoke Control: Coordinate control of ventilation fans, supply fans, return fans, exhaust fans, and dampers with smoke control system.

4. Refrigerants:
   a. Comply with the requirements of ASHRAE 15-2004.
   b. Prevent release of refrigerant to atmosphere.

c. Prevent exposure of occupants to hazardous refrigerants.

5. Indoor Air Quality: Provide sufficient ventilation to obtain acceptable indoor quality, determined using either the Ventilation Rate Procedure or the Indoor Air Quality Procedure of ANSI/ASHRAE 62.1-2004 .

E. Operation and Maintenance:

1. Design Criteria:
   a. Cooling Leaving Air Temperature: 52 degrees F to 55 degrees F (12.8 degrees C).
   b. Heating Leaving Air Temperature: 95 degrees F to 105 degrees F (40 degrees C).
   c. Water-Source Heat Pump Loop Temperature Range: 60 degrees F (15.5 degrees C) to 90 degrees F (32.2 degrees C).
   d. Ground-Source or Geothermal Heat Pump Loop Temperature Range: 25 degrees F (-4 degrees C) to 110 degrees F (43.3 degrees C).

2. HVAC Reliability:
   a. Boilers: Provide multiple boilers to deliver design load capacity.
      1) For 2 Boilers: Size each at 67 percent of design load capacity.
      2) For 3 Boilers: Size each at 50 percent of design load capacity.
   b. Pumps: Provide multiple pumps to deliver design flow requirements.
      1) For 2 Pumps: Size each at 100 percent of design flow.
      2) Provide a stand-by pump for each hot water, chilled water, heat pump water and geothermal well field water pump.
   c. Geothermal Well Field : Provide additional drilled wells in the geothermal well field equal to 10 percent of the design load for the geothermal system
   d. Substantiation:
      1) Design Documents: Identification of equipment that requires redundancy.

PRODUCTS

A. HVAC System Type:

1. Use f the following:
   a. HVAC System Type: Geothermal closed-loop system with geothermal source heat pumps, utilizing one or more of the following components:
      1) Variable volume and constant volume air handlers with air terminals.
      2) Central ventilation units (100% outside air with energy recovery.)
      3) Supplemental heat source, including solar heating (if required)
      4) Closed loop geothermal well field.
      5) Energy recovery units.

2. Do not use:
   a. Stand-Alone HVAC Systems:
      1) Forced-draft, natural gas furnace with split-system cooling.
      2) Forced-draft, natural gas furnace with split-system heat pump.
      3) Air cooled packaged terminal air-conditioning units or heat pumps.
      4) Air-cooled, self-contained air handlers.
      5) Variable air volume, self-contained, air-conditioning unit.

b. Central HVAC Systems:
   1) Steam heating system.
   2) Chilled water cooling system supplied by a water-cooled chiller.
   3) Open loop geothermal well field.
   4) Electric Heating.

EXTRA MATERIALS

A. Furnish extra materials to Newark Public Schools that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Two (2) full sets of filters.
2. One (1) fFull set of Belt Changes.
3. Ten Percent (10%) of heat pump fan motors. Where more than one size is required, proportion quantity based on number of each size of installed motor sizes.
4. Ten Percent (10%) heat pump thermostats and sensors.
5. Ten Percent (10%) zone temperature sensors.
6. One (1) set of pump seals for each type installed.
7. One (1) Set of bearing assemblies for each type of freezer pump.
8. Ten Percent (10%) of cabinet heater and unit heater fan motors.
9. One (1) unopened 55 gallon drum of pre-mixed glycol solution.
10. One (1) set of boiler general maintenance components for each boiler.

B.

END OF SECTION D3

SECTION D31

ENERGY SUPPLY

PERFORMANCE

A. Basic Function:

1. Provide natural gas for use by HVAC, plumbing, and food service and emergency power equipment as follows:
2. Comply with ICC International Fuel Gas Code-2006.
3. Comply with ICC International Mechanical Code-2006.
4. Where energy supply elements also must function as elements defined within another element group, meet the requirements of both element groups.
5. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section D - Services, and Section D3 - HVAC.

B. Amenity and Comfort:

1. Heating: Provide fuel to all fuel burning equipment that is used to maintain space comfort.
2. Plumbing: Provide fuel to all fuel burning equipment that is used to produce domestic hot water.
3. Food Service: Provide fuel to all fuel burning equipment that is used in Food Service Operation.
4. Emergency Generator: Provide fuel to all fuel burning equipment that is used to produce emergency and stand-by power.

C. Health and Safety:

1. System Design Pressure: Sufficient to satisfy pressure requirements of the greatest supply pressure equipment demand
2. Natural Gas System Working Pressure: Sufficient to satisfy pressure requirements of each individual piece of equipment.
3. Natural Gas Entrance into Facility: Locate the service meter at least 3 feet from ignition sources and as required by the natural gas utility requirements.

D. Structural:

1. Seismic Protection:
   a. Provide fuel distribution system with the ability to flex where differential movement is anticipated.

E. Durability:

1. Expected Service Life Span: Provide a system which will be viable for the life of building.

2. Vandalism: Protect the service meter from unauthorized access and the public.
3. Accidental Damage: Protect service meter from accidental damage by installing bollards to stop vehicles.

F. Operation and Maintenance:

1. Ease of Service:
   a. Provide shut-off valves as required by code and at each branch connection.

PRODUCTS

A. Pipe:

1. Use one or more of the following:
   a. Materials permitted by code.
   b. Steel pipe with threaded or welded joints.
2. Do not use:
   a. Copper pipe.
   b. Aluminum-alloy pipe.
   c. Ductile iron pipe.
   d. Plastic pipe.
   e. Stainless steel pipe.

B. Fittings:

1. Use one or more of the following:
   a. Materials permitted by code.
   b. Steel.
2. Do not use:
   a. Copper.
   b. Aluminum-alloy.
   c. Ductile iron.
   d. Plastic.
   e. Stainless steel.

METHODS OF CONSTRUCTION

A. Construct the system using the following methods:

1. Install all gas piping and accessories in accordance with International Fuel Gas Code 2006, the local Gas Company's rules and regulations, and fuel-burning equipment manufacturer's recommendations.
2. Notify the Gas Company and local plumbing inspector prior to start of work and prior to testing.
3. Prior to start of work, contractor shall verify available gas pressure with the Gas Company.

4. Provide gas meter enclosure with fencing, concrete pads, and vehicle protection as required by the gas company.
5. Provide lockup type regulators as required by the gas company
6. Provide separate (not combined) gas vent piping from gas trains and pressure regulators as required by the gas company. Install all gas piping, vents, valves and accessories in strict accordance with the Gas Company's rules and regulations, the International Fuel Gas Code 2006, ANSI Z83.3, and ANSI Z83.3a.
7. Provide minimum UL-FM approved gas trains; IRI gas trains preferred.
8. Test, inspect, and purge gas piping according to Section 406 of the International Fuel Gas Code, 2006 and requirements of authorities having Jurisdiction. Repair leaks and defects with new materials and retest system until satisfactory results are obtained.
9. Provide seismic restraints for gas piping as per Code.
10. Provide UL Listed firestop system for all pipe penetrations through fire-rated constructions.
11. Provide pipe sleeves for pipes passing through concrete walls, masonry walls, concrete floor slabs, and concrete roof slabs.
12. Provide welding certificates. Welding shall comply with ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications.
13. Prime and paint gas piping (including gas train and vents) yellow as recommended by ANSI A13.1-1996.

END OF SECTION D31

SECTION D32

HEAT GENERATION

PERFORMANCE

A. Basic Function:

1. Provide the necessary equipment and infrastructure to deliver heat to the conditioned spaces.
2. Where HVAC elements also must function as elements defined within another element group, meet the requirements of both element groups.
3. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility and Performance, Section D - Services, and Section D3 - HVAC.

B. Health and Safety:

1. Hazards: Provide boilers which safeguard people, property and equipment from the following potential hazards:
   a. Exposure to open flames.
   b. Exposure to hot surfaces.

C. Durability:

1. Temperature Endurance: Provide equipment designed for ambient temperatures ranging from 50 degrees F to 122 degrees F (10 degrees C to 50 degrees C).
2. Chimneys and Flues: Provide flues and chimneys designed for flue gas temperature compatible with boiler(s), domestic water heaters and other fuel burning equipmemt.
3. Boiler Design: Design boilers to conform to construction standards of ASME Boiler and Pressure Vessel Code, Section IV, Rules for Construction of Heating Boilers, 2004.

D. Operation and Maintenance:

1. Boiler Operating Water Pressure and Temperature: 40 to 160 psig dependant on boiler type, at 250 degrees F.
2. Ease of Use: Provide access to and working clearances around heating equipment as recommended by the manufacturer.

PRODUCTS

A. Boilers:

1. Use one of the following:
   a. Heating using hot water.
   b. Equipment fueled by natural gas.
   c. Modular condensing boilers.

B. Chimneys and Flues:

1. Use one or more of the following approved by the fuel burning equipment manufacturer:
   a. Double-walled; stainless steel inner and aluminum coated steel outer duct.
   b. Double-walled; stainless steel inner and aluminum coated steel outer duct with insulation between inner and outer walls.
   c. Welded black steel with calcium silicate insulation.

C. Auxiliary Equipment:

1. Use one or more of the following:
   a. Air separators.
   b. Expansion tanks
   c. Chemical water treatment.

METHODS OF CONSTRUCTION

A. Construct the HVAC system using the following methods:

1. Certified breeching sizing calculations certified by the breeching manufacturer

2. Install support and restrain breeching per seismic restraint requirements per code

B. Do not use any of the following methods or procedures:

1. Do not connect breeching from a condensing boiler into a masonry chimney.

2. Do no connect breeching from domestic water heater into boiler breeching. Provide separate systems.

END OF SECTION D32

SECTION D33

REFRIGERATION

PERFORMANCE

A. Basic Function:

1. Provide the necessary equipment to generate the cooling required to maintain building comfort.
2. Where refrigeration elements also must function as elements defined within another element group, meet the requirements of both element groups.
3. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section D - Services, and Section D3 - Heating, Ventilating, and Air Conditioning (HVAC).

B. Health and Safety:

1. Provide condensing units that comply with ASHRAE 15 2007, Safety Code for Mechanical Refrigeration.
2. Provide chiller pressure vessels that comply with ASME Boiler and Pressure Vessel Code, Section VIII, Pressure Vessels, 2004, including both coolers and condensers.

C. Durability:

1. Temperature Endurance: Provide equipment designed for temperatures ranging from 10 degrees F to 122 degrees F.

D. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace geothermal heat pump compressors that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Ten (10) years from date of Substantial Completion.

E.

PRODUCTS

A. Refrigeration Units:

1. Use one or more of the following:
   a. Water chillers.
   b. Condensing units.
   c. Heat pumps
2. Do not use:
   a. Cooling towers.
   b. Packaged terminal air-conditioners.

B. Water Chillers.

1. Use one or more of the following:
   a. Air-cooled chillers.

b. Scroll chillers.
c. Rotary screw chillers.

2. Do not use:
   a. Centrifugal chillers.

C. Auxiliary Equipment:

1. Use all of the following:
   a. Pot feeders.
   b. Air separators.
   c. Expansion tanks.
   d. Chemical water treatment.

METHODS OF CONSTRUCTION

A. Construct in accordance with the following:

1. Use only non-HCFC refrigerants R-134a (HFC) or R-410A. One of the possible LEED checklist items require non-HCFC refrigerants.
2. Aboveground Refrigerant Piping, within the Building: Type ACR drawn-copper tubing or Type L drawn-copper tubing.
3. Below Ground Refrigerant Piping for 2" and Smaller: Type L or Type K annealed-copper tubing. Install below ground refrigerant piping in protective conduit. Vent conduit outdoors.
4. Refrigerant Pipe Hangers and Supports: Comply with the requirements and recommendations of MSS, Manufacturers Standard Society for the Valve and Fittings Industry, Inc.
5. Provide vibration isolation and seismic restraints for refrigeration equipment and refrigerant piping, per code .
6. Provide UL Listed firestop system for all refrigerant pipe penetrations through fire-rated constructions.
7. Provide pipe sleeves for refrigerant pipes passing through concrete walls, masonry walls, concrete floor slabs, and concrete roof slabs.
8. Install refrigerant piping according to ASHRAE 15.
9. Install refrigerant piping in rigid or flexible conduit in locations where tubing will be exposed to mechanical injury.
10. Test and inspect refrigerant piping according to ASME B31.5, Chapter VI.
11. Provide refrigerant monitoring and oxygen depletion monitoring system in compliance with ASHRAE 15 and the International Mechanical Code for all mechanical rooms with indoor chillers or other indoor mechanical equipment containing refrigerants.
12. Provide protective aluminum jacket or protective weather-resistant finish for insulated refrigerant piping located outdoors or subject to abuse.

13. Install coltrol keypad for any equipment no higher than centerline at 8'-0" above finished floor.

B. Do not use:

1. CFC'S refrigerants.

END OF SECTION D33

SECTION D34

AIR DISTRIBUTION

PERFORMANCE

A. Basic Function:

1. Distribute air to maintain the required space conditions.
   a. Special-Purpose Exhaust: See Sections E12 and E15.
2. Where air distribution elements also must function as elements defined within another element group, meet the requirements of both element groups.
3. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section D - Services, Section D3 - HVAC, and Section D36 - HVAC Controls.

B. Amenity and Comfort:

1. Space Temperature Control: Coordination of air distribution system's design and installation with zoning and space temperature requirements specified in Section D36 - HVAC Controls.
   a. Maintain winter effective temperature as defined by ANSI/ASHRAE Std 55-2004 between 68 degrees F and 74 degrees F.
   b. Maintain summer effective temperature as defined by ANSI/ASHRAE Std 55-2004 between 73 degrees F and 79 degrees F.
   c. Vertical Air Temperature Difference: Comply with requirements of ANSI/ASHRAE Std 55-2004.
2. Humidity Control:
   a. Provide humidification equipment in computer rooms.
   b. Maintain relative humidity between 30 and 50 percent in computer rooms.
3. Air Movement:
   a. Provide an air distribution system that limits the air velocity within the occupied zone of each space to 50 fpm, maximum.
   b. Adjustments: Provide an air distribution system which allows relocating supply diffusers, adjusting direction of airflow from supply diffusers, adjusting dampers, and changing the thermostat setpoint.
   c. Substantiation:
      1) Occupancy: Measure air movement at work station in accordance with ANSI/ASHRAE Standard 55-2004 in areas where more than 10 percent of the occupants are uncomfortable and adjust air distribution system to make occupants comfortable.
4. Acoustical Performance:
   a. Air Distribution Background Noise: Provide systems which comply with the acoustical requirements of Section C - Interiors and the following RC Levels as defined in ASHRAE HVAC Applications Handbook, 2003. Do not exceed the sound pressure level for any octave band at the specified RC.
      1) Halls, Corridors, and Lobbies: 35-45, neutral.

2) Private Offices: 25-35,neutral.
3) Conference Rooms: 25-35, neutral.
4) Open Plan Offices: 35, neutral.
5) Classrooms: 35, neutral.
6) Libraries: 35, neutral.
7) Auditorium 30, neutral
8) Instrument, Choral Rooms: 25-30, neutral.
9) Cafeteria, Kitchen, Servery: 40, maximum, neutral.
10) Nurse, Clinic Offices: 30, maximum, neutral.
11) Teaching Labs: 35, maximum, neutral.
12) All other Rooms/ Spaces not Listed: 35, maximum, neutral.
13) Substantiation:
    a) Construction: Measurement, record, and report of sound pressure levels in each octave frequency band.
        (1) Measurement of room sound levels at the occupants work station; at the center point of the room; and at the center of each 15 by 15 foot square meter square area.
        (2) Measurement of room sound levels with ANSI S1.4-1983(R06), Type 1or 2 sound level meters.
        (3) Calibration of meters and then measure room sound levels.
        (4) Result Interpretation:
            (a) Acceptable RC Levels: Measured sound pressure levels are below the specified dB levels for the given octave band.
            (b) Remedial Action: Reduction of sound pressure levels which exceed specified dB levels for a given octave band.

b. Provide equipment with sound ratings which comply with testing and rating requirements of ARI 880-1998.
    1) Substantiation:
        a) Construction: Tested and rated air terminals.

5. Cleanliness: Provide filtration of the air distributed to the occupied spaces. Filer shall be easily accessible.

6. Odor: Provide exhaust to remove odors in accordance with code requirements and the following:.
    a. Janitors Closet Exhaust: 2 cfm per sq. ft..
    b. Locker Room Exhaust: 2 cfm per sq. ft..

7. Appearance:
    a. Diffuser Color: Provide diffusers with ceiling matching color.

C. Health and Safety:

1. Bacterial Growth: Provide humidifiers which do not promote the growth of microorganisms.

2. Fire Sources: Provide air distribution elements constructed from incombustible materials.

3. Fire Spread: Provide interlocks to prevent operation or start-up of air distribution elements when fire or smoke detection systems are in alarm condition.

4. Accidental Explosion: Provide ventilation to prevent build-up of explosive gases.

D. Durability:

1. Expected Service Life Span: Provide a system which will be viable for the life of building.

2. Aesthetic Life Span: Provide units exposed within the occupied space which will not fade, chip, or peal for a minimum of 10 years.

3. Accidental Damage: Protection of air distribution system and equipment from accidental damage.

E. Operation and Maintenance:

1. Operating Parameters:
   a. Duct Construction: In accordance with SMACNA HVAC Duct Construction Standards-2005.
      1) Duct Seal Class A for Duct Pressure Classes above 2 inches w.g. and above.
      2) Duct Seal Class B for Duct Pressure Classes 2 inches w.g. and less.
   b. Fans: Match fan pressure characteristics to the air distribution system pressure characteristics including the system effect factors; pressure characteristics based on ANSI/AMCA Standard 210-1999 fan ratings and system characteristics based on engineering calculations.
      1) Substantiation:
         a) Preliminary Design: Identification of the type of fan to be used.
         b) Design: Calculations showing the air distribution pressure characteristics and data supporting the selection of the fan.
         c) Construction: Calculations showing the air distribution systems pressure characteristics; AMCA seal and ratings on each fan used.

2. Ease of Use: Provide units with individual controls coordinated with controls specified in Section D36.

3. Ease of Cleaning: Provide units with removable access panels to allow cleaning.

PRODUCTS

A. Ductwork:

1. Use one or more of the following:
   a. Galvanized sheet metal duct.
   b. Stainless steel sheet metal duct.
   c. Aluminum sheet metal duct.
   d. Flexible duct; limited to 4 feet extended length in supply applications.

2. Do not use:
   a. Steel sheet metal duct.
   b. Fibrous glass duct.

B. Diffusers, Registers, and Grilles:

1. Use one or more of the following:
   a. Steel diffusers.
   b. Aluminum diffusers.

2. Do not use:
   a. Stainless steel diffusers.

C. Air Filters:

1. Use one or more of the following:
   a. Panel filters.
   b. Pleated panel filters.
   c. Extended surface filters.
   d. Cartridge filters.

2. Do not use:
   a. Automatic roll filters.
   b. Bag-type filters.
   c. Cleanable media filters.

METHODS OF CONSTRUCTION

A. Construct the system using the following methods:

1. Construct and install duct and duct accessories in accordance with SMACNA " HVAC Duct construction Standards - Metal and Flexible, Third Edition, 2005.

2. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire dampers, fire/smoke dampers, sleeves, and firestopping system. Install fire and smoke dampers, with fusible links, according to manufacturer's UL-approved written instructions

3. Protect duct interiors from the elements and foreign materials. Follow SMACNA's "Duct Cleanliness for New Construction."

4. Install ducts with hangers and braces designed to withstand, without damage, seismic force required by the applicable building Code.

5. Commercial Kitchen Grease Exhaust Ducts:
   a. Concealed: Carbon-steel sheet (minimum 0.060 inch or No. 16 U.S. Standard Gauge).
   b. Exposed: Type 304, stainless steel (minimum 0.050 inch or No. 18 U.S. Standard Gauge) with finish to match kitchen equipment and range hood.
   c. Weld and flange seams and joints
   d. Comply with International Mechanical Code 2006, Chapter 5, Exhaust Systems, Section 506.
   e. Minimum duct velocity shall be 1500 feet per minute.

6. Dishwasher Hood Exhaust Ducts:

a. Type 304, stainless steel with finish to match kitchen equipment and range hood. Weld and flange seams and joints.
b. Aluminum, with seams and laps arranged on top of duct.

7. Acid-Resistant (Fume-Handling) or other Hazardous Ducts: Type 316 or 304, stainless-steel sheet (minimum 0.050 inch or No. 18 U.S. Standard Gauge) with No. 4 or No. 3 finish. Comply with International Mechanical Code 2006, Chapter 5, Exhaust Systems, Section 510. Comply with the appropriate sections (that include duct velocities and capture velocities) of the latest "Industrial Ventilation, a Manual of Recommended Practice."

8. Provide duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

9. Provide balancing or volume dampers at points on supply, return, and exhaust systems where branches lead from larger ducts as required for air balancing. Install at a minimum of two duct widths from branch takeoff.

10. Install backdraft dampers or motorized dampers on exhaust fans or exhaust ducts nearest to outside.

11. Install flexible connectors immediately adjacent to equipment in ducts associated with fans and motorized equipment supported by vibration isolators.

12. Install duct access doors to allow for inspecting, adjusting, and maintaining accessories and terminal units. this includes but is not limited to the following:
    a. On inlet side of duct coils.
    b. Adjacent to fire or smoke dampers, providing access to reset or reinstall fusible links.
    c. Duct smoke detectors.

13. Provide the services of a Testing, Adjusting, and Balancing Firm certified by either AABC (Associated Air Balance Council) or NEBB (National Environmental Balancing Bureau).

14. Duct Coverings and linings, including adhesives when used, shall have a flame spread index not more than 25 and a smoke developed index not more than 50, when tested in accordance with ASTM E84.

15. Duct coverings and linings shall not flame, glow, smolder, or smoke when tested in accordance with ASTM C411 at the temperature to which they are exposed in service. The test temperature shall not fall below 250 degrees F.

16. Commercial kitchen grease exhaust duct insulation shall have a minimum 2-hour fire rating.

17. Duct Identification: Install duct markers with permanent adhesive on air ducts in the following color codes:
    a. ASME A13.1 Colors and Designs

18. Install new filters prior to testing adjusting and balancing.

19. Install new filters immediately before turning over building to Newark Public Schools.
20. Provide one complete set of extra filters for each piece of equipment that is provided with filters. Where equipment is provided with pre-filters and final filter, provide both types. Turn filters over to Newark School District for future use.
21. Provide walkways, bridging, or other suitable means to protect ductwork from personnel climbing on ductwork. Where necessary to gain access to access doors or equipment obstructed by or located over ductwork.

B. Do not use any the following methods or procedures:

1. Duct tape as a sealant on any ducts.
2. Electrical Equipment Spaces: Do not route ducts to pass through transformer vaults and electrical equipment spaces and enclosures.

END OF SECTION D34

SECTION D35

HYDRONIC DISTRIBUTION

PERFORMANCE

A. Basic Function:

1. Distribute heating water and cooling water to maintain the required space conditions.
2. System(s) required include chilled water system and heating hot water system, geothermal heat pump water system.
3. Configuration - All Systems: Direct return and/or Reverse return.
4. Where hydronic distribution elements also must function as elements defined within another element group, meet the requirements of both element groups.
5. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section D - Services, and Section D3 - HVAC.

B. Amenity and Comfort:

1. Space Temperature Control: Coordination of HVAC distribution system's design and installation with zoning and space temperature requirements specified in Section D36 - Controls and Instrumentation.

C. Health and Safety:

1. Accidental Explosion: Provide pressure relief valves to prevent overpressurizing the systems.
2. Fire Source: Provide distribution elements constructed from incombustible materials.

D. Durability:

1. Expected Service Life Span: Provide a hydronic distribution system which will be viable for the life of building.
2. Pressure Ratings: Provide air coils with pressure ratings of 300 psig and which exceed the pressure rating of the system in which they are installed.
3. Erosion Control: Provide a means of removing air from hydronic distribution systems to prevent erosion. Design systems in a manner to prevent cavitation.
4. Corrosion Control: Drain condensate from cooling coils to prevent corrosion of associated equipment.
5. Pipe Stress and Strain Control: Provide pipe loops, bends, expansion joints, and flexible pipie connectors to reduce stress and strain due to expansion and contraction.

E. Operation and Maintenance:

1. Operating Parameters:

a. Building Systems:
   1) Heating Water System Pressure: 125 psig, maximum.
   2) Chilled Water System Pressure: 125 psig, maximum.
b. Pumps: Match pump pressure and flow characteristics with the pressure and flow characteristics of the distribution system.

PRODUCTS

A. Distribution Piping:

1. Use one or more of the following:
   a. Pipes 2 Inches in Diameter and Smaller:
      1) Schedule 40, continuous welded steel pipe with threaded Class 125 cast iron fittings.
      2) Hard copper, Type L with brazed or silver soldered wrought copper fittings.
   b. Pipes Larger than 2 Inches in Diameter:
      1) Schedule 40, electric resistance welded pipe.
         a) Joints and Fittings:
            (1) Welded Standard Class wrought steel fittings.
            (2) Flanged Class 150 wrought steel fittings.
            (3) Flanged Class 125 cast iron fittings.
            (4) Flanged Class 250 cast iron fittings.
            (5) Grooved ductile iron fittings.

METHODS OF CONSTRUCTION

A. Construct the system using the following methods:

1. Piping materials shall bear the label, stamp, or other markings of specified testing agency.
2. Pipe hangers and supports shall comply with the requirements and recommendations of MSS, Manufacturers Standard Society for the Valve and Fittings Industry, Inc.
3. Provide thermal-hanger shield inserts for supporting insulated pipes.
4. Provide vibration isolation and seismic restraints per Code.
5. Provide UL Listed firestop system for all pipe penetrations through fire-rated constructions.
6. Provide pipe sleeves for pipes passing through concrete walls, masonry walls, concrete floor slabs, and concrete roof slabs.
7. Provide dielectric fittings for combining piping system materials of copper alloy and ferrous materials.
8. Provide welding certificates. Welding shall comply with ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
9. Comply with ASME for materials, products, and installation.
10. Piping shall also be insulated to prevent condensation.

11. Provide protective aluminum or ultraviolet-resistant PVC jackets for insulated piping located outdoors or subject to abuse.
12. Provide thermometers at each hydronic zone, each boiler, each chiller, each thermal storage tank, and each hydronic heat exchanger.
13. Provide pressure gauges at the discharge of each pressure reducing valve, suction and discharge of each pump, and chilled water inlets and outlets of each chiller, inlets and outlets of each boiler, hydronic heat exchanger, water coil .
14. Pipe Identification: Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.
15. Valve tags: Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; plumbing fixture supply stops; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Do not use any the following methods or procedures:

1. PVC or CPVC piping.

END OF SECTION D35

SECTION D36

HVAC CONTROLS

PERFORMANCE

A. Basic Function:

1. Provide the elements necessary to control the building's indoor environment.
   a. Provide a building control system which controls the indoor environment, manages energy consumption, schedules preventative maintenance, controls interior lighting, controls exterior lighting, integrates fire alarm and security functions, monitors packaged equipment controls, and monitors fuel, water and all other utility usage.
      1) Provide a thermostat or a temperature sensor for each zone to maintain the required space conditions.
      2) Provide monitoring and control of major pieces of HVAC equipment.
      3) Monitor the following equipment:
         a) Air terminals.
         b) Air handlers.
            (1) On-off status.
            (2) Entering air temperature.
            (3) Leaving air temperature.
            (4) Entering chilled water temperature.
            (5) Leaving chilled water temperature.
            (6) Entering heating water temperature.
            (7) Leaving heating water temperature.
            (8) Supply fan airflow.
            (9) Return fan airflow.
            (10) Exhaust fan airflow.
            (11) Outside airflow.
            (12) Filter static pressure.
         c) Chillers.
            (1) On-off status.
            (2) Entering chilled water temperature.
            (3) Leaving chilled water temperature.
            (4) Percent of full load.
            (5) Chilled water flow.
            (6) Safety controls.
         d) Boilers.
            (1) On-off status.
            (2) Entering water temperature
            (3) Leaving water temperature.
            (4) Percent of full load.
            (5) Safety controls.
         e) Geothermal hydronic loop.
            (1) Main supply loop temperature.
            (2) Main return loop temperature.

f) Heat pumps
g) Fan coil units.
h) Exhaust fans.
i) Pumps: On-off status.

4) Control the following equipment:
a) Air terminals.
b) Air handlers.
c) Chillers.
d) Boilers.
e) Heatpumps
f) Fan coil units.
g) Exhaust fans
h) Pumps.

2. Where control and instrumentation elements also must function as elements defined within another element group, meet the requirements of both element groups.

3. Provide capability to report all functions/control points to a central location (computer work station)

4. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section D - Services, and Section D3 - HVAC.

B. Amenity and Comfort:

1. Zoning and Space Temperature Control:
a. Dedicated terminal unit and thermostat for each separated space.
b. Dedicated terminal unit and thermostat for each corner space.

2. Building Control System: Provide a central location to monitor and control each zone setpoint.

3. Humidity Control: Provide monitoring and control of humidification equipment in computer rooms.

C. Health and Safety:

1. Life Safety: Provide interconnection and coordination of HVAC controls with other life safety systems.

2. Fire Sources: Provide products which are rated for the specific locations where they are installed.

D. Durability:

1. Expected Service Life Span: Provide a system which will last a minimum of 10 years in service without major repairs or operating expense.

2. Vandalism: Protect the system from unauthorized access.

3. Accidental Damage: Protect thermostats, temperature sensors, control wiring, field panels, and computer, keyboard, and monitor from accidental damage.

E. Operation and Maintenance:

1. System Capacity: Provide a building control system with sensors and points to perform as specified and add 15 percent more points.

2. Ease of Use:
   a. Locate field panels in mechanical rooms.
   b. Locate the central controller as Directed by the Newark Public Schools.
   c. Provide a system which is user programmable, has a graphic user interface, has dial-in modem access from remote locations, and has multiple layers of secured access to data and program information.
   d. Provide field panels which are independent and do not need the central controller to continue functioning.

3. Ease of Service:
   a. Provide a system of modular design, with self-diagnostic capability, and with historical data storage.

4. Allowance for Change and Expansion: Provide a building control system which is expandable to meet future needs.
   a. Spare Capacity: Provide sensors and points required to perform as specified and add 15 percent more points.

5. Energy Efficiency: Provide the following control functions or features:
   a. Holiday scheduling.
   b. Night setback/ setup for both systems and rooms levels..
   c. Outside air economizer.
   d. Boiler staging.
   e. Boiler optimization.
   f. Chiller staging.
   g. Optimum start.
   h. Optimum stop.
   i. Chilled water temperature reset.
   j. Heating water temperature reset.
   k. Variable speed pumping.
   l. Demand limiting and load shedding.

PRODUCTS

A. Building Control System Types:

1. Use the following:
   a. Direct digital control (DDC) system, web based open protocol, BACnet./Lonworks; capable of seamlessly tieing into and interfacing with the Newark Public Schools existing district network.

2. Do not use:
   a. Pneumatic system.

METHODS OF CONSTRUCTION

A. Construct the system using the following methods:

1. Provide instructions to the Owner's personnel in the operation and maintenance of the control system. Training will be provided after the system has been commissioned and demonstrated to the Newark Public Schools.
2. HVAC Controls Installer Qualifications: An experienced installer who is an authorized representative of the automatic control system manufacturer for both installation and maintenance of units required for this Project.
3. HVAC Controls Manufacturer: Direct Digital Control - BACnet pen communication protocol to interface with any leding HVAC manufacturers and web-based energy management system for remote monitoring.
4. Comply with ASHRAE 135 for DDC system control components.
5. Hydronic control valve sizing: Maximum 5-psig pressure drop at design flow rate.
6. Motorized low-leakage dampers shall be rated for leakage at less than 10 cfm per sq. ft. of damper area, at differential pressure of 4 inches wg when damper is being held by torque of 50 in. x lbf; when tested according to AMCA 500D.

B. Do not use any the following methods or procedures:

1. Dealers and contractors buying controls from a wholesale distributor will not be accepted..

END OF SECTION D36

SECTION D4

FIRE PROTECTION

PERFORMANCE

A. Basic Function:

1. Provide services systems to protect life and property.
2. Fire protection comprises the following elements:
   a. Fire Sprinkler and Extinguishing Systems D41: Elements which automatically extinguish fires.
   b. Standpipe Systems D42: Elements that deliver adequate supplies of water to locations in the building for manual fire-fighting.
   c. Fire Detection and Alarm D43: Elements required to detect fires and communicate fire location to building occupants, building management, and public fire fighting agencies.
   d. Fire Protection Specialties D45: Elements required for manual fire-fighting by occupants.
3. Provide automatic fire suppression for entire school facility building and lower level of parking garage, including complete fire pump and accessories.
4. Water Use:
   a. Provide water supply arrangement for standpipes as required by code..
   b. Provide a water supply to sprinkler systems that is sufficient to extinguish fires inside the structure.
5. Where fire protection elements also must function as elements defined within another element group, meet the requirements of both element groups.
6. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance and Section D - Services.

B. Amenity and Comfort:

1. Leakage: Provide systems that are leak-free.
2. Accessibility: Provide clearances around system components for service and use.
3. Sound: Provide audible alarm system to signal building occupants of fire hazard.
4. Convenience: Provide an automatic system to signal building occupants of fire.
5. Hazards: Provide systems which minimize risk of injury and damage to property.
6. Substantiation:
   a. Construction Documents: Fire protection zones indicated on the drawings with riser locations identified.
   b. Construction: Functional performance testing in accordance with code.

C. Structural:

1. Seismic Design: Provide support systems which sustain static (dead) loads and code required seismic loads.

D. Durability:

1. Vandalism: Provide systems which are tamper-resistant.

E. Operation and Maintenance:

1. Ease of Use: Provide easy access to and working clearances around system components.
2. Unauthorized Use: Provide systems which minimize activation and use by unauthorized persons.

PRODUCTS

A. Use one or more of the following:

1. Combination automatic wet pipe sprinkler and manual wet Class I Standpipe system.
2. Dry pipe sprinkler system for parking structure.
3. Manual dry standpipe system for parking structure.
4. Fire detection and alarm system.

B. Do not use:

1. Preaction sprinkler system.
2. Deluge sprinkler system.
3. Non-water extinguishing systems.

METHODS OF CONSTRUCTION

A. Construct using the following methods:

1. Utilize fire-hydrant flow test provided and in accordance with to NFPA 13. Use results for system design calculations. Report test results promptly and in writing.
2. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water distribution piping.
3. Use approved fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
4. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, sized and located according to NFPA 13.
5. Install sprinkler piping with drains for complete system testing and drainage.
6. Install sprinkler zone control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.
7. Install drain valves on standpipes.

8. Install ball drip valves to drain piping between fire department connections, fire pump test header and check valves. Drain to floor drain or outside building.
9. Install alarm devices in piping systems.
10. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 (DN 8) and with. soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.
11. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply except from fire department connections. Install permanent identification signs indicating portion of system controlled by each valve.
12. Install alarm check valves in vertical position for proper direction of flow, including bypass check valve and retarding chamber drain-line connection.
13. Install external reset type dry-pipe valves with trim sets for air supply, drain priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.
    a. Install air compressor and compressed-air supply piping.
14. Install sprinklers in suspended ceilings in center of narrow dimension of acoustical ceiling panels and tiles.
15. Install sprinkler guards on all sprinkler heads in the gymnasium, mechanical, electric rooms, service areas and in all spaces with minimum 7'-0" clearance between floor and sprinkler per NFPA 13.
16. Arrange for pipe spaces and openings in the building structure to allow for mechanical installations.
17. Install sprinkler piping in concealed locations except in equipment rooms and service areas.
18. Install exposed piping in equipment room and service areas at right angles or parallel to building walls.
19. Install piping above accessible ceilings to allow sufficient space for ceiling removal.
20. Install piping free of sags or bends.
21. Install approved fittings for changes in direction.
22. Install escutcheons for penetrations of walls, ceilings, and floors.
23. Install sleeves for piping passing through concrete and masonry walls and concrete floors.
24. Maintain indicated fire rating of walls, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.

B. Do not use any of the following methods or procedures:

1. Plain end Schedule 10 steel pipe for 3-1/2 inch and smaller pipe.

2. Grooved pipe connections on piping 2-1/2 inch or less.
3. Mechanical "T" and cross fittings.
4. Snap-on and strapless outlet fittings

END OF SECTION D4

SECTION D41

FIRE SPRINKLER AND EXTINGUISHING SYSTEMS

PERFORMANCE

A. Basic Function:

1. Provide fire sprinkler or fire extinguishing systems for all interior spaces and covered levels of parking garage.
2. Provide wet pipe sprinkler or dry pipe systems unless otherwise indicated or required by code.
3. Spaces and Areas With Fire Extinguishing Systems:
   a. Kitchen Exhaust Hoods: use code permitted agent.
4. Provide code-required coverage if the coverage specified above is less than required by code.
5. Fire Sprinklers: Design and construction in accordance with code and NFPA 13-2002.
6. Standpipes and Hoses: Design and construction in accordance with code and NFPA 14-2003.
7. Dry-Chemical Extinguishing Systems: Design and construction in accordance with code and NFPA 17-2002.
8. Foam Extinguishing Systems: Design and construction in accordance with code and NFPA 11-2005.
9. Foam Water Extinguishing Systems: Design and construction in accordance with code and NFPA 16-2003.
10. Fire Pump and all Accessories: Design and construction in accordance with code and NFPA 20-2007.
11. Where fire sprinkler and extinguishing elements also must function as elements defined within another element group, meet the requirements of both element groups.
12. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section D - Services, and Section D4 - Fire Protection.

B. Amenity and Comfort:

1. Accessibility:
   a. Provide fire department valve cabinet at each intermediate stair landing or a location approved by the Newark Fire Department.
2. Appearance:
   a. All spaces unless indicated otherwise on the drawings or below: Concealed sprinklers.

1) Provide Pendant sprinklers at rooms without ceilings: Gymnasiums, mechanical spaces without ceilings, and parking garage.

b. Provide fire department valve cabinets with off-white finish and glass window in the door.

c. Provide valves with brass finish.

d. Provide fire department connections with brass finish.

3. Convenience: Provide fire department connections that interconnect each standpipe as required by code. Coordiante location of fire department connection(s) with newark Fire Department.

C. Health and Safety:

1. Sprinkler Head Performance: As required by code and NFPA 13-2002.

2. Water Demand Requirements:

a. Determine minimum water supply requirements for each sprinkler system using the hydraulic calculation method defined by NFPA 13.

b. Substantiation:

1) Design Development: Water supply for sprinkler systems shown on the drawings.

2) Construction: Tests of each sprinkler system in accordance with the requirements of the design standard.

3. Water Source:

a. Provide fire pump designed in accordance with NFPA 20-2007.

b. Provide water from a public service main.

D. Structural:

1. Seismic Design:

a. Provide a sprinkler system which allows movement where differential movement is anticipated and with clearances around piping at walls and floors in accordance with NFPA 13.

b. Provide sprinkler system components, bracing and clearances in accordance with NFPA 13.

E. Durability:

1. Expected Service Life Span: Provide a sprinkler system which will be viable for the life of building when maintained as specified in NFPA 25-2002.

a. Substantiation:

1) Preliminary Design: Identification of the system type to be installed.

F. Operation and Maintenance:

1. Provide sprinkler system and fire pump maintenance in accordance with NFPA 25-2002.

2. Ease of Service:

a. Spare Sprinkler Heads: Provide additional sprinkler heads.

PRODUCTS

A. Pipe:

1. Use the following:
   a. Black and galvanized steel pipe with grooved joints with seals and couplings.
   b. Black and galvanized steel pipe with threaded joints and couplings.

2. Do not use:
   a. Copper pipe.
   b. CPVC pipe.
   c. PB pipe.

B. Fittings:

1. Use the following:
   a. Steel.

2. Do not use:
   a. Copper.
   b. Cast iron.
   c. CPVC.
   d. PB.

C. Fire Pumps:

1. Use one or more of the following:
   a. Electric fire pumps.

2. Do not use:
   a. Diesel engine driven fire pumps.

END OF SECTION D41

SECTION D42

STANDPIPE AND HOSE SYSTEMS

PERFORMANCE

A. Basic Function:

1. Provide a standpipe system to protect life and property.
2. System Class and Type: Provide Class I, manual-dry standpipe and Class I manual-wet standpipe systems.
3. Standpipe Design and Installation: Provide a standpipe system as required by code and NFPA 14-2003.
4. Where standpipe and hose system elements also must function as elements defined within another element group, meet the requirements of both element groups.
5. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section D - Services, and Section D4 - Fire Protection.

B. Amenity and Comfort:

1. Accessibility:
   a. Provide fire department connections as required by code.
   b. Provide a fire department valve cabinet as required by code.
2. Appearance:
   a. Fire Department Valve Cabinets: Bright-chrome finish and solid metal door panel.
   b. Valves: Brass finish.
   c. Fire Department Connections: Brass finish.
3. Convenience: Provide fire department connections for each standpipe as required by code.

C. Health and Safety:

1. Fire Spread: Provide a standpipe system to assist firefighters in preventing the spread of fire.
   a. Substantiation:
      1) Preliminary Design: Identification of locations of each standpipe.
      2) Design Development: Indication of standpipe locations on the drawings.
2. Water Source: Provide water supply as required by NFPA 14.
   a. Substantiation:
      1) Design Development: Water supply for each standpipe on the drawings.
      2) Construction: Tests of each standpipe system.

D. Durability:

1. Expected Service Life Span: Provide standpipes which will be viable for the life of building.
   a. Substantiation:
      1) Design Development: Identification of similar standpipes in use in an existing facility for 3 years.

E. Operation and Maintenance:

1. Provide standpipe maintenance in accordance with NFPA 25-2002.
2. Ease of Use: Provide standpipes which comply with the acceptance requirements of NFPA 14.

PRODUCTS

A. Pipe:

1. Use the following:
   a. Steel pipe.
      1) Joints: Grooved with seals and couplings.
2. Do not use:
   a. Copper pipe.

B. Fittings:

1. Use one or more of the following:
   a. Steel.
2. Do not use:
   a. Copper.
   b. Cast iron.

END OF SECTION D42

SECTION D43

FIRE DETECTION AND ALARM

PERFORMANCE

A. Basic Function:

1. Provide automatic fire detection and automatic and manual alarm systems as required by code. System shall provide dedicated manual and automatic origination, control, transmission and supervision of information and meet NFPA requirements for emergency voice / alarm communication.
2. In addition to protected premises system(s), provide a new on-premises supervising station located at main office with connection between protected premises and supervising station by same method currently used for other buildings within the School District
3. Connect the protected premises system(s) to public fire department via transmission as approved by Newark Public Schools.
4. Integrated systems performing all functions are required, subject to requirements of code for separated, independent systems.
5. Where fire detection and alarm elements also must function as elements defined within another element group, meet the requirements of both element groups.
6. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section D - Services, and Section D4 - Fire Protection.
7. Substantiation:
   a. Construction Documents: Detailed layout of input and output device locations.
   b. Closeout: Complete functional performance testing as specified in Section 00830, under Commissioning.

B. Amenity and Comfort:

1. Accessibility: Comply with requirements of local, State, and federal authorities for facilities for the disabled.

C. Health and Safety:

1. Detection, Alarm, Notification Methods: In accordance with NFPA 72-2002.
2. Evacuation Plan: Provide general evacuation of entire premises upon initiation of automatic or manual alarm condition.
3. Detection:
   a. Comply with NJAC 5:23-3.11A.
   b. Air Handling Units Over 2,000 cfm: Minimum of one detector in the return.
   c. Upon detection of fire or smoke condition, automatic notification of occupants.
4. Alarms:

a. Means for occupants to communicate same types of alarm as automatic system does.
b. Manual stations at minimum of 100 feet intervals along means of egress paths.
c. Audible Alarms: Minimum of 75 db at 10 feet and 15 dB over ambient noise, audible throughout the building and at the build exterior property.
d. Visual alarms, in locations required by code and public toilets, corridors, and assembly spaces.
e. Separate audible and visual signals for alarms and trouble notification in corridors.

5. Fire Protection Controls:
   a. Provide connections between alarm and detection system and fire suppression system activation sensors.
   b. Upon Alarm: Shut down or deactivate the following:
      1) HVAC air distribution.
      2) Elevators (thermal detection only).
      3) Fire-rated door hold-opens.
      4) Locks restricting exit through doors constituting means of egress.

6. Audible and visual trouble notification of operations staff, for alarm zone failures, annunciator zone failures, ground faults, backup power failure, water supply equipment failures.

7. Error and Failure Prevention: Addressable system; "tamper" sensors at sensitive points; products of only one manufacturer or certified by manufacturer as compatible. Provide isolation modules for each floor.

8. Substantiation:
   a. Construction or Closeout: Functional performance tests approved by code authorities.

D. Operation and Maintenance:

1. Power Supplies:
   a. Building power with power line conditioner for all systems.
   b. Dedicated Battery Backup Power: For:
      1) Fire safety systems, 90 minutes.
      2) Emergency communications, 90 minutes.

2. Ease of Use:
   a. Minimum of one centralized monitoring display for all systems is required; locate in security office.

3. Newark Public Schools' Personnel Training: Refer to Design Build Contract Document Volume 1 - Front End Documenmts, Division1
   a. Operational: Minimum of 8 hours, for 1 person, for each separate system.
   b. Maintenance: Minimum of 8 hours, for 1 person, for each separate system.

PRODUCTS

A. Control Systems for All Applications:

1. Use one of the following:
   a. Microprocessor-based hardware.
   b. Point Addressible fire alarm devices.
2. Do not use:
   a. Hardwired relay base controls
   b. zoned alarm devices.

B. Fire/Smoke Detectors:

1. Use one of the following:
   a. Photoelectric smoke detectors.
   b. Beam detectors.
   c. Thermal detectors.
2. Do not use:
   a. Ionization smoke detectors.

C. Warning Devices:

1. Use one of the following:
   a. Speakers.
   b. ADA Strobes.
   c. Combination speaker /strobes.
2. Do not use:
   a. Horns.
   b. Combination horn/strobes.

D. Communication Cabling:

1. Use one of the following:
   a. Copper cable complying with manufacturer's requirements.

METHODS OF CONSTRUCTION

A. Use products by Edwards Systems Technology (EST) or Notifier for district wide compatibility.

1. Provide fire alarm cable installed in conduit.
2. Provide tamper proof protective devices at all fire alarm pull stations - Stopper II

B. Do not use:

1. Loose fire alarm cable without raceway.

END OF SECTION D43

SECTION D45

FIRE PROTECTION SPECIALTIES

PERFORMANCE

A. Basic Function:

1. Provide equipment and fixtures to facilitate manual fire-fighting in accordance with the code.
2. Fire protection specialties comprise the following elements:
   a. Fire extinguishers.
   b. Fire blankets.
   c. Cabinets for storage.
   d. Combination extinguisher and hose cabinets.
3. Provide portable fire extinguishers throughout the facility, of the type and size and in the locations required by and NFPA 10 and the code.
4. Provide fire blankets at science rooms.
5. Where fire protection specialty elements also must function as elements defined within another element group, meet the requirements of both element groups.
6. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section D - Services, and Section D4 - Fire Protection.
7. Substantiation:
   a. Design Development: Types, locations, and calculations of travel distances.

B. Amenity and Comfort:

C. Health and Safety:

1. Accident Prevention:
   a. Locate extinguishers and cabinets so that means of egress is not impeded, in accordance with code.
2. Fire Safety: Mount extinguishers in permanent location using mounting fixtures that will inhibit casual removal but allow ready use in case of fire.

D. Durability:

1. Expected Service Life Span: Same as life span of building.

E. Operation and Maintenance:

1. By-Products: Use extinguishing agents that minimize adverse effects of use on building equipment and finishes.
2. Ease of Use: For extinguishers intended for the use of occupants other than trained fire brigade members, weight of extinguisher shall not exceed 12 pounds.

PRODUCTS

A. Cabinets:

1. Provide one of the following:
   a. Painted steel cabinets.
   b. Aluminum cabinets.
   c. Stainless steel cabinets.
   d. Cabinets without vision panels.

2. Do not use:
   a. Wood cabinets.
   b. Cabinets without vision panels.

END OF SECTION D45

SECTION D5

ELECTRICAL POWER

PERFORMANCE

A. Basic Function:

1. Provide electrical power with the appropriate characteristics to operate all electrically operated devices, including those in other services.

2. The electrical system comprises the following elements:
   a. Electrical Energy Generation (D51): Utility power sources, engine-generator systems, battery power systems, uninterruptible power supply systems and unit power conditioners.
   b. Service and Distribution (D52): Service entrance equipment, distribution equipment, transformers, motor control equipment, service and feeder wiring (conductors and raceways), monitoring, safety and control equipment, and other elements required for a complete functional system.
   c. Branch Circuits (D53): Branch circuit wiring and receptacles and other branch circuit wiring systems.

3. Utility Revenue Meters: Meter incoming electrical service on the low-voltage side of the service transformer (secondary metering).

4. Where electrical power elements also must function as elements defined within another element group, meet the requirements of both element groups.

5. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance and Section D - Services.

6. Substantiation:
   a. Construction: Install electrical work as indicated, in accordance with equipment manufacturer's written instructions and complying with applicable portions of NEC, the American Electricians Handbook; the National Electrical Safety Code, ANSI C2; and National Electrical Contractors Association's Standard Practices for Good Workmanship in Electrical Construction NECA 1-2000.
   b. Construction: Provide testing in accordance with International Electrical Testing Association Acceptance Testing Specifications for Electric Power Distribution Equipment and Systems NETA ATS-1999.
      1) Test switchboards, panelboards, transformers, cables, bus ducts, switches, circuit breakers, grounding system, ground fault protection system, surge arrestors and TVSS devices, generators, and transfer switches.
      2) Perform each visual and mechanical inspection and electrical test listed.
   c. Construction: Test generator for full load bank test before Final Completion and meet all NJDEP air permit requirements
   d. Before an application for Final Completion of the work will be considered, all tests deemed necessary to show proper execution of the work will be performed, witnessed, approved, and completed. Scheduling of all testing procedures shall be submitted for approval.

e. Where electricity-utilizing equipment, supplied by other trades is energized, controlled or otherwise made operative by electric wiring systems, the testing which will prove proper functional performance shall be conducted specifically by the trade responsible for the mechanical equipment.
f. Testing to show the proper functioning of all lighting fixtures and lamps, including those supplied by others, shall be included in the electrical work.
g. Perform all tests and inspections of equipment, material and wiring to determine whether all provisions of these specifications and drawings have been fulfilled. Wiring shall be tested for proper performance. Lubrication of all rotating equipment and direction of rotation of all 3 phase motors shall be checked.

B. Amenity and Comfort:

C. Health and Safety:

1. Electrical Hazards: Construct in accordance with requirements of all NFPA standards that apply to the occupancy, application, and design.
   a. Protect against unauthorized access to spaces housing electrical components and allow access only by qualified personnel.
   b. Provide electrical distribution equipment with locking cabinets, doors, and panels when it is located in public areas.
   c. Hazardous Locations: Comply with code.

2. Emergency Systems: Provide emergency power when normal power is interrupted, for the following:
   a. Systems and areas as required by code.
   b. Elevator system. See Section D11 for requirements.
   c. Air handlers. See Section D3 for requirements.
   d. Computers. See Section D51 for requirements.
   e. Interior Lighting. See Section D61 for requirements.

3. Hazardous Locations: Comply with requirements of NFPA 70-2005 chapter on Hazardous (Classified) Locations, in the following areas:
   a. Flammable gas storage.
   b. Flammable liquid storage.
   c. Service stations.
   d. Paint booth.
   e. Chemical storage.
   f. Bottled gas storage.

4. Grounding: Provide solidly grounded electrical distribution systems in accordance with NFPA 70-2002 and as follows:
   a. Ground the neutral terminal of the main service entrance and distribution equipment to the following:
      1) Incoming water service with bonding jumper across meter.
      2) Steel reinforcing in concrete footing.
      3) Interior (grounded) structural steel.
      4) External driven ground rods.
   b. Ground the interior structural steel in the vicinity of the main service entrance

and distribution equipment.

c. Bond the ground terminal of the main service entrance and distribution equipment to the following:
   1) Gas service pipe (after meter).
   2) Local interior hot and cold water piping.
   3) interior (ungrounded) structural steel.
d. Ensure that interior structural steel and roof system are electrically continuous. Provide bonding jumpers across expansion/control joints.
e. Provide insulate green equipment grounding conductors in all circuits.
f. Ground neutral terminals of transformers to building steel and driven ground rods and bond to local interior hot and cold water piping. .
g. Provide isolated grounding system as required to meet technology requirements.
h. Indicate sizes of grounding electrode conductors, equipment grounding conductors, isolated grounding conductors and bonding jumpers.
i. Use 3/4-inch diameter by 10'-0" copper clad steel ground rod with exothermic welded connections
j. Use all copper or bronze grounding materials

D. Durability:

E. Operation and Maintenance:

1. Capacity: Calculated in accordance with NFPA 70; provide 12 volt-amperes per square foot nominal and 15 volt-amperes per square foot maximum for the entire building.

2. Power Consumption and Efficiency:
   a. Comply with requirements of IEEE Standard 739-1995.
   b. Comply with requirements of ASHRAE 90.1-2004.

3. Protection Against Disturbances:
   a. Surge Protection: Voltage excursion limit of 2 times design voltage.
      1) Voltage excursion limit of 800 volts for 480Y/277 volt systems and 400 volts for 208Y/120 volt systems.
      2) Comply with U.L. 1449 Second Edition.
      3) Provide protection at service entrance switchboard.
      4) Provide protection of all 120/208 volt panelboards supplying 120 volt computer power and normal power receptacle circuits.
      5) Provide separately mounted TVSS devices, flush or surface mounted to match panelboard.
      6) Provide switchboard and panelboard mounted circuit breakers to disconnect respective surge suppressors.
      7) Provide additional surge suppressors as required to protect branch circuits supplying power to the following:
         a) Fire alarm panel
         b) School intercom and program system.
      8) Do not provide integrally mounted TVSS devices for switchboards and panelboards.

9) Substantiation:
   a) Design Development: Description of surge protection devices to be used.
   b) Construction: Measurement of voltage excursions on protected circuits.

b. Phase Failure - provide phase failure protection for three-phase motors

4. General System Voltage: 480 GndY/277 volts/3-phase, 4-wire /60 Hz for lighting and power.
   a. General Receptacle System Voltage: 120 volts/3-phase/60 Hz.
   b. Lighting Voltage: 277 volts/3-phase, 4-wire /60 Hz for fluorscent and high intensity discharge lighting.
   c. Accent and Specialtiy Lighting Voltage: 208 GndY/120 volts 3-phase, 4-wire /60 Hz.
   d. Receptacle and small Applicnces Voltage: 208 GndY/120 volts 3-phase, 4-wire /60 Hz.

METHODS OF CONSTRUCTION

A. Construct using the following methods:

1. All electro-mechanical installations required by this Division shall be performed as outlined in the American Electricians Handbook, latest edition..

2. Contractor shall make application to the local electrical inspection authority before any work commences and shall furnish a copy of such application for approval and record.

3. The permit must be signed and sealed by a contractor licensed to perform electrical work in the --city and state in which the project is located.

4. Comply with all applicable federal, state and local electrical and safety codes.

5. Comply with all utility company requirements.

6. Upon completion of the Work, before Final Completion, furnish certificate of approval of electrical inspection authority having jurisdiction, or executed copy thereof.

7. All electrical material and equipment shall bear the seal of approval of the National Fire Protection Association and the Underwriter's Laboratory Label where such approvals and labeling are applicable.

8. The work shall be installed in cooperation with other trades installing inter-related work. Before installation, make proper provision to avoid interferences with other trades.

9. Locations of pipes, ducts, electrical raceways, switches, panels, equipment, fixtures, etc., shall be adjusted to accommodate the work for interferences anticipated and encountered. Determine the exact route and location of each pipe, duct and electrical raceway prior to fabrication.

10. Right-of-way: Lines which pitch shall have the right-of-way over those which do not pitch. For example, steam, condensate and plumbing drains shall normally have the

right-of-way. Lines whose elevations cannot be changed shall have the right-of-way lines over lines whose elevations can be changed. Lines containing liquid or gas have right-of-way over electrical lines.

11. Offsets, transitions and changes in direction in pipe, ducts, and electrical raceways shall be made as required to maintain proper headroom and pitch of sloping lines whether or not indicated on the drawings. Furnish and install all offsets, pull boxes, etc., required to effect these transitions and changes in direction.
12. Seal all penetrations in foundation walls and floors with non-cracking polyurethane caulk to close off any soil gas entry routes. Provide threaded or solvent glued joints in all conduits below the foundation floor which penetrate the foundation walls and floors.
13. Install all raceway, wiring and cable concealed in finished spaces. Provide pullboxes, size and type as required.
14. Install exposed raceway true, plumb and parallel or perpendicular to building lines. Provide electrical metallic tubing, 3/4-inch minimum in unfinished spaces; provide surface metal raceway where it must be exposed in finished spaces.
15. Provide flexible connections to motors and other rotating/vibrating equipment.
16. Make taps and splices for branch circuits and feeders larger than #10 AWG with mechanical or compression connectors, insulated.
17. Make taps and splices for branch circuits and feeders larger than #10 AWG and smaller with crimp connectors and insulating caps. Do not use screw-on type connectors.
18. Taps shall be full circuit size up to their overcurrent protection device.
19. Make connections to fixture and motor leads #10 AWG and smaller with screw-on pre-insulated spring pressure connectors.
20. Connect stranded wire connectors to screw terminals with locking fork crimp terminals with nylon insulated grips.
21. Route raceways through roof using dedicated roof jacks or pitch pockets. Install raceway on roof on dedicated roof supports eight inches high minimum.
22. Provide seismic restraints and anchors for equipment, fixtures, raceway, etc. in accordance with 2006 International Building Code, Section 1621 Architectural, Mechanical and Electrical Component Seismic Design Requirements.

B. Do not use:

1. Exposed wiring or cable not U.L. listed for the purpose; wood supports or anchorages; nonmetallic conduit, boxes or fittings; or vinyl, plastic, nylon, or other combustible or smoke producing identification or construction materials shall not be used in the space above hung ceilings used as a plenum for the return of environmental air.

END OF SECTION D5

SECTION D51

ELECTRICAL ENERGY GENERATION

PERFORMANCE

A. Basic Function:

1. Provide electrical energy generation for emergency and standby power systems.
   a. Provide emergency and standby power as required by code including the following:
      1) Emergency Lighting, Exit Signs and Egress Lighting: Duration for duration of outage, and as specified in Section D61.
      2) Elevators: See Section D11 for requirements.
      3) Electric Fire Pumps: Duration for duration of outage.
      4) Fire Detection and Alarm System: Duration for duration of outage.
      5) Mechanical Equipment serving Smokeproof Enclosures: Duration for duration of outage.
      6) HVAC Equipment: Necessary to keep the building from freeze-up during loss of power; Duration for duration of outage.
      7) Public Address and Clock System: Duration for duration of outage.
      8) Lights: Duration for duration of outage.
      9) Electrical Room Lights: Duration for duration of outage.
      10) Telecommunications System: Duration for duration of outage.
      11) Sewage Removal System (if any) : Duration for duration of outage.
      12) Kitchen Refrigerators, Walk-in cooler and Freezer: Duration for duration of outage.
      13) Selected Kitchen Equipment: Duration for duration of outage.
      14) Security System: Duration for duration of outage.
      15) BMS System: Duration for duration of outage.

2. Electrical Energy Generation Capacity:
   a. Provide capacity at least 20 percent more than the connected load.
   b. Provide 2 volt-amperes per square foot nominal and 3 volt-amperes per square foot maximum for the entire building.

3. Configuration:
   a. Underground service entrance.

4. Where electrical energy generation elements must also function as elements defined within another element group, meet the requirements of both groups.

5. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section D - Services, and Section D5 - Electrical.

B. Amenity and Comfort:

1. Sound and Noise:
   a. Provide generator exhaust silencer ratings of the critical (25-35 dB(A)) type.

2. Appearance: Provide emergency lights integrated with interior architectural lighting, which appear to be normal space luminaires.
   a. Exception: Mechanical and electrical rooms may have self-contained emergency lights.

C. Health and Safety:

1. Protection from Breakage: Locate electrical energy generation equipment away from high traffic areas, building occupants, public, and vehicular traffic.

2. Fire Source: Locate electrical energy generation equipment away from storage areas.

3. Accidental Explosion: Ventilate electrical energy generation equipment to prevent the build-up of explosive gases.

4. Electrical Shock: Protect personnel from exposure to live power leads and stray voltage.

5. Intrusion: Protect electrical energy generation equipment from unauthorized access and vandalism.

6. Generators and Fuel Supplies: Located in a separate 2 hour fire rated room..

D. Structural:

1. Seismic Design:
   a. Provide a electrical energy generation elements with flexible joints where differential movement is anticipated.
   b. Provide electrical energy generation equipment supports capable of supporting twice equipment's normal weight.
   c. Mount generator on isolated concrete slab.

E. Durability:

1. Expected Service Life Span: Provide equipment, generators and batteries which will last a minimum of 12 years in service without major repairs or operating expense.

2. Moisture Resistance: Provide electrical energy generation equipment which is resistant to moisture.

3. Corrosion Resistance: Provide electrical energy generation equipment which is resistant to corrosion.

4. Generator Set Start Up: Minimum time-delay to start of 15 minutes, to prevent transfer in case of short-time outage.

F. Operation and Maintenance:

1. Standby Generator:
   a. Electrical Characteristics: 460 volts/3 phase/60 Hz.
   b. Generator Fuel Supply: Natural gas.
   c. Generator Reliability: 100 percent.

d. Generator Efficiency: 25 percent.
e. Power Quality: Compatible voltage, wave shape, and frequency with the primary power source, coordinate power requirements with PSE&G.

2. Spare Capacity:
   a. Generator Systems: 20 percent over total load.

3. Generator Room:
   a. Ventilation: provide exhaust fan with thermostatic control. Provide intake and exhaust louvers with gravity dampers. Connect generator radiator to louver with canvas duct.

PRODUCTS

A. Generator Sets:

1. Engine Type:
   a. Use the following:
      1) Four-stroke, spark ignited.
   b. Do not use:
      1) Two-stroke.

2. Starting and Control Batteries:
   a. Use the following:
      1) Lead-calcium (flooded cell).
      2) Lead-antimony (flooded cell).
   b. Do not use:
      1) Valve-regulated lead-calcium.
      2) Nickel cadmium.

3. Engine Cooling:
   a. Use the following:
      1) Liquid-cooled engine mounted radiator.

B. Automatic Transfer Switches

1. Electrical Characteristics: 480V, 4 pole, with short circuit rating required

2. Systems: Provide separate transfer switch and electrical distribution systems for code required standby, optional stand-by and emergency loads.

3. Utility Coordination: Automatic Transfer switches shall be coordinated with PSE&G.

METHODS OF CONSTRUCTION

A. Use the following:

1. House generator inside the building with proper ventilation and heating, preferably on the ground floor and/or at the location where it is easily serviceable by the elevator.

END OF SECTION D51

SECTION D52

SERVICE AND DISTRIBUTION

PERFORMANCE

A. Basic Function:

1. Distribute electric power for equipment circuits, lighting circuits, receptacle circuits, and electrical utilization devices.
2. Main Electrical Service: The utility will provide a service transformer to convert its distribution voltage to the building's utilization voltage.
3. Switchboard Location: Locate main switchboard in the main electrical room.
4. Panelboard Locations: Locate panelboards in electrical rooms on each floor. Do not locate panelboards in public corridors, hallways or stairwells.
   a. Provide separate panelboards for lighting, receptacles and equipment
5. Where service and distribution elements must also function as elements defined within another elements group, meet requirements of both groups.
6. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section D - Services, and Section D5 - Electrical.

B. Amenity and Comfort:

1. Sound and Noise:
   a. Do not locate transformers near sound sensitive areas. See Section C for interior space sound level requirements.
   b. Provide transformers with noise generation equal or less than the sound levels listed in IEEE Standard 241-1990 (R1997).
2. Appearance:
   a. Location of Service Transformer: Outside the building, pad mounted a minimum of 10 feet from the building.
   b. Do not locate switchboards, transformers, and panelboards in corridors, lobbies, or stairwells.
   c. Conceal electrical conduit in walls and behind ceilings in all finished spaces. See Section D for additional requirements.

C. Health and Safety:

1. Protection from Breakage: Locate service and distribution equipment in closets, electrical rooms, and mechanical rooms with clearances required by NFPA 70.
2. Intrusion: Protect electrical distribution equipment from unauthorized access and vandalism.

D. Structural:

1. Seismic Design: Provide service and distribution elements with the ability to move where differential movement is anticipated in accordance with Codes

E. Durability:

1. Impact Resistance: Provide service and distribution equipment with industrial grade enclosures.

2. Transformer Insulation Class: As follows:
   a. Insulation Class 185 deg C.

F. Operation and Maintenance:

1. Capacity:
   a. Main Switchboards: In accordance with code plus 20 percent spare capacity.
   b. Interior Distribution Transformers: As required to serve building circuits and equipment plus 20 percent spare capacity.
   c. Branch Circuit Panelboards: In accordance with code plus 20 percent spare capacity.
   d. Substantiation:
      1) Construction Documents: Riser diagram and calculations.
      2) Construction: Equipment characteristics.
      3) Closeout: For each panelboard, balance current on each phase conductor within 5 percent.

2. Transformer Applications:
   a. Distribution Transformers For Ordinary Loads: Provide general purpose, dry-type, or energy-saving transformers.
   b. Distribution Transformers For Loads Sensitive to Noise: Shielded isolation transformers.

3. Ease of Maintenance and Repair:
   a. Provide equipment which is segmented into modules to ease replacement of component failures.
   b. Wherever equipment is located in cabinets or enclosures, provide doors or removable panels sized to allow easy removal and replacement.

PRODUCTS

A. Transformers:

1. Use one of the following:
   a. Dry type, NEMA TP-1 / Energy Star Compliant
   b. Cast-coil.

2. Do not use:
   a. Oil type.
   b. Less-flammable liquid type.
   c. Liquid filled.
   d. Gas type.

B. Secondary Service and Distribution Feeders:

1. Conduits:
   a. Provide one of the following:
      1) Below Grade, Single Run or Grouped: RNC.

2) Exterior, Exposed or Concealed: RMC.
3) Exterior Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid or Motor Driven Equipment: LFMC
4) Exterior Boxes and Enclosures: NEMA 250, Type 3R
5) Interior, Exposed: EMT.
6) Interior, Concealed: EMT.
7) Interior Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid or Motor Driven Equipment: FMC, except use LFMC in damp and wet locations.
8) Interior Damp and wet locations: RMC.
9) Interior Boxes and Enclosures: NEMA 250, Type 1, except damp or wet locations Type 4 stainless steel.3R
10) Interior Concrete Slabs 6 inches or greater and below slabs on grade: RNC with separate insulated equipment grounding conductor. Provide RMC or EMT elbows for stub-ups out of the slab.
11) Hazardous Locations: Use rigid steel conduit and threaded fittings of NEMA type listed and labeled for the location and class of the hazard.

b. Minimum Raceway Size: 3/4 inch (DN 21)
c. Fittings: Compatible with raceway and suitable for use and location.

2. Conductors for use in conduits:
   a. Use the following:
      1) Copper.
         a) Service Entrance conductors in Underground Conduit: Type USE, 75 Degrees C.
         b) Feeders in Underground Conduit: Type USE, 75 Degrees C
         c) Interior Feeders in Conduit: Type THHN, 90 Degrees C
         d) Elevator Feeders in Conduit: Type THHN, 90 Degrees C
         e) Fire Pump Feeder: Type MI Cable or USE, 75 Degree C, encased in concrete, minimum 2 inches thick.

C. Main Service Equipment:

1. Types of Equipment:
   a. Use the following:
      1) Switchboards.

2. Main Devices:
   a. Use the following:
      1) Insulated case circuit breakers, individually mounted.
   b. Do not use:
      1) Series-rated equipment

3. Branch Devices:
   a. Use the following:
      1) Molder case circuit breakers, group mounted.
   b. Do not use:
      1) Series-rated equipment.

4. Busbars:

a. Use the following:
   1) Copper.
b. Do not use:
   1) Plated aluminum.

D. Branch Circuit Panelboards:

1. Busbars:
   a. Use the following:
      1) Copper.
   b. Do not use:
      1) Plated aluminum.

2. Circuit Breakers:
   a. Use the following:
      1) Molded case circuit breakers.
   b. Do not use:
      1) Series-rated equipment.

E. Motor Control Centers:

1. Busbars:
   a. Use the following:
      1) Copper.
   b. Do not use:
      1) Plated aluminum.

2. Overcurrent Protectors:
   a. Use one of the following:
      1) Circuit breakers.
      2) Motor circuit protector (MCP).
   b. Do not use:
      1) Series-rated equipment

METHODS OF CONSTRUCTION

A. Use the following practices and procedures:

1. Provide service entrance conductors in raceway entering directly into the service disconnecting means through the wall or floor at the exterior wall of the building or structure.

2. Where service entrance conductors must be run through or under any portion of the building or structure to reach the service disconnecting means, provide raceway covered by or encased in not less than 2-inches of concrete supported from the building or structure in an approved manner.

3. Furnish equipment installed in sprinklered spaces with devices to prevent water from entering and accumulating within the enclosure or shall have NEMA 3R, rainproof enclosures.

4. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed

manufacturer's recommended maximum pulling tensions and sidewall pressure values.

5. Use pulling means, including fish tape, cable, rope, and basket weave wire/cable grips, that will . not damage cables or raceway.
6. Bundle incoming and outgoing feeder conductors together in switchboards and wrap with wire ties 6-inches on center up to within 6-inches of their termination. Provide ties of sufficient strength to withstand device short circuit rating.
7. Size feeder taps for full circuit size up to their overcurrent protection device unless otherwise indicated.
8. Provide insulation piercing connectors or compression splices for taps and splices for feeders larger than #10 AWG
9. Provide crimp connectors with insulated caps for taps and splices for branch circuits and feeders #10 AWG and smaller
10. Torque electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.
11. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

END OF SECTION D52

SECTION D53

BRANCH CIRCUITS

PERFORMANCE

A. Basic Function:

1. Power: Provide adequate electrical power and safe and efficient distribution from panelboards to lighting, wiring devices, equipment, appliances, and the locations where it is needed, based on the project program, other requirements in Volumes A through G, and as follows:

2. Branch circuits comprise the following elements:
   a. Branch circuit breakers.
   b. Conductors and cable from panelboards to fixtures, wiring devices, and mechanical equipment.
   c. Raceways and boxes.
   d. Wiring devices, including, but not limited to, receptacles, floor boxes and plates, wall switches, wall dimmers, remote control switching devices, and wall plates.

3. Where branch circuits are integral with elements defined within another element group, meet requirements of both element groups.

4. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section D - Services, and Section D5 - Electrical Power.

B. Amenity and Comfort:

1. Accessibility: Comply with ADA Accessibility Guidelines and the following:
   a. ICC-ANSI A117.1-2003 and N.J.A.C. 5:23-7.2

C. Health and Safety:

1. Tested Materials:
   a. Provide branch circuit elements in compliance with code and that are UL listed or labeled..
   b. Provide elements that have their flame spread and smoke developed ratings printed on them.

D. Operations and Maintenance:

1. Capacity: Provide branch circuit wiring with sufficient capacity to accommodate future growth and renovation without major rewiring.
   a. Lighting Circuits: Limit design loads to 75 percent of capacity permitted by code.
   b. Receptacle Circuits: Limit design loads to 75 percent of capacity permitted by code.
   c. Appliance Circuits: Limit design loads to 100 percent of capacity permitted by code.

d. Equipment Circuits: Limit design loads to 100 percent of capacity permitted by code.

2. Power Consumption and Efficiency: See requirements in Section D5 - Electrical.

PRODUCTS

A. Conduits:

1. Provide one of the following:
   a. Below Grade, Single Run or Grouped: RNC.
   b. Exterior, Exposed or Concealed: RMC.
   c. Exterior Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid or Motor Driven Equipment: LFMC
   d. Exterior Boxes and Enclosures: NEMA 250, Type 3R
   e. Interior, Exposed: EMT.
   f. Interior, Concealed: EMT.
   g. Interior Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid or Motor Driven Equipment: FMC, except use LFMC in damp and wet locations.
   h. Interior Damp and wet locations: RMC.
   i. Interior Boxes and Enclosures: NEMA 250, Type 1, except damp or wet locations Type 4 stainless steel.3R
   j. Interior Concrete Slabs 6 inches or greater and below slabs on grade: RNC with separate insulated equipment grounding conductor. Provide RMC or EMT elbows for stub-ups out of the slab.
   k. Hazardous Locations: Use rigid steel conduit and threaded fittings of NEMA type listed and labeled for the location and class of the hazard.

2. Minimum Raceway Size: 3/4 inch (DN 21)

3. Fittings: Compatible with raceway and suitable for use and location.

B. Branch Circuit Wiring:

1. Use the following:
   a. Copper.
      1) Branch Circuits in Underground Conduit: Type USE, 75 Degrees C.
      2) Interior Branch Circuits in Conduit: Type THHN, 90 Degrees C
      3) Interior Branch Circuits Homeruns: Type THHN, 90 Degrees C in conduit from panelboard to first outlet box. Homerun, individual and multiple circuit cables are not to be run from panelboards. After first outlet box, approved cable may be used.
      4) Branch Circuits: For wiring #8 AWG and smaller in ceilings spaces and for connections to conduit with boxes to lighting fixtures and equipment: Type MC Metal Clad Cable in accordance with the following:
         a) May be utilized for branch circuit wiring concealed above accessible ceilings
         b) Shall carry not more than nine (9) current carrying conductors, including neutrals.

c) Maintain minimum 6 inches clearance from high temperature piping and 12 inches clearance from open telecommunications cable.
d) Support MC cable every 5 feet and within 1 foot of every box. Rout cables bundled on common hangers, parallel and perpendicular to walls.

2. Do not use the following:
   a. Surface mounted raceway.

C. Receptacle Cover Plates:

1. Use the following:
   a. Material and Finish: Stainless steel, Type 302, brushed.

METHODS OF CONSTRUCTION

A. Use the following practices and procedures:

1. Install direct burial cables on a 2-inch minimum depth fine sand bed covered with a 4-inch minimum layer fine sand covering the conductors. Install in raceway under pavement and planter areas and within three feet of structures. Provide line marker tape.
2. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
3. Install cables concealed in ceiling spaces, in hollow spaces of interior masonry walls in dry locations.
4. Install cables above accessible tile ceilings supported by acoustical tile support clips so the cables do not rest on the ceiling tiles.
5. Securely fastened cables to the building structure at intervals prescribed by NFPA 70 and not pulled through rings or wiring harnesses.
6. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
7. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
8. Lighting Circuits: Installed no more than one 3 phase circuit or three consecutive 1 phase circuits with common neutral in the same conduit.
9. Receptacle Circuits: Install no more than one 3 phase circuit or three consecutive 1 phase circuits with separate neutrals in same conduit.
10. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
11. Bundle incoming and outgoing feeder conductors together in switchboards and wrap with wire ties 6-inches on center up to within 6-inches of their termination. Ties shall be of sufficient strength to withstand short circuit rating.

12. Firestop cables penetrating fire rated walls.
13. Identify and color-code conductors and cables.
14. Provide full circuit size branch circuit taps up to their overcurrent protection device unless otherwise indicated
15. Taps and splice branch circuits larger than #10 AWG with insulation piercing connectors or compression splices.
16. Taps and splice branch circuits and feeders #10 AWG and smaller with crimp connectors-with insulated caps connectors or compression splices.
17. Connections to fixture and motor leads #10 AWG and smaller: Provide with pre-insulated spring pressure connectors.
18. Stranded Wiring Conductors: Use screw terminals with locking fork crimp terminals with nylon insulated grips.
19. Torque electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.
20. Provide splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
21. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack and pigtail connections
22. Provide a separate green insulated equipment ground conductor for each branch circuit or group of branch circuits

B. Do not use:

1. Exposed conduit on exterior surfaces where visible from ground level.
2. Exposed conduit on finished interior vertical surfaces.

END OF SECTION D53

SECTION D6

ARTIFICIAL LIGHTING

PERFORMANCE

A. Basic Function:

1. Provide artificial means of lighting interior and exterior spaces.
2. Artificial lighting comprises the following elements:
   a. Interior Lighting (D61): General room lighting, emergency lighting, and accent lighting.
   b. Exterior Area Lighting (D62): General lighting of exterior spaces including roadways, driveways, walkways, parking areas, and recreation areas.
   c. Athletic Lighting (D63): Lighting for interior and exterior athletic activities.
   d. Other Artificial Lighting Elements (D69).
3. Provide lighting designed in accordance with recommendations of the following: N.J.A.C. 6A:26-6.3 and 6.4.
4. Portable lamps (not permanently attached to the building or other building furnishings) may not be used to accomplish required artificial lighting.
5. Where artificial lighting elements also must function as elements defined within another element group, meet the requirements of both element groups.
6. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance and Section D - Services.

B. Amenity and Comfort:

1. Light Levels: Provide maintained ambient illuminance values for various activities that are within the ranges specified in the IESNA Lighting Handbook-2000 and referenced N.J.A.C. standard.
2. Light Quality: Provide luminous environment in each space that is designed to complement the functions and the character of the space.
   a. Distribution: In keeping with geometry of space and location of visual tasks.
   b. Visual Comfort: Provide lighting systems with the following characteristics:
      1) VCP: Visual Comfort Probability (VCP) of not less than 80.
      2) Luminance Ratio: Maximum luminance of luminaire does not exceed average luminance by ratio of more than 4:1 at 45, 55, 65, 75, and 85 degrees from nadir for crosswise and lengthwise viewing.
      3) Maximum luminances of luminaires crosswise and lengthwise do not exceed the following values:
         a) 45 degrees above nadir: 7500 cd/sq m.
         b) 55 degrees above nadir: 5000 cd/sq m.
         c) 65 degrees above nadir: 3500 cd/sq m.
         d) 75 degrees above nadir: 2200 cd/sq m.
         e) 85 degrees above nadir: 1500 cd/sq m.

c. Color Temperature: Appropriate for functions accommodated in space and characteristics of interior finishes. In general provide interior color temperature of 3500 Degrees K.
d. Character of Fixtures: Coordinated with architecture and other building systems and appropriate to finish level.

C. Health and Safety:

1. Electrical Hazards: Construct in accordance with requirements of all NFPA standards that apply to the occupancy, application, and design.
   a. Comply with NFPA 70 requirements for hazardous locations applications.

2. Emergency Systems: Provide backup lighting for periods of normal power interruption, for the following:
   a. Systems and areas as required by code.

D. Durability:

1. Moisture Resistance: Regardless of whether exposure to moisture is likely or not, provide lighting equipment to be resistant to moisture.

E. Operation and Maintenance:

1. Capacity: Provide lighting to deliver required illumination while operating within intended ratings.

2. Power Consumption and Efficiency:
   a. Comply with requirements for energy efficiency of lighting in ASHRAE 90.1-2004 and all applicable requirements in Section 111.

END OF SECTION D6

SECTION D61

INTERIOR LIGHTING

PERFORMANCE

A. Basic Function:

1. Provide artificial lighting for all interior spaces that is adequate in quality and distribution for the performance of tasks typical for the type of space and the characteristics of the intended population, regardless of the availability of natural light.

2. Interior lighting comprises the following elements:
   a. Luminaires for general illumination.
   b. Accent lighting.
   c. Emergency lighting.
   d. Illuminated exit signs.

3. Where artificial lighting is integral with elements defined within another element group, meet requirements of both element groups.

4. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section D - Services, and Section D6 - Artificial Lighting.

B. Amenity and Comfort:

1. Accessibility: Comply with ADA Accessibility Guidelines. and ICC / ANSI A117.1-2003 and N.J.A.C 5:23--7.2

2. Light Levels: In compliance with Section D6.

3. Light Quality:
   a. Spatial Luminance: Provide luminous environments throughout project in which brightness ratios are maintained within the following ranges:
      1) Task Area and Adjacent Darker Surroundings: 3:1.
      2) Task Area and Adjacent Lighter Surroundings: 1:3.
      3) Task Area and More Remote Darker Surfaces: 5:1.
      4) Task Area and More Remote Lighter Surfaces: 1:5.
   b. Color: Provide light sources throughout project with color temperatures and Color Rendering Indices as follows:.
      1) Linear Fluorescent Lamps: 3500 Degrees K; CRI 80 minimum.
      2) Compact Fluorescent Lamps: 3500 Degrees K; CRI 80 minimum
      3) Metal Halide Lamps: 4000 Degrees K; CRI 65 minimum
      4) High Pressure Sodium Lamps: 1900 Degrees K; CRI 121 minimum
      5) Exception: Accent, display and specialty lighting applications.
   c. Substantiation:
      1) Construction Documents: Calculations for representative spaces, prepared by a registered electrical engineer, and product data for lamps and luminaires.

2) Construction: Measurements of quality of light for representative spaces throughout the project.

C. Health and Safety:

1. Emergency Lighting: Provide emergency lighting that complies with code.

2. Fire-Resistant Construction: Provide lighting elements throughout the project that are made of incombustible materials in compliance with code and that are UL listed or labeled, with flame spread and smoke developed ratings printed on product.

D. Operation and Maintenance:

1. Power Consumption and Efficiency: Comply with requirements of Section D6 - Artificial Lighting and the following:
   a. Lighting Controls: Provide level of control of lighting appropriate to type of space and NJSDA' requirements for energy conservation.
   b. Occupancy Controls: Provide lighting circuits throughout the project that are controlled by devices that do not require action by occupants.
      1) Controls: Occupancy sensors and programmable lighting control panels throughout project.
   c. Light Sources: Provide lamps with average lamp efficacy rating not less than the following:
      1) LED Lamps: 70 lumens/watt.
      2) Compact Fluorescent Lamps: 69 lumens/watt.
      3) Linear Fluorescent Lamps:90 lumens/watt.
      4) Exception: Theatrical, display and specialty lighting lamps.
   d. Ballasts: Provide electronic ballasts with fluorescent lamps.

2. Ease of Maintenance: Provide luminaires that do not collect dirt rapidly and are readily cleanable.
   a. Luminaire Categories: Provide luminaires of IESNA Category I, II, or V, for minimum dirt accumulation and LDD factors.

PRODUCTS

A. Use the following:

1. Direct lighting units:
   a. For recessed, for general use in all interior finished spaces with suspended ceilings not described below
   b. For all exterior general area lighting applications "Dark Sky" compliant.

2. Direct linear fluorescent lighting units for gymnasium and similar low and high bay areas.

3. Semi-direct lighting units at surface or pendant mounted, for storage rooms and similar areas..

4. General diffuse lighting units for accent and decorative purposes only.

5. Direct-indirect linear fluorescent lighting units at , for classrooms and similar instructional spaces, small group instruction rooms, labs, offices, conference rooms, etc.; Direct-indirect - 30% / 70%.
6. Linear fluorescent lamps for general interior lighting.
7. Compact fluorescent lamps, for accent lighting only.
8. Reflector halogen lamps for accent only.
9. LED's for exit signs
10. Bi-axial fluorescent lamps, for 2 by 2 foot lighting units, and special applications.
11. Linear fluorescent lamps for low bay gym lighting units.
12. Metal halide and compact fluorescent lamps, for exterior use.

B. Do not use the following:

1. Indirect lighting units.
2. vapor lamps
3. High Pressure sodium lamps.

METHODS OF CONSTRUCTION

END OF SECTION D61

SECTION D62

EXTERIOR AREA LIGHTING

PERFORMANCE

A. Basic Function:

1. Provide artificial lighting for exterior spaces, as required by the project program, that is adequate in quantity, quality, and distribution for the performance of tasks typical for the type of outdoor space and the characteristics of the intended user population.
2. Exterior area lighting comprises the following elements: Exterior luminaires, poles, standards, or other means of mounting the luminaires, power supply, and controls.
3. Where exterior area lighting is integral with elements defined within another element group, meet requirements of both element groups.
4. Provide IDA Approved as Dark Sky Friendly products for exterior lighting fixtures.
5. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section D - Services, and Section D6 - Artificial Lighting.

B. Amenity and Comfort:

1. Light Levels: Provide maintained average illuminance values for exterior spaces that are based on the primary visual tasks to be accommodated and are not less than the following, when measured at grade:
   a. Parking Lots, Medium Activity: 0.6 fc, maximum uniformity ratio (average to minimum) of 4:1.
   b. Building Entrance Areas: 5 fc, maximum uniformity ratio (average to minimum) of 4:1.
   c. Pedestrian Areas:
      1) Sidewalks: 1.0 fc, maximum uniformity ratio (average to minimum) of 4:1.
      2) Stairways: 1.0 fc, maximum uniformity ratio (average to minimum) of 10:1.
   d. Substantiation:
      1) Construction Documents: Calculations of illuminance levels and uniformity ratios for representative exterior areas, prepared by a registered electrical engineer.
2. Light Quality:
   a. Glare Minimization: Provide exterior area lighting that minimizes the incidence of discomfort glare and avoids disability glare under all normal conditions of use, in accordance with IESNA recommendations.
   b. Color: Provide light sources throughout project with Color Rendering Index of not less than 70.
   c. Substantiation:
      1) Construction: Measurement of actual installation in accordance with procedures referenced in ANSI/IESNA RP-8-2000(R05).
3. Appearance of Lighting Installation:

a. Provide exterior area lighting that is compatible with overall project appearance and coordinated with site layout and building organization.
   1) Luminaire Mounting:
      a) Installation on poles or wall mounting brackets with full cut off optics.:
      b) Maximum height of 25 ft.
      c) Style compatible with building design.
      d) Material and finish compatible with exterior building elements.
   2) Luminaire Design:
      a) Light distribution by direct methods.
      b) Optical control by reflectors or refractors.
      c) Material and finish of housing compatible with mounting.

4. Lighting Cutoff:
   a. Configure exterior area lighting to avoid spill light on adjacent property and streets.

C. Structure:

1. Provide poles for parking lot area lighting that are located to avoid damage by automobiles or mounted to bases that are structurally capable of withstanding moderate impact.

2. Provide mounting system for exterior area lighting that is capable of withstanding 3-second wind gusts in excess of 100 mph.

3. Substantiation:
   a. Construction Documents: Strength calculations for representative installations, prepared by a registered structural engineer.

D. Durability:

1. Expected Service Life Span: Provide a system which will last a minimum of 25 years in service without major repairs.

2. Vandal Resistance:
   a. Parts not easily removed without the use of special tools.
   b. Luminaires mounted at minimum height of 12 ft above grade.
   c. Lenses of tempered glass or high impact acrylic.
   d. Metal gratings for protection of optical assemblies.

3. Substantiation:
   a. Design Development: Identification of actual products to be used.

E. Operation and Maintenance:

1. Minimum Outdoor Operating Temperature: Provide lighting systems that operate at temperatures as low as -10 degrees F.

2. Power Consumption and Efficiency: Comply with requirements of Section D6 - Artificial Lighting.
   a. Lighting Controls: Provide daylight sensing controls and programmable timing.

3. Maintenance Efficiency: Provide luminaires that do not collect dirt rapidly and are readily cleanable.

4. Luminaire Categories: Provide luminaires of IESNA Category I, for minimum dirt accumulation and LDD factors.

5. Ease of Relamping: Provide luminaires designed for easy relamping with special tools.

PRODUCTS

A. Luminaires:

1. Use one of the following types:
   a. Direct lighting units at at all exterior lighting applications.
   b. General diffuse lighting units at accent and decorative lights.

2. Do not use the following:
   a. Semi-direct lighting units.
   b. Semi-indirect lighting units.
   c. Indirect lighting units.

B. Lamps:

1. Use one of the following types:
   a. Compact fluorescent lamps.
   b. Metal halide lamps.

2. Do not use the following:
   a. Incandescent lamps.
   b. Tungsten-halogen lamps.
   c. U-tube fluorescent lamps.
   d. Full size fluorescent lamps.
   e. Mercury lamps.
   f. High pressure sodium lamps.
   g. Low pressure sodium lamps.
   h. Cold cathode lamps.

C. Lighting Standards or Poles:

1. Use the following:
   a. Galvanized powder coated steel.

2. Do not use:
   a. Spun aluminum.
   b. Treated wood.
   c. Precast concrete.
   d. Fiberglass.

END OF SECTION D62

SECTION D63

ATHLETIC LIGHTING

PERFORMANCE

A. Basic Function:

1. Provide artificial lighting for athletic activities, as required by the project program, that is adequate in quantity, quality, and distribution for the intended activities and the characteristics of the intended user population.
2. Athletic lighting comprises the following elements: luminaires, standards and other means of mounting the luminaires, power supply, and lighting controls.
3. Where athletic lighting is integral with elements defined within another element group, meet requirements of both element groups.
4. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section D - Services, and Section D6 - Artificial Lighting.

END OF SECTION D63

SECTION D7

TELECOMMUNICATIONS

PERFORMANCE

A. Basic Function:

1. Provide the following telecommunications services:
   a. Voice and Data (D71): Infrastructure for voice and data transmission.
   b. Sound Reinforcement (D72): Public address and music systems.
   c. Television (D73): Television distribution.
   d. Time/Date Display (Clocks): In lobbies, corridors, open offices, equipment rooms, cafeteria, and dining rooms.

2. Where telecommunications elements also must function as elements defined within another element group, meet the requirements of both element groups.

3. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance and Section D - Services.

4. Coordinate telecommunications system with E-Rate program through the New Jersey Office of Educational and Information Technology and the New Jersey Smart Start Buildings Program.
   a. Design and construct project to maximize its telecommunications connectivity consistent with the E-Rate Program.

B. Amenity and Comfort:

1. Convenience:
   a. Time/Date Displays: Analog or digital as selected by the Newark Public School easily readable from at least 30 ft distance by persons of normal eyesight.

C. Health and Safety:

1. Electrical Hazards: Construct in accordance with requirements of all NFPA standards that apply to the occupancy, application, and design.
   a. Protect against unauthorized access to spaces housing electrical components and allow access only by qualified personnel.
   b. Comply with NFPA 70 requirements for hazardous locations applications.

2. Emergency Systems: Provide emergency power when normal power is interrupted.
   a. Systems and areas as required by code.

D. Durability:

1. Enclosures: As required to protect equipment from environment in which it is installed, complying with NEMA 250-2003 and:
   a. Areas to be Hosed-Down, or Equivalent, Exterior or Interior: Type 4.
   b. Exterior, Exposed to Weather and Wind: Type 3S.
   c. Exterior, Other Locations: Type 3R.
   d. Interior, Subject to Settling Dust, Falling Dirt, or Dripping Liquids: Type 5.
   e. Interior, Subject to Circulating Dust: NEMA Type 12.

f. Interior, Other Locations: Type 1.

E. Operation and Maintenance:

1. Capacity: Provide systems to deliver required performance while operating within their intended ratings.
   a. Substantiation:
      1) Construction: Testing of wiring systems for continuity, prior to functional performance testing; functional performance testing.

2. Power Consumption and Efficiency:
   a. Comply with requirements for energy efficiency of electrical equipment in ASHRAE 90.1-2004.

3. Ease of Use:
   a. Zoning: Provide wiring and protective devices so that outages caused by local faults do not affect unrelated areas or systems.

4. Allowance for Change and Expansion:
   a. Spare Distribution Capacity: 20 percent, minimum.
   b. Future Distribution Capacity: 20 percent, minimum.

END OF SECTION D7

SECTION D71

VOICE AND DATA

PERFORMANCE

A. Basic Function:

1. Voice and data systems equipment and distribution shall be as outlined in Newark Public School's School District Technology Standards for Voice Systems and Telecommunications Infrastructure.

2. Building Telephone System:
   a. Telephone switch shall be compatible Newark Public School's (NPS) standardized telephone equipment with TDM switching.
   b. Selection of system and equipment shall be school district's business administrator and technology coordinator.
   c. Provide survivability of WAN connectivity interruption.
   d. Configure media server and gateway with local survivable processor (LSP).
   e. Provide system by Bogen Communications, GE Security or Rauland-Borg per Newark Public School's District Standards.

3. Voice Mail/Auto Attendant:
   a. Provide a voicemail system compatible with school district's standardized telephone equipment.
   b. Provide mailboxes for all teachers and staff.
   c. Verify requirement for homework hotline with school district at time of design.
   d. All incoming calls shall be answered by an automated attendant.
   e. Menu prompts shall include four-digit extensions and department directory.

4. Administrative Telephones:
   a. Provide digital multi-line speaker phones with visual display for main office and principal.
   b. Provide analog single line phones with message waiting lamps for nurse, guidance offices, private office and conference rooms.

5. Classroom Telephones
   a. Provide analog single line phones with message waiting lamps for general classrooms, small group instruction rooms, gym office, and all other faculty and staff locations.
   b. Locate classroom phones on wall by classroom door.

6. Public Address System Interface:
   a. Provide station or trunk port and connection to main public address system.
   b. Access via code for selected phones.

7. Trunking Requirements:
   a. To be determined by school district's business administrator and technology coordinator.

8. Programming:

a. Restrictions: Provide programming of system as directed by the NPS, restricting access to local, state, domestic and international calls.
b. Authorization Codes:
   1) Allow authorized personnel to make higher class calls from restricted phones.
   2) Code must be entered for each connection made.
   3) Phone reverts back to programmed class of restriction after each use.
c. Power Failure Transfer:
   1) Provide five locations with power failure phones.
      a) Main office administrative phone (one).
      b) Main office counter (courtesy phone)
      c) Principal's office administrative phone.
      d) Principals office side table (courtesy phone)
      e) Second floor location to be determined.
d. Courtesy Telephones:
   1) Provide two locations with courtesy phones.
      a) Main office counter.
      b) Principals office side table.
   2) Program for Class 3 restriction.
   3) Designate as "Courtesy Telephone".
e. Access Denial:
   1) Provide system to deny access to local operator (9-0)
f. Blocking:
   1) Program system to restrict calls to selected area codes (900 and 700) as well as selected interactive exchanges (540, 550, 970, 976, etc.).

9. Implementation:
   a. Consult with school district's business administrator and technology coordinator and prepare floor plans indicating the following:
      1) Location and type of each phone.
      2) Class or restriction.
      3) Name of user.
      4) Call coverage pattern.
      5) Ringing/non-ringing pattern.
      6) User's authorization code assignment.

10. Data Systems - Telecommunications infrastructure:
   a. Classrooms and Instructional Spaces:
      1) 4 data drops for students (computer workstation).
      2) 2 data drops for teacher (computer & printer).
      3) SGI classrooms shall have 2 data drops for teacher (computer & printer) only.
      4) 1 data drop for video monitor.
      5) 1 voice drop for room telephone.
      6) 1 CATV coax drop for video monitor.
      7) In-room cabling from teacher to video monitor (RGB, S-video, BNC, dual RCA).

b. Labs:
   1) 1 data drop for each computer location.
   2) 1 data drop for printer.
   3) AV & electric for ceiling mounted video projector.
c. Faculty, Staff and Administration:
   1) 2 data drops.
   2) 1 voice drop.
   3) Locations include offices, nurse, custodial, conference, lounges, work & prep areas, mechanical and electrical rooms, etc.
d. Cafeteria and Gym:
   1) 1 data drop each wall for video monitor.
   2) 1 CATV coax drop each wall for video monitor.
e. Support Services:
   1) 1 voice drop for direct outside line in the following locations as determined by school district's technology coordinator
      a) Principal.
      b) Nurse.
      c) Head custodian.
      d) Gym office.
      e) Pay phones.
      f) MDF and IDF closets.
      g) Building system controls.
      h) Horizontal cabling:
f. Horizontal cabling:
   1) Run from IDF to outlet.
   2) Use Category 6 plenum rated for data and voice, 1 Gigabits per second.
   3) Use RG6 quad shield for CATV coax.
   4) Terminate data cabling on patch panels at IDF and RJ45 connectors at outlets.
   5) Terminate voice cabling on wall mounted 110 blocks at IDF and RJ45 connectors wall at outlets.
   6) CATV distribution shall support ITV and video conferencing for all rooms.
   7) CATV system shall provide access to all non-premium channels broadcast by cable provider.
   8) No daisy-chaining permitted.
   9) No cable splicing permitted.
g. Backbone data cabling:
   1) Star configuration from IDFs to MDF.
   2) Use 12 strand, 50-micron laser enhanced multimode optical fiber to connect MDF each to IDF
   3) Optical fiber bandwidth capabilities up to 10 Gigabits per second per pair of strands (2000MHzIKm).
   4) Provide two additional Category 6 copper cables from MDF to each IDF within 300 feet.
h. Backbone video cabling:
   1) Use minimum RG11 with quad shield and 750 MHz bandwidth for CATV coax drops.

i. Backbone voice cabling:
   1) Use 50 pair Category 3 from each IDF to MDF.
   2) Use 50 pair Category 3 from MDF to telephone demarc point
j. Grounding/Bonding:
   1) Provide grounding and bonding system for copper backbone cabling from main electric service to MDF, IDFs and telephone demarc per ANSU/TIA/EIA 607.

11. Integrated systems performing all functions are preferred, subject to requirements of code for separated, independent systems.
    a.

12. Provide means of conveying data between computers within the building and between the data transmission network and the NJSDA' Internet service provider as follows.
    a. Comply with ANSI/TIA/EIA-568 and -569, latest editions.

13. Where voice and data elements also must function as elements defined within another element group, meet the requirements of both element groups.

14. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section D - Services, and Section D7 - Telecommunications.

15. Substantiation:
    a. Construction Documents: Details of each type of input and output device; capacities of systems; manufacturer data. Detailed layout of input and output device locations.
    b. Closeout: Complete functional performance testing as specified in Section 00830, under Commissioning.
    c. Test in Accordance with ANSI/TIA/EIA 586A, latest edition.

B. Amenity and Comfort:

1. Accessibility: Comply will requirements of ADA 1994 and ICC/ANSI-A117.1-2003 and N.J.A.C. 5:23-7.2 authorities for facilities for the disabled.

C. Durability:

1. Moisture Resistance and Thermal Compatibility: Materials that will resist degradation and failure of signals under ambient conditions expected.

D. Operation and Maintenance:

1. Power Supplies: As specified in Section D51.
   a. Building power with power line conditioner for all systems.
   b. Dedicated Battery Backup Power: For:
      1) Emergency communications, 90 minutes.

2. Ease of Maintenance: Provide communications networks that are logically arranged and well-marked, using terminal panels that provide:
   a. Connections between each voice station and hub in server room.

b. Point-to-point connections between each data input and output point and hub location in server room.

3. NJSDA Personnel Training: As specified in Section 00830.
   a. Operational: Minimum of 8 hours, for 1 person, for each separate system.
   b. Maintenance: Minimum of 8 hours, for 1 person, for each separate system.

4. Administrative Labeling: Provide labeling of voice and data systems per ANSI/TIA/EIA, latest edition

PRODUCTS

A. Control Systems for All Applications:

1. Use one of the following:
   a. Microprocessor-based hardware.

B. Communication Cabling:

1. Use one of the following:
   a. Copper cable.
   b. Fiberoptic cable.
   c. Backbone Cable: Fiberoptic.
   d. Distribution Cable: Copper.
   e. 110 Blocks.
   f. Wiring troughs.
   g. Equipment racks.

METHODS OF CONSTRUCTION

A. Construct in accordance with ANSI/TIA/EIA 586A using the following methods:

1. Provide continuous wire basket cable tray above suspended corridor ceilings.

2. Provide minimum of one 1 inch EMT from cable tray through corridor and classroom walls to telecom outlet box.

3. Use a minimum of four-inch fireproofed conduit sleeves through walls to MDF and IDFs.

4. Use 4 inch square, minimum 2-1/2 inch deep boxes at telecom outlets.

5. Provide adequate lighting, electrical power, ventilation and cooling for MDF and IDFs.

6. Provide standalone UPSs for MDF and IDF.

7. Provide separate electrical power distribution system for power outlets for all computer equipment (excluding printers).

8. Use TVSS devices at main electric service and computer power panels.

9. Use K-13 rated transformers and 200% neutrals for distribution to computer power panels.

10. Provide racks, hardware and backboards at MDF and IDFs.

11. Provide one 20A, 120V circuit and one quad receptacle per rack.
12. Provide one circuit 20A, 120V and one quad receptacle per backboard.

END OF SECTION D71

SECTION D72

SOUND REINFORCEMENT

PERFORMANCE

A. Basic Function:

1. Provide the following sound reinforcement functions:
   a. based main public address system rack in main office area. Provide sound transmission to all locations in the facility.
   b. Provide separate sound systems to pickup, amplify, filter, equalize and reproduce voice, music and instrument sources in the cafeteria, gymnasium and auditorium
   c. Provide distributive system with ceiling mounted speakers for cafeteria and gymnasium.
   d. Provide combination distributive (with ceiling mounted speakers) and directional (with proscenium mounted speakers) for auditorium.
   e. Speaker Outlets: Required in the following spaces:
      1) Cafeterias.
      2) Auditorium.
      3) All assembly spaces occupied by students and staff.

2. Integrated systems performing all functions are required, subject to requirements of code for separated, independent systems.

3. Where sound reinforcement elements also must function as elements defined within another element group, meet the requirements of both element groups.

4. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section D - Services, and Section D7 - Telecommunications.

5. Substantiation:
   a. Design Development: Details of each type of input and output device; capacities of systems; manufacturer data.
   b. Construction Documents: Detailed layout of input and output device locations.
   c. Closeout: Complete functional performance testing as specified in Section 00830, under Commissioning.

B. Amenity and Comfort:

1. Accessibility: Comply will requirements of ADA 1994 and ICC/ANSI-A117.1-2003 and N.J.A.C. 5:23-7.2 authorities for facilities for the disabled.

C. Durability:

1. Moisture Resistance and Thermal Compatibility: Materials that will resist degradation and failure of signals under ambient conditions expected.

D. Operation and Maintenance:

1. Power Supplies: As specified in Section D51 and as follows:

a. Building power with power line conditioner for all systems.

2. Transmission Capacity:
   a. Sound Communication: 100 megabits per second; RJ45 connectors.
   b. Substantiation:
      1) Closeout: Continuity and performance testing.

3. Ease of Maintenance:
   a. Connections between each sound input/output station and hub in server room.

4. NJSDA Personnel Training: As specified in Section 00830.
   a. Operational: Minimum of 8 hours, for 1 person, for each separate system.
   b. Maintenance: Minimum of 8 hours, for 1 person, for each separate system.

PRODUCTS

A. Control Systems for All Applications:

1. Use one of the following:
   a. Microprocessor-based hardware.

B. Communication Cabling:

1. Use one of the following:
   a. Copper cable.

END OF SECTION D72

SECTION D73

TELEVISION

PERFORMANCE

A. Basic Function:

1. Audio visual system equipment and distribution shall be as outlined in the Newark Public School's District Technology Standards for Audio Visual Systems included in the Design-Build COntract Documents Volume 3 - Appendices.

2. General Classrooms, Music Room, Small Group Instruction Rooms and old instructional spaces not otherwise described herein:
   a. Teacher's computer shall access and display. any content residing on the computer and educational resources from the Internet and Cable TV.
   b. System Element List:
      1) Cable Television Wall Plate with “F” Connector
      2) Teacher Connection Station with computer and AV connections to video Monitor; provide blocking for monitor support.
      3) Connectivity for Internet access
      4) Adequate protected AC power as appropriate for equipment
      5) Printer connectivity

3. Computer/Science Lab:
   a. Teacher's computer shall access and display any content residing on the computer and educational resources from the Internet and Cable TV. An electronic whiteboard shall allow interactive display and control of any content residing on the computer.
   b. System Element List:
      1) Teacher workstation
      2) Cable Television Wall plate with “F” connector
      3) Teacher Connection Station with computer and AV connections for future CMP and video Monitor
      4) Connectivity for Internet access
      5) Adequate protected AC power as appropriate for equipment
      6) Whiteboard Printer connectivity
      7) Printer connectivity

4. Media Center:
   a. Teacher's computer shall access and display any content residing on the computer and educational resources from the Internet and Cable TV through a ceiling mounted projector.
   b. System Element List:
      1) Ceiling Mounted Projector
      2) Local audio System for Program and PA Audio
      3) Two Cable Television Wallplates with “F” connector
      4) Two Teacher Connection Stations with computer and AV connections to video Monitors

5) One Presentation Station with Audio and Video Connections to Video Projector
6) Connectivity for Internet access
7) Adequate protected AC power as appropriate for equipment

5. Gym:
   a. The Gym system shall have local sound reinforcement system with override from the main system.
   b. System Element List:
      1) Local Program Audio/PA Sound System

6. Cafeteria System:
   a. The Cafeteria system shall have local sound reinforcement system with override from the main system as well as the viewing of video sources through the video monitors.
   b. System Element List:
      1) Two Microphone Program Audio/PA System
      2) Two video Monitor Connection Wallplates
      3) Two Microphone Connection Locations
      4) Ceiling Mounted Projector

7. Administrative Systems:
   a. The Principal's Office and Conference, Child Study Team Office and Conference Room will receive the same system as a General Classroom.
   b. System Element List:
      1) Cable Television Wall plate with “F” connector.
      2) Teacher Connection Station with computer and AV connections to future video Monitor
      3) Connectivity for Internet access
      4) Adequate protected AC power as appropriate for equipment
      5) Printer connectivity
   c. The Faculty Lounge, Main Office and Waiting Room:
   d. System Element List:
      1) Cable Television Wall plate with “F” connector

8. Integrated systems performing all functions are required, subject to requirements of code for separated, independent systems.

9. Where television elements also must function as elements defined within another element group, meet the requirements of both element groups.

10. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section D - Services, and Section D7 - Telecommunications.

11. Substantiation:
    a. Design Development: Details of each type of input and output device; capacities of systems; manufacturer data.
    b. Construction Documents: Detailed layout of input and output device locations.

c. Closeout: Complete functional performance testing as specified in Section 00830, under Commissioning.

B. Amenity and Comfort:

1. Accessibility: Comply will requirements of ADA 1994 and ICC/ANSI-A117.1-2003 and N.J.A.C. 5:23-7.2 authorities for facilities for the disabled.

C. Durability:

1. Moisture Resistance and Thermal Compatibility: Materials that will resist degradation and failure of signals under ambient conditions expected.

D. Operation and Maintenance:

1. Power Supplies: As specified in Section D51.
   a. Building power with power line conditioner for all systems.
2. Transmission Capacity:
   a. Video/Audio Cabling: Coaxial 75 ohm, plus 2 dB, 100 percent shielded.
   b. Substantiation:
      1) Closeout: Continuity and performance testing.
3. NJSDA Personnel Training: As specified in Section 00830.
   a. Operational: Minimum of 8 hours, for 1 person, for each separate system.
   b. Maintenance: Minimum of 8 hours, for 1 person, for each separate system.

PRODUCTS

A. Control Systems for All Applications:

1. Use the following:
   a. Microprocessor-based hardware.

B. Communication Cabling:

1. Use one of the following:
   a. Copper cable.
   b. Fiberoptic cable.

END OF SECTION D73

SECTION D9

OTHER SERVICES

PERFORMANCE

A. Basic Function:

1. Other services include:
   a. Surveillance and Security Controls (D92): Elements for intrusion detection, access control, and visual and auditory monitoring.
   b. Special Grounding Systems (D93): Elements for lightning protection, fence grounding, and raised access floor grounding.

B. Where services elements also must function as elements defined within another element group, meet requirements of both element groups.

END OF SECTION D9

SECTION D92

SURVEILLANCE AND SECURITY CONTROLS

PERFORMANCE

A. Basic Function:

1. Provide remote surveillance of specified areas, intrusion detection, and automatic and remote control of access to building areas, as required by the code and as follows.
2. Integrated systems performing all functions are required, subject to requirements of code for separated, independent systems.
3. Provide surveillance and security controls as outlined in the Newark Public School's District Technology Standards for Security Systems and as follows:
   a. Provide system continuously monitored by security personnel at one location (Main Office area) at the facility.
   b. Use internal LAN and external WAN to allow central security personnel as well as administrators to control, monitor, and administer security system components.
   c. Use secure LAN, WAN, MAN, and/or dial up telephone connections for privileged users to allow administrators to control, monitor, and administer security system components.
   d. Provide battery backup, UPS backup, and connection to emergency power.
   e. Digitally record all events (including video events) and make available for call up at designated workstations on the LAN and WAN.
   f. Provide color CCTV system utilizing integral, programmable video motion detection.
   g. Provide functionally integrated and viewable system on a single screen.
   h. Provide system utilizing industry-standard PC components. Several security standards have been incorporated into the design for the school, among them being.
      1) The design requires that only the main entrance, lobby, gymnasium, cafeteria and mechanical room openings be capable of being electrically locked, including any loading dock doors.
      2) Provide a system with:
         a) Total Lockdown for the space achieved from the Main Security Command Center and activated and deactivated by authorized personnel.
         b) Intercom Entry products at main entrance out, for central command center operators to remotely verify and admit personnel to critical areas.
         c) Card readers at all local control of premises protection zones, etc.
         d) Where surveillance and security control elements also must function as elements defined within another element group, meet the requirements of both element groups.

4. Where surveillance and security control elements also must function as elements defined within another element group, meet the requirements of both element groups.

5. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section D - Services, and Section D9 - Other Services.

6. Substantiation:
   a. Construction Documents: Details of each type of input and output device; capacities of systems; manufacturer data. Detailed layout of input and output device locations.
   b. Closeout: Complete functional performance testing as specified in Section 00830, under Commissioning.

B. Amenity and Comfort:

1. Accessibility: Comply will requirements of ADA 1994 and ICC/ANSI-A117.1-2003 and N.J.A.C. 5:23-7.2 authorities for facilities for the disabled.

2. Visual Image Quality:
   a. Television Monitors: Minimum 13 inch diagonal, color.

C. Health and Safety:

1. Fire Safety Functions: In accordance with code and Section D43.

D. Durability:

1. Moisture Resistance and Thermal Compatibility: Materials that will resist degradation and failure of signals under ambient conditions expected.

E. Operation and Maintenance:

1. Power Supplies:
   a. Building power with power line conditioner for all systems.
   b. Dedicated Battery Backup Power: For:
      1) Access/entry controls; fail-secure, 90 minutes.
      2) Intrusion detection, 90 minutes.

2. Transmission Capacity:
   a. Sound Communication Cabling: 100 megabits per second; 4 pair UTP RJ45 connectors.
   b. Data Communication Cabling: 100 megabits per second; 4 pair UTP RJ45 connectors.
   c. Visual Communication Cabling: Coaxial 75 ohm, plus 2 dB, 100 percent shielded.
   d. Substantiation:
      1) Closeout: Continuity and performance testing.

3. Data Storage Capacity:
   a. Keyless Entry Devices: Minimum of 100,000 unique combinations, with minimum of 4 levels of access authorization.

b. Visual Images: Minimum stored on dedicated DVR harddrive.

4. Ease of Operation:
   a. Time/date displays centrally synchronized and adjustable.
   b. Minimum of one centralized monitoring display for all systems is required; locate in the main office area.
   c. Keyless Entry Devices: Reprogrammable from central control location.

5. NJSDA Personnel Training: As specified in Section 00830.
   a. Operational: Minimum of 8 hours, for 1 person, for each separate system.
   b. Maintenance: Minimum of 8 hours, for 1 person, for each separate system.

PRODUCTS

A. Control Systems for All Applications:

1. Use one of the following:
   a. Microprocessor-based hardware.

B. Provide protection in areas in and around the building, including, but not limited to the following:

1. Automated access control at designated interior and exterior doors

2. Emergency Telephone systems install by the telecom contractor in elevators (Hard wire)

3. Security alarm monitoring and reporting of alarm and trouble conditions detected by sensors and / or devices throughout the facility.

4. A CCTV Electronic Article Surveillance System that is compatible with the existing tapping.

C. Provide the Following Systems and Coverages :

1. CCTV at:
   a. Interior corridors and stairwells
   b. Interior exit areas
   c. Computer labs
   d. Gymnasium
   e. Cafeteria
   f. Exterior area including parking garage (with pan, tilt and zoom controlled cameras)
   g. All exterior doors

2. Flush Door Contacts: All exterior doors

3. Card Based Access Control:
   a. All exterior doors
   b. Main Entrance (with remote unlocking)
   c. All mechanical room doors.

4. Local Alarm (Door Prop) Devices:
   a. Interior exit areas

5. Motion Detection:
   a. Administration Areas.
6. Intercom
   a. Main Entrance
7. Power Door Operators
   a. Main Entrance
   b. Selected exterior doors
8. Electronic Article Surveillance:
   a. Media Center (Library)
9. Central Station Monitoring

D. Power all field devices from the MDF and IDF locations. Avoid or limit the requirement for 120 VAC power supplies to peripheral locations

METHODS OF CONSTRUCTION

A. Use the following: GE Security System per Newark Public Schools District Standard.

END OF SECTION D92

SECTION D93

SPECIAL GROUNDING SYSTEMS

PERFORMANCE

A. Basic Function:

1. Provide grounding systems that:
   a. Provide protection from lightning strikes; scope and design of protection as defined in Section 111.
   b. Provide protection from shock due to overhead power transmission lines accidentally contacting metal fences.
   c. Comply with applicable recommendations of IEEE 142-1991 and IEEE 1100-2005.
2. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section D - Services, and Section D9 - Other Services.

B. Amenity and Comfort:

1. Appearance: Concealed grounding conductors and ground terminals wherever possible.

C. Health and Safety:

1. Lightning Protection System Minimum Capacity:
   a. Maximum Ground Resistance: 10 ohms, between any individual down conductor and ground.
   b. Substantiation: As specified in Section 111.
2. Fence Grounding Capacity:
   a. Non-metallic fences are not required to be grounded.
   b. Fences that are electrically continuous with metal posts embedded at least 24 inches into the ground, with or without concrete encasement, will be considered adequately grounded.
   c. Fences that are grounded in accordance with requirements for lightning protection will be considered adequately grounded.

D. Durability:

1. Expected Service Life Span of All Grounding Systems: Life of the building without requiring any more maintenance than annual inspection and minor repairs not more frequently than annually.
   a. Substantiation:
      1) Design Development: Maintenance analysis.
      2) Closeout: Maintenance schedule and instructions.
2. Lightning Protection Elements: Minimum quality demonstrated by listing or labeling by UL.

3. Lightning Protection Strike (Air) Terminals: Sheet metal elements less than 3/16 inch thick are likely to be damaged by direct lightning strikes and may not be used as strike (air) terminals.

PRODUCTS

A. Lightning Protection Conductors:

1. Use one or more of the following:
   a. Stranded copper cable.
   b. Solid copper strip.
   c. Solid aluminum strip.
   d. Structural steel superstructure, electrically-continuous.
   e. Concrete reinforcing steel, electrically-continuous.
   f. Sheet metal roofing or walls, electrically-continuous.

2. Do not use any of the following:
   a. A mixture of materials.
   b. Copper conductors on aluminum surfaces.
   c. Aluminum conductors on copper surfaces or where subject to runoff from copper surfaces.
   d. Metal services piping.
   e. Aluminum for any component in contact with earth.
   f. Stranded aluminum cable.
   g. Solid aluminum strip.

B. Lightning Protection Grounding Terminals:

1. Use one or more of the following:
   a. Solid copper ground rods.
   b. Ground ring electrode in direct contact with earth.
   c. Ground ring electrode encased in footings.
   d. Grounding plates connected to conductor network.

2. Do not use any of the following:
   a. Concrete encased electrodes located in or near footings.

C. Lightning Protection Air Strike (Air) Terminals:

1. Use one or more of the following:
   a. Solid copper.
   b. Hollow tubular copper.
   c. Any metal part of building of 3/16 inch metal thickness or greater.

2. Do not use any of the following:
   a. Any metal part of building of less than 3/16 inch metal thickness.
   b. Hollow tubular aluminum.
   c. Solid aluminum.

D. Metal Fence Grounding:

1. Use one or more of the following:

a. Solid copper ground rods.
b. Stranded copper cable conductors.
c. Solid copper strip conductors.

METHODS OF CONSTRUCTION

A. Use one of the following methods:

1. Provide UL Master Labeled System.

B. Do not use:

1. Expose down conductors attached to building exterior.

END OF SECTION D93

SECTION D94

CATHODIC PROTECTION

PERFORMANCE

A. Basic Function:

1. Cathodic protection shall be provided for the following elements:
   a. Submerged metal pipes, ducts, conduits, tanks, and structural elements.
   b. Buried metal piping carrying petroleum products or other hazardous or toxic materials, where installed without means of visual observation of entire exterior surface of piping.
   c. Buried metal tanks holding petroleum products or other hazardous or toxic materials, where installed without means of visual observation of entire exterior surface of tank.
   d. Other buried metal pipes, ducts, conduits, tanks, and structural elements outside the building.
   e. Other buried metal elements, if post-occupancy tests determine AC or DC electrical currents to be present in the ground.

2. Where cathodic protection elements also must function as elements defined within another element group, meet requirements of both element groups.

3. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section D - Services, and Section D9 - Other Services.

B. Amenity and Comfort:

1. Appearance: Conceal all portions of cathodic protection systems.

C. Durability:

1. Corrosion Prevention by Cathodic Protection: Designed and constructed in accordance with NACE RP0169-1996(R2002) and NACE RP0285-2002; either galvanic anode or impressed current system.
   a. Design of Protected Elements: In addition to requirements specified elsewhere, as specified in NACE RP0169-1996(R2002) and NACE RP0285-2002, including coatings.
   b. Measurement Techniques: As specified in NACE TM0497-2002.
   c. Substantiation:
      1) Design Development: Identification of elements required to be protected using either coatings, wrappings, or cathodic protection; method of protection to be used.
      2) Construction Documents: Details of cathodic protection system.
      3) Commissioning: Tests to verify achievement of cathodic potential or polarization required by design; documentation of operating parameters in accordance with applicable NACE standard.
      4) Occupancy: After one month of full occupancy and activation of all services and again at the end of one year, tests to determine if AC or DC

currents or potentials exist between buried metal elements and the ground; addition, replacement, or enhancement of cathodic protection as necessary to achieve protective effect.

D. Operation and Maintenance:

1. Ease of Maintenance:
   a. Anodes: Located for ease of replacement; locations recorded in project record documents.
   b. Test Stations: Permanent testing stations and test equipment for periodic measuring of cathodic potential, as specified in NACE RP0169-1996(R2002) and NACE RP0285-2002 and at minimum of 2 locations.
   c. Impressed Current Type: Monitoring panel for electrical equipment located in a utility room, with separate readouts for each current source, display of last inspection date, and storage for maintenance records.

END OF SECTION D94

SECTION E

EQUIPMENT AND FURNISHINGS

PERFORMANCE

A. Basic Function:

1. Construct the facility to accommodate the equipment and furnishings required by the NJSDA Approved Space Program and Educational Specification, which are specified in the project program.
2. Equipment and furnishings comprise the following elements:
   a. Equipment (E1): Mechanized, plumbed, and electrical devices, other than equipment that is part of a service system (HVAC, electrical, etc.), and permanently installed fixtures not covered by another Section.
3. All specified equipment and furnishings are to be provided by the Design-Builder.
4. The following equipment and furnishings are to be provided by the NJSDA:
   a. All loose furnishings indicate as Furnishings in the Education Specification included in the Design-Build- Contract Documents Volume 3, Appendices.
   b. Items indicated as Not in Contract (NIC).
5. NJSDA-Furnished Items: Performance requirements that specify characteristics of equipment or furnishings items do not apply; requirements for accommodating items to the project do apply.
6. Where equipment or furnishings elements also must function as elements defined within another element group, meet requirements of both element groups.
7. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance.

B. Amenity and Comfort:

1. Appearance:
   a. Services Connections to Equipment: Concealed behind or under items or their housings.

C. Health and Safety:

1. Accident Prevention:
   a. comply will the requirements of 29 CFR 1910, regulations of Occupational Safety and Health Administration.
   b. Prevent accidental pinching, crushing, and cutting of operator limbs, fingers, and toes in or by moving parts of equipment by using intelligent design or guards or other protection, without reliance on self-protective operation by operator.
      1) Exception: Equipment specifically designed for cutting, such as food preparation equipment, may have exposed cutting edges.

D. Durability:

1. Service Life Span: Same as for building.
   a. Substantiation:
      1) Design Development: Identification of actual products to be used.
2. Weather Resistance: Items located outdoors shall comply with requirements of Section B.
3. Vandal Resistance: Parts not easily removed without the use of tools.

E. Operation and Maintenance:

1. Ease of Maintenance: Not requiring any routine measures to maintain operation or finishes, other than washing with soap and water.
2. Ease of Repair: Serviceable parts and access panels easily removable with common tools.

END OF SECTION E

SECTION E1

EQUIPMENT

PERFORMANCE

A. Basic Function:

1. Provide equipment as specified in Section E.
2. Equipment comprises the following elements:
   a. General Equipment (E11): Equipment that would be found in buildings of any type of occupancy, including loading dock equipment.
   b. Food Service Equipment (E12): Food and beverage storage, preparation, serving, and cleanup equipment, except residential appliances and cabinetry.
   c. Residential Equipment (E15): Equipment used in private residential occupancies and residential portions of other occupancies, including residential kitchen appliances and laundry appliances, but not cabinetry.
3. Where equipment elements also must function as elements defined within another element group, meet requirements of both element groups.
4. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance and Section E.

B. Amenity and Comfort:

1. Convenience:
   a. Electrical Convenience Outlets for Movable Equipment:
      1) Floor-Mounted Equipment: Within 5 feet of cord connection to equipment housing.
      2) Counter-Mounted Equipment: Within 2 feet of cord connection to equipment housing.
      3) Ceiling-Mounted Equipment: Within 2 feet of cord connection to equipment housing.
      4) Equipment Intended to be Operated in More Than One Location: Equivalent convenience outlets in each location.

C. Durability:

1. Service Life Span: Same as for building.
   a. Substantiation:
      1) Construction Documents: Identification of actual products to be used.

END OF SECTION E1

SECTION E11

GENERAL EQUIPMENT

PERFORMANCE

A. Basic Function:

1. Provide general building equipment of the type and in the quantity required by the program and in accordance with the code.

2. General equipment comprises the following elements:
   a. Loading dock equipment, including bumpers, levelers, and lifts.
   b. Anchorage equipment for working on roofs.

3. Loading Docks: Goods movement will be primarily unloading.
   a. See the project program or Drawings for number of loading bays and sizes required.
   b. Types of trucks to be accommodated include tractor-trailers (semis), Step vans, and panel trucks or vans.
   c. Each bay must accommodate the full range of required truck sizes.
   d. Loading and unloading will be accomplished by NJSDA' personnel using hand carts, manual pallet jacks, and powered pallet jacks.
   e. Substantiation:
      1) Construction Documents: Loading dock space layout with methods of conveying goods to and from trucks identified.

4. Roof Worker Safety: Provide fixed equipment required by code for worker safety on roofs and other elevated areas, complying with ANSI Z359.1-2007.
   a. Substantiation:
      1) Documents: Identification of code requirements for worker safety on roofs and methods of compliance.

5. Where general equipment elements also must function as elements defined within another element group, meet requirements of both element groups.

6. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section E, and Section E1.

B. Amenity and Comfort:

1. Comfort:
   a. Loading Docks: Provide weather enclosure whenever a truck is parked in a loading bay.

2. Convenience:
   a. Dock equipment for changing levels permanently installed.

C. Health and Safety:

1. Accident Prevention:
   a. Loading Docks:

1) Construct to allow movement of goods and goods-handling equipment from the interior of trucks to loading dock surface and vice versa without manual lifting or traversing a slope greater than 1:20.
2) Construct to prevent accidental movement of trucks away from docks.
3) Construct to prevent accidents due to changing of levels of lifts or levelers.
4) Dock Levelers: Provide equipment complying with safety requirements of ANSI MH30.1-1993.
5) Dock Lifts: Provide equipment complying with safety requirements of ANSI MH29.1-2003.

D. Durability:

1. Service Life Span: Same as for building.
   a. Substantiation:
      1) Construction Documents: Identification of actual products to be used.

2. Impact Resistance:
   a. Loading Docks: Construct to prevent accidental damage to building elements caused by trucks backing up to loading dock.

E. Operation and Maintenance:

1. Capacity:
   a. Loading Dock Levelers and Lifts: As required for loading conditions, with minimum 20 percent extra capacity based on manufacturer's rating.
   b. Loading Dock Levelers: 25,000 pounds.

2. Ease of Operation:
   a. Dock Lifts and Levelers: Easily adjusted without the use of tools.

3. Ease of Maintenance: Not requiring any routine measures to maintain operation or finishes, other than washing with soap and water.

END OF SECTION E11

SECTION E12

FOOD SERVICE EQUIPMENT

PERFORMANCE

A. Basic Function:

1. Provide food service equipment of the type and in the quantity required by the project program in accordance with the code and the following: Provide kitchen for Pre-K to 8 school of the size indicated in the Educational Specifications.

2. Food service equipment shall be provided for the cafeteria.

3. Food service equipment comprises the following elements:
   a. Refrigeration equipment and walk-in cold rooms and freezers.
   b. Food and beverage storage equipment and fixtures, including fixed shelving, movable shelving, and carts.
   c. Food preparation equipment and fixtures, including built-in and freestanding appliances, work surfaces, and sinks.
   d. Food and beverage serving equipment and fixtures, including serving tables, serving counters, tray lines, warming equipment, and self-service dispensers.
   e. Cleaning equipment, including sinks, dishwashers, can washers, cart washers, garbage disposers, and trash compactors.
   f. Serving ware and utensil storage and handling equipment and fixtures, including dispensers, shelving, cabinets, sorters, racks, trays, and carts.
   g. Exhaust hoods and fans, including fire suppression requirements as specified in Section D41.

4. Provide equipment that prevents the entry of food, vermin, dust, and dirt into crevices and concealed spaces; will not impart toxic substances, odors, colors, or tastes to food; is easy to clean, safe to use, and easy to service.
   a. Construct interfaces between equipment and surrounds to comply with this requirement.
   b. Construct services within food service spaces to comply with this requirement.
   c. Provide equipment and fixtures that comply with ANSI/NSF 2-2005a or an equivalent level of performance.
   d. Substantiation:
      1) Design Development: Identification and quantities of equipment to be provided.
      2) Construction Documents: Fixed equipment and fixtures listed and labeled by NSF International.
      3) Construction Documents: Appliances and powered equipment certified by NSF International for compliance with published NSF standards and listed by UL for safety.
      4) Construction Documents: Surface material specifications, interface details, and installation requirements.

5. Definitions:

a. Food Zone: All surfaces that come into contact with food during normal operations, and those surfaces which might otherwise be classified as splash zone but from which food may drain, drip, or splash back onto normal food zone surfaces.
b. Splash Zone: Surfaces that are not normally in contact with food, by which are subject to routine splashing, spilling, or soiling by food during normal use.
c. Nonfood Zone: All exposed surfaces other than food zone and splash zone surfaces.

6. Where food service elements also must function as elements defined within another element group, meet the requirements of both element groups.
   a. Services elements within food service spaces shall also comply with applicable requirements of Volume D.

7. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section E - Equipment and Furnishings, and Section E1 - Equipment.

B. Amenity and Comfort:

1. Noise Reduction: Construct to minimize noise produced by equipment and reduce reverberation in spaces.

2. Convenience: Install equipment so that food preparation, storage, service, and cleaning operations function smoothly, without unnecessary effort, and for optimum food hygiene.

3. Apparent Cleanliness: Provide visible materials of uniform color, preferably light in color, for maximum visibility of food debris and dirt.

C. Health and Safety:

1. Safety of Fire Sources: Provide equipment that is certified by an independent testing agency recognized by the local authority for safety.

2. Flammability: Do not use any flammable materials in the construction of food service equipment.

3. Food Safety: Maintain temperature inside chilled food storage units within ranges required to prevent spoilage as follows:
   a. Refrigerators and Refrigerated Display Units: Constant interior temperature of 45 degrees F, plus/minus 5 degrees F maximum.
   b. Freezers: Constant interior temperature of 25 degrees F, plus/minus 5 degrees F maximum.

4. Accident Prevention:
   a. Construct to minimize misuse by food service personnel and prevent accidental misuse by other persons.

D. Structure:

1. Items Large Enough to Support a Person: Strong enough to withstand such abnormal usage without failure.

2. Free-Standing Items: Anchored or sufficiently well-balanced to prevent overturning when fully loaded.

E. Durability:

1. Service Life Span:
   a. Appliances and Operating Equipment: Minimum of 15 years.
   b. Fixtures and Non-Operating Components: Minimum of 50 years.

2. Surface Durability: Provide only materials that will withstand normal wear-and-tear, including impact from mobile equipment, without significant deterioration over the specified life span.
   a. Food Zone: Additional material limitations as specified below under Products.
   b. Splash Zone: Additional material limitations as specified below under Products.
   c. Exposed Surfaces in Nonfood Zone: Also comply with requirements for finishes specified in Section C16 for SR3 Food Facilities.

3. Moisture Resistance: Do not use any hygroscopic material.

4. Corrosion Resistance: Do not use any exposed material that will corrode in the presence of moisture, unless finished with abrasion-resistant permanent coating that prevents passage of moisture vapor.

5. Rot and Fungus Resistance: Do not use any material, exposed or concealed, that will rot or grow fungus unless completely sealed with abuse resistant, moisture-resistant material.

6. Grease Resistance: Do not use any material that attracts grease or air-borne dirt.

7. Cleanability: All surfaces within food service areas shall be smooth and easily cleanable.

F. Operation and Maintenance:

1. Heating Modes: Acceptable means of generating heat for cooking are natural gas.

2. Hot Water Supply: If domestic hot water supply is inadequate for food service purposes, provide supplementary water heating.

3. By-Products: Minimize adverse effects of waste heat, moisture, and humidity, produced by equipment, by using efficient equipment, thermal insulation, air movement, and/or exhaust air as required.
   a. During normal operation of equipment, maintain interior space temperature and humidity within ranges specified.
   b. Prevent formation of frost and condensation on the warm side of refrigerated rooms and cases.
   c. Prevent scorching of adjacent surfaces by heat-producing appliances.
   d. Prevent water running or dripping on adjacent surfaces.
   e. Prevent formation of fungus, mold, or mildew on surfaces inside spaces housing equipment.

4. Ease of Use: All removable drawers, bins, trays, etc., interchangeable and sized for dishwasher cleaning.

5. Ease of Cleaning Adjacent Surfaces: Where equipment is not permanently sealed to adjacent surface with waterproof joint sealant, provide at least 1 inch separation between equipment and adjacent surface or install equipment item so it is easily movable for access to adjacent surfaces.

6. Ease of Service, Repair, and Maintenance: As specified in Section E and all powered equipment easily removable for repair or replacement.

PRODUCTS

A. Provide food service equipment listed in the Education Specifications for the Proposed New Elliott Street School prepared by Morris Boyd Associates and included in the Design-Build Contract Documents Volume 3 - Appendices and as follows.

B. Surfacing Materials Used in the Food Zone:

1. Provide one of the following:
   a. Flat, smooth or slightly embossed, stainless steel.

2. Do not use:

C. Surface Materials Used in the Splash Zone:

1. Provide the following:
   a. Any material acceptable in the food zone.

D. Refrigeration:

1. Provide one of the following:
   a. Site-built walk-in rooms.
   b. Refrigerated bulk serving equipment.

2. Do not use:
   a. Residential refrigerators.
   b. Under-counter refrigerators.

E. Freezers:

1. Provide one of the following:
   a. Site-built walk-in rooms.

2. Do not use:
   a. Commercial freezers.
   b. Residential freezers.

F. Cooking Equipment:

1. Provide one of the following:
   a. Gas ranges.
   b. Electric convection ovens.
   c. Kettles.
   d. Steamers.
   e. Table-mounted appliances.

G. Exhaust Hoods:

1. Provide one of the following:
   a. Stainless steel hoods.
   b. Stainless steel ducts.

H. Sinks:

1. Provide the following:
   a. Stainless steel.

I. Sink Counters and Work Tables:

1. Provide the following:
   a. Stainless steel.

J. Serving Equipment:

1. Provide one of the following:
   a. Hot tables.
   b. Cold tables.

K. Cleaning Equipment:

1. Provide one of the following:
   a. Conveyor type dishwashing machines.
2. Do not use:
   a. Residential type dishwashing machines.

L. Food Storage Shelving:

1. Provide the following:
   a. Stainless steel wire.
2. Do not use:
   a. Hot-dip galvanized steel wire.
   b. Vinyl-covered steel wire.

END OF SECTION E12

SECTION E15

RESIDENTIAL EQUIPMENT

PERFORMANCE

A. Basic Function:

1. Provide residential equipment as required by the project program (for staff break rooms and similar locations), that is adequate in size and capacity for the performance of functions typical for the type of residential application and the characteristics of the intended user population.

2. Residential equipment comprises the following elements:
   a. Built-in devices and appliances, including cooktops, dishwashers, and refrigerators.

3. Food Refrigeration/Freezing at loactins indicated int he Educational Specifications included int eh Appendix : Provide chilled/frozen food storage as required by program and with characteristics indicatd.

4. Dishwashing at locations indicated in Educational Specifications included in the Appendix: Provide automatic cleaning capacity for cooking and eating utensils as required by program, and as follows:
   a. Capacity: Minimum 4.0 cubic ft.
   b. Features: Provide full-extension upper and lower racks, removable flatware basket, soft food disposer, electronic controls, minimum of three wash cycles, and stainless steel lining.

5. Where residential equipment is integral with elements defined within another element group, comply with requirements of both element groups.

6. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section E - Equipment and Furnishings, and Section E1 - Equipment.

B. Amenity and Comfort:

1. Accessibility:
   a. Comply with ADAAG-1994.
   b. Provide residential equipment with accessible controls for all locations.
   c. Where items of residential equipment with accessible controls are required, provide equipment with controls that are mounted so they can be reached from a wheelchair and are not more than 54 inches and not less than 15 inches from the floor.
   d. Operating Force: Where residential equipment with accessible controls is required, provide controls that can be operated without tight grasping or pinching and by a force of not more than 5 lbf.

2. Appearance: Provide residential equipment that is compatible with overall project appearance and coordinated with adjacent interior construction and interior fixtures.

a. Finishes: Exposed surfaces of porcelain enamel on steel, stainless steel, black glass, or panels matching cabinetry.

C. Health and Safety:

1. Electrical Shock: Provide residential equipment that is safe from electrical shock hazard.

2. Substantiation:
   a. Construction: Assemblies that have been tested and labeled by Underwriters Laboratories, Warnock Hersey, or American Gas Association as acceptable for the intended use.

D. Durability:

1. Service Life Span: 15 years, under normal usage.

2. Substantiation:
   a. Construction Documents: Identification of proven-in-use equipment of the same type, for inspection by NJSDA.

E. Operation and Maintenance:

1. Power Consumption and Efficiency: Provide refrigerators, clothes washers, and dishwashers that are not less than 20 percent more energy efficient than minimum energy efficiency standards set by the Department of Energy.

END OF SECTION E15

SECTION G

SITEWORK

PERFORMANCE

A. Basic Function:

1. Provide all modifications to the site and site improvements and utilities required for proper functioning of the project and as indicated in the project program.
2. Sitework comprises the following elements:
   a. Site Preparation (G1): All modifications to the site and grades required for construction of new work and for proper functioning of the project.
   b. Site Improvements (G2): All elements required to provide finished and durable site surfaces, indoor plantings, and outdoor improvements described in the project program.
   c. Site Services (G3): All outdoor and underground elements required to complete the design of services defined in Volume D - Services.
3. Athletic Facilities: Provide playing surfaces, enclosures, goals, fixtures, and equipment for sports as described in the project program and in accordance with requirements of Section 111 - Facility Performance.
4. Where site elements also must function as elements defined within another element group, meet the requirements of both element groups.
5. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance.

B. Amenity and Comfort:

1. Heat/Cold: Design and construct to minimize heat gain in summer and maximize heat gain in winter.
2. Wind: Design and construct to shield entrances from wind in all seasons.
3. Privacy:
   a. Provide complete visual screens around the following, preventing visual observation of occupants from other areas of the site:
      1) Private outdoor sitting areas.
4. Cleanliness: Provide abovegrade elements, fixtures, and equipment that:
   a. Prevent attraction and adherence of dust and air-borne dirt and soot, and minimize appearance of settled dust and dirt.
   b. Are washed reasonably clean by normal precipitation.
5. Comfort:
   a. Provide outdoor seating as described in the project program and as follows:
      1) See Section C25 for performance requirements.
      2) Quantity:
6. Appearance:

a. Fit the new activities on site to the topography, soils, and existing vegetation as much as possible.
b. Finished Surfaces:
   1) Make finished surfaces smooth and uniform in appearance, without depressions that collect water.
   2) Do not leave soil surfaces exposed in finished work; minimize the amount of time soil surfaces are left exposed.
   3) If, after consideration of other performance requirements, options remain as to methods of finishing soil surfaces, the NJSDA prefers:
      a) Landscaping, rather than paving.
      b) Perennial shrubbery and ground covers, rather than lawns.
      c) Water-pervious paving, such as unit pavers on pervious bed, rather than monolithic pavement.
c. Conceal unsightly site elements from view from the street.
d. Conceal the following from view from the remainder of the site:
   1) Trash collection and storage areas.
   2) Utility yards.
e. Substantiation:
   1) Design Development: Site plans showing methods of achieving appearance requirements; renderings or sketches showing principal views described in requirements.

C. Health and Safety:

1. Safety:
   a. Prevent:
      1) The passage of people from the site onto the public right-of-way.
      2) The accidental crossing of vehicles between driving lanes moving in opposite directions, except for roadways on which the intended speed limit is less than 40 mph.
      3) Access by unauthorized persons to outdoor areas containing electrical equipment that has exposed powered components.
   b. Substantiation:
      1) Construction Documents: Identification of barrier location and type.

2. Maximum Slopes:
   a. Slopes with Smooth Pavement: 1:10, unless restricted to vehicular use.
   b. Slopes Covered with Grass: 1:5, unless less than 3 feet in height.
   c. Slopes with Pedestrian-Inhibiting Vegetation: 1:1, unless less than 5 feet in height.
   d. Slopes With No Access From Top: Limited only by structural stability and resistance to erosion.

3. Physical Security:
   a. Provide fixed mountings for securing of bicycles against theft.
      1) Bicycle owner to provide lock and chain.
      2) Allow for securing of 20 bicycles at each entrance.
   b. Substantiation:

1) Construction Documents: Identification of physical security measures and locations.

4. Vehicular Safety: Comply with the code.
   a. Provide visual barriers at extreme changes in elevation near roadways.
   b. Provide tactile warnings where pedestrian walkways cross or run adjacent to roadways.

D. Structure:

1. Earthwork: Provide structural design in accordance with ASCE 7-2005 if not otherwise required by code.
   a. Bearing Capacity: Under substructure, paving, and site structural elements, maintain natural bearing capacity or achieve or correct compaction as required to prevent uncontrolled subsidence or other movement.
   b. Substantiation:
      1) Design Development: Engineering design of any structural fills required.

2. Site Fixtures, Equipment, and Services:
   a. Provide foundations or other mountings as required to support the completed and operational element permanently and safely and without uncontrolled subsidence or other movement.
   b. Construct structural elements in accordance with code and requirements specified in Section B.
   c. Miscellaneous Site Structures with Floors or Roofs: Designed to comply with same requirements as building superstructure.

E. Durability:

1. Weather Resistance of Built Elements: comply with requirements of Section B.

2. Weather Resistance of Plants and Turf: Provide plants that will withstand extremes of weather likely to occur in any 5 years without supplementary irrigation and without seasonal protection other than mulch.
   a. NJSDA agrees that maintenance to the level specified by the Design-Builder will be necessary to assure survival of the plants.
   b. Exception: Supplementary irrigation is expected during new plant establishment period.
   c. Exception: Turf is required for sports fields, play fields, and lawns; supplementary irrigation as necessary to maintain health, growth, and appearance is required.
   d. Substantiation:
      1) Construction Documents: Proven-in-use documentation of all plants used; proven-in-use data may be from actual nearby growing locations or from non-local nursery supplier having plants grown under same climatic conditions.
      2) Closeout: Maintenance requirements of all plants used, for new plant establishment period and subsequent maintenance; length of establishment period for each type of plant.

3) Occupancy: Report of inspection of plants at end of spring, summer, fall, and winter, beginning with season immediately following planting.

3. Soil Erosion Resistance: Comply with the code and the following:
   a. Maintain the existing site features that contribute to erosion resistance to the greatest extent possible.
   b. The present natural resistance to erosion is insufficient; take measures to improve the resistance to erosion.
   c. Construct to minimize soil erosion.
   d. If erosion occurs during construction and within one year after completion, relocation or replacement of eroded soil and repair of eroded areas shall be performed by the Design-Builder at no cost to the NJSDA.
   e. If erosion occurs within one year after completion, provide improved erosion control measures within one week after notification by NJSDA.

4. Traffic Resistance: Provide finished site surfaces that are permanently resistant to the type of traffic to be expected, under all weather conditions.
   a. Where vegetated surfaces will not withstand the anticipated traffic, provide pavement or other surfacing.
   b. If vegetated surfaces are damaged due to traffic within two years after completion, replacement of vegetation with more durable materials shall be performed by the Design-Builder at no cost to the NJSDA.
   c. Vegetation and fencing will be used to discourage pedestrian traffic, if other functional requirements can be met.
   d. Substantiation, Paving and Hard Surfacing:
      1) Design Development: Proven-in-use documentation of paving and surfacing consistent with types of traffic anticipated; manufacturer's data may be submitted for modular paving units.

5. Flooding:
   a. Control storm water runoff as required to prevent damage to project elements, including vegetation, and to prevent damage to neighboring sites, including vegetation.
   b. Prevent storm water runoff into public utilities in excess of actual capacity or amount allowed by public agencies, whichever is less, under conditions of the most extreme rainfall that might occur in 50 years.
   c. Minimize increase in storm water runoff into rivers, streams, lakes, and other waterways and drainageways as required by authorities having jurisdiction.
   d. Substantiation:
      1) Design Development: Engineering design of site drainage, including drainage volume calculations.

6. Vehicular Collision: Construct to minimize the probability of vehicular impact on site fixtures and accidental driving on lawns and landscaped areas.

F. Operation and Maintenance:

1. Utilities: See Section D and other applicable chapters in Volume D for design parameters.

2. Water Conservation: Minimize water use; see Section G23 for method of determining acceptable level of water use.
   a. Substantiation:
      1) Design Development: Irrigation system design for required plant materials; estimated water use, by season and by year; explanation of conservation measures.
      2) Construction Documents: Calculated water use based on final design and irrigation schedule.

3. Ease of Maintenance:
   a. Snow Removal: Design and construct to facilitate removal of snow from vehicular and pedestrian trafficways using mechanized equipment or automatic means wherever possible; where not possible, design and construct to minimize the effort required to use manual snow removal methods.

4. Substantiation:
   a. Design Development: Identification of vehicular and pedestrian traffic surfaces and anticipated methods of snow removal.

5. Theft Deterrence:
   a. Provide fixtures that are either anchored securely to the ground using fastenings not easily removable or that are too heavy for one person to carry, and that are made of materials with no intrinsic or salvage value.

END OF SECTION G

SECTION G1

SITE PREPARATION

PERFORMANCE

A. Basic Function:

1. Provide all modifications to the site required for proper functioning of the project and as indicated in the program.
2. Site preparation is comprised of the following elements:
   a. Clearing (G11): Removal of trash, existing built elements, and vegetation that is not needed, and temporary erosion control.
   b. Earthwork (G12): Changing of grade levels, removal of soil and rock, modifying existing soils in preparation for construction, and temporary and permanent erosion and sediment control structures made of soil or rock.
   c. Hazardous Waste Remediation: Removal, treatment, or other remediation of hazardous wastes found on site.
3. Where site preparation elements also must function as elements defined within another element group, meet the requirements of both element groups.
4. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance and Section G - Sitework.

B. Durability:

1. Soil Erosion Resistance: As specified in Section G and as follows:
   a. During construction, take whatever measures are required to minimize the amount of eroded soil that is transported off the site or into waterways under the most extreme short term and 24-hour rainfall events that might occur in 25 years.
   b. In the design and constructed elements, take whatever measures are required to minimize soil erosion under the most extreme short term and 24-hour rainfall events that might occur in 25 years, and to prevent eroded soil from being transported off the site or into waterways.
   c. Provide erosion control measures designed in accordance with "Best Management Practices (BMPs)" and design procedures prescribed by law.
      1) State of New Jersey Erosion and Sediment Control Manual.
   d. Limit continuous slopes to maximum of 30 feet measured vertically, unless intermediate terraces with drainage swales are provided.
   e. Replace temporary measures with permanent measures unless made unnecessary by constructed site elements, final topography, or permanent vegetation.
   f. Substantiation:
      1) Design Development: Site plan showing grading and new improvements, probable causes of erosion during construction, proposed methods of prevention and remediation, and maintenance requirements for permanent erosion control measures;

2) Design Development: Where extensive areas of soil will be disturbed, storm water flow and volume calculations, with soil loss predictions.
3) Construction Documents: Complete erosion and sediment control plan, including scheduling of temporary and permanent measures and construction.
4) Construction: Daily inspection and repair of erosion control measures; cleanout of sediment control structures weekly.
5) Closeout: Removal of temporary measures, cleanout of permanent measures, and repair of damage; submittal of written maintenance procedures.
6) Occupancy: Monthly inspection of site and repair of damage.

C. Operation and Maintenance:

1. Ease of Maintenance:
   a. Construct earthwork elements so that they are permanent, not requiring periodic maintenance to maintain stability or appearance.

END OF SECTION G1

SECTION G11

CLEARING

PERFORMANCE

A. Basic Function:

1. Prepare site for execution of earthwork by removing trash, debris, loose rocks, all vegetative matter not required for final design, and all unwanted built elements, and by protecting soils from erosion.
2. Where site clearing elements also must function as elements defined within another element group, meet the requirements of both element groups.
3. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section G - Sitework, and Section G1 - Site Preparation.

B. Durability:

1. Erosion Resistance: As specified in Section G and as follows:
   a. Timing of Clearing: To leave soils exposed for as short time as possible; removal of sod last.
   b. Construct sediment barriers and traps wherever run-off will leave the property and wherever significant erosion will occur on the property.
   c. Construct temporary vehicular structures wherever construction equipment will have to cross flowing watercourses, to protect stream banks and beds.
   d. Construct temporary construction exit wherever construction equipment will have to enter the site from public roads, to prevent transportation of soil onto roads.

METHODS OF CONSTRUCTION

A. Temporary Sediment Barriers and Traps:

1. Provide one or more of the following methods:
   a. Storm drain drop inlet sediment traps.
   b. Retrofit construction at storm water outlet structures.
   c. Sediment basins.
   d. Silt fences, of geotextile fabric on wood posts.
   e. Straw or hay bales, anchored to ground.
2. Do not use:
   a. Sandbag barriers.
   b. Brush, logs, or poles.

END OF SECTION G11

SECTION G12

EARTHWORK

PERFORMANCE

A. Basic Function:

1. Modify site grades and soils as required for construction of buildings and utilities, for proper functioning of the project, and as indicated in the project program.
2. Principal finished site earthwork elements required include:
   a. Roadways.
   b. Parking lots.
   c. Playing fields.
   d. Retaining walls.
   e. Permanent erosion control structures as required.
3. Where earthwork elements also must function as elements defined within another element group, meet the requirements of both element groups.
4. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section G - Sitework, and Section G1 - Site Preparation.

B. Structure:

1. Retaining Walls: Construct retaining walls to permanently resist soil and water pressure as well as live loads.
   a. Substantiation:
      1) Design Development: Engineering design and estimate of longevity.

C. Durability:

1. Erosion Resistance: As specified in Sections G and G1 and as follows:
   a. Permanent erosion control structures are required wherever permanent vegetation will not prevent erosion or sediment loss.
   b. Whenever grades are changed, vegetative stabilization is required immediately, to be maintained until final grades are stabilized with permanent vegetation.

D. Operation and Maintenance:

1. Ease of Maintenance:
   a. Do not use invasive or competitive plants for temporary cover crops.

PRODUCTS

A. Retaining Walls:

1. Provide one of the following:
   a. Cast-in-place concrete.
   b. Solid modular concrete units.
2. Do not use:
   a. Stone.

b. Granite.
c. Limestone.
d. Sandstone.
e. Hollow modular concrete units.
f. Sheetpiling.
g. Wood cribbing.
h. Railroad ties.
i. Gabions.

METHODS OF CONSTRUCTION

A. Changing of Grade Levels:

1. Use one or more of the following methods:
   a. Grading.
   b. Balanced cut and fill, with no excess soil to be removed.
   c. Removal of excess soil from site.
   d. Removal of rock from site.
   e. Importation of fill from off site.

B. Excavation:

1. Use one or more of the following methods:
   a. Machine excavation.
   b. Hand excavation.

2. Do not use any of the following methods:
   a. Caissons.
   b. Dredging.
   c. Tunneling or boring.

C. Excavation Support and Protection:

1. Use one or more of the following methods:
   a. Sheetpiling.
   b. Cribbing and walers.
   c. Reinforced earth.
   d. Soil stabilization.

2. Do not use any of the following methods:
   a. Cofferdams.
   b. Slurry walls.
   c. Vibroflotation or densification.

D. Soil Stabilization:

1. Use one or more of the following methods:
   a. Geotextile reinforcement.
   b. Cement soil stabilization.
   c. Lime soil stabilization.

2. Do not use any of the following methods:
   a. Asphalt soil stabilization.

b. Pressure grouting stabilization.

E. Permanent Erosion Control Structures:

1. Provide one of the following:
   a. Retaining walls.
   b. Slope stabilization, using:
      1) Geogrids.
      2) Grass pavers.
      3) Riprap.
      4) Concrete.

2. Do not use any of the following methods:
   a. Channel stabilization of waterways, using riprap or concrete.
   b. Permanent downdrain structures.
   c. Permanent sediment basins.
   d. Storm drain outlet protection using riprap.
   e. Vegetated storm water conveyance channels.
   f. Diversion channels across slopes.
   g. Gabions.
   h. Rock filter dams.
   i. Sand fences.

F. Temporary Vegetative Erosion Control Measures:

1. Provide one of the following:
   a. Mulching of disturbed areas for stabilization, using:
      1) Straw or hay.
      2) Wood waste, chips, or bark.
      3) Erosion control matting or netting.
   b. Temporary cover crops on disturbed areas for stabilization.
   c. Coastal dune stabilization with vegetation and irrigation.

G. Permanent Vegetative Erosion Control Measures: See Section G23.

END OF SECTION G12

SECTION G2

SITE IMPROVEMENTS

PERFORMANCE

A. Basic Function:

1. Provide all elements required for finished and durable site surfaces, and outdoor improvements described in the project program.

2. Site improvements comprise the following elements:
   a. Pavements and Surfacing (G21): Finished surfaces for vehicular, pedestrian, and sports and recreational traffic, other than turf.
   b. Site Fixtures and Equipment (G22): Fixtures, equipment, and miscellaneous structures located out-of-doors, except those located on the roof or mounted on walls of buildings.
   c. Landscaping (G23): Outdoor plants and elements supporting plants.

3. Where site improvements elements also must function as elements defined within another element group, meet the requirements of both element groups.

4. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance and Section G - Sitework.

B. Appearance:

1. Plants:
   a. Outdoor: Provide an attractively landscaped site that looks tidy during non-growing seasons.
   b. Substantiation:
      1) Design Development: Identification of types of plants to be used, with any seasonal variations in appearance.

2. Pavements and Surfacing: Provide rigid surfaces that are smooth, consistent in color and finish, sloped and drained to avoid ponding, and neatly finished at edges.
   a. Vehicular Areas: Marked neatly to denote traffic lanes and parking spaces.
   b. Pedestrian Areas: Designed to contrast visually with vehicular areas.
   c. Athletic Areas: Color and texture in keeping with governing sports authority, with permanent game markings.

C. Durability:

1. Weather Resistance of Plants: Provide a concealed irrigation system for all plantings that are not required to survive normal weather extremes without supplementary irrigation.

2. Pavements and Surfacing: Provide systems that are designed and engineered to withstand the types and intensity of traffic anticipated for the facility size and type.

PRODUCTS

A. Pavements and Surfacing:

1. Provide one of the following:
   a. Rigid paving throughout project.
   b. Flexible paving throughout project.
   c. Modular pavers throughout project.
   d. Turf reinforcing system throughout project.
   e. Resilient sports surfacing throughout project.
   f. Granular surfacing throughout project.

B. Barriers:

1. Provide one of the following:
   a. Fences.

2. Do not use:
   a. Walls.
   b. Hedges.

C. Landscape Plants:

1. Provide one of the following:
   a. Evergreen types.
   b. Deciduous types.

END OF SECTION G2

SECTION G21

PAVEMENTS AND SURFACING

PERFORMANCE

A. Basic Function:

1. Provide exterior pavements and surfacing, as required by the project program and by code, that are adequate in extent and sufficiently durable to accommodate without damage the types of traffic that can be reasonably anticipated for the facility type and intended user population.

2. Pavements and surfacing comprise the following elements:
   a. Exterior paved or surfaced areas such as roadways, driveways, parking lots, walkways, and sports surfaces.
   b. Exterior steps and ramps not connected to buildings, including handrails and stair nosings.
   c. Appurtenances for roadways and driveways, including curbs, gutters, guardrails, pavement markings, and parking bumpers.
   d. Signs, including traffic signals, "stop," "yield, and directional signs, and parking space marking and identification.

3. Roadways and Driveways: Provide paved surfaces as required for vehicular access to the project site and to various functional areas requiring vehicular access, including main entrance, parking areas, freight docks, and loading and unloading zones.
   a. Comply with recommendations of AASHTO "A Policy on Geometric Design of Highways and Streets", 2004.
   b. Minimum Widths: Traffic lanes not less than 12 ft wide.
   c. Maximum Slopes: 1:10.
   d. Curbs: Minimum 6 inch mountable curbs at all roadways and driveways.
   e. Gutters: Minimum 12 in width, designed in accordance with AASHTO recommendations, located on one side of all roadways and driveways.
   f. Traffic Lanes and Directional Markings: Permanent and highly visible, minimum width of 4 in.

4. Parking Areas: Provide paved surfaces as required for vehicular parking.
   a. Minimum Width of Parking Spaces: 96 in.
   b. Bumpers or Wheelstops: Located and sized to prevent damage to fixed objects, or excessive encroachment on pedestrian walkways.
   c. Space Markings: Permanent and highly visible, minimum width of 4 in.
   d. Parking Signage: As required by code and project program.

5. Walkways, Pedestrian Ramps, and Exterior Stairs: Provide paved surfaces as required for pedestrian movement on the site without damage to landscaping.
   a. Minimum Widths: Sized to allow comfortable two-way traffic.
      1) Main Entrance: 144 in.
      2) Secondary Entrances and Emergency Exits: 60 in.
      3) Major Routes: 60 in.

4) Secondary Routes: 48 in.

b. Handrails, Railings, or Protective Walls: Required when pedestrian surfaces are more than 16 in above adjacent grade.

6. Sports Surfacing: Provide smooth, seamless, and resilient surfacing for athletic activities not normally conducted on grass, clay, or dirt surfaces, including basketball.

7. Playground Surfacing: Provide smooth and resilient surfacing complying with CPSC Pub. No. 325 under playground equipment, including swings, climbing equipment, slides, and merry-go-rounds.

8. Where pavements and surfacing are integral with elements defined within another element group, meet requirements of both element groups.

9. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section G - Sitework and Section G2 - Site Improvements.

B. Amenity and Comfort:

1. Thermal Comfort: Provide pavements and surfacing at parking lots with minimum initial reflectivity of 0.3 to reduce solar heat gain.

2. Accessibility:
   a. Comply with ADAAG-1994.
   b. Parking: Provide not fewer than 1 accessible parking space in addition to the number required under ADAAG-1994 in each parking area.
   c. Van Accessibility: Provide not fewer than 1 van accessible parking space in addition to the number required under ADAAG-1994 in each parking area.
   d. Pedestrian Ramps: Limit slope to maximum of 1:16 and rise to maximum of 24 in in any run.

3. Stair Comfort:
   a. Steepness: Provide exterior stairs with risers of not more than 6 inches and treads sized so that twice the riser height plus the tread depth totals 26 inches.
   b. Landings: Provide exterior stairs with maximum rise of not more than 8 ft between landings.

4. Noise Control: Provide paving at parking lots, roadways, and driveways that minimizes noise from automobile tires due to rough surface texture and paving joints.

5. Appearance:
   a. Vehicular Paving: Construct paving to achieve plain, utilitarian appearance.
   b. Pedestrian Stairs, Ramps, and Walkways: Provide pedestrian walking surfaces that contrast with vehicular paving and achieve smooth, consistent appearance.
   c. Exterior Sports Surfacing at Basketball Court: Provide surfaces that are smooth and colorful and contrast with adjacent materials.
   d. Curbs and Gutters: Provide smooth, rounded shapes that contrast with roadway surfaces for maximum visibility.
   e. Railings, Handrails, Guardrails, and Protective Walls: Provide materials and finishes that are consistent with building exterior in appearance.

6. Resilience: Provide exterior sports surfacing with inherent flexibility and resilience appropriate for the intended uses and as follows:
   a. At Playground Equipment: Critical height of not less than 4 ft, when measured in accordance with ASTM F 1292-2004 in the Use Zones defined by ASTM F 1487-2005.

C. Health and Safety:

1. Safety of Pedestrian Surfaces:
   a. Slip Resistance: Provide walking surfaces of exterior stairs, ramps, and walkways with a minimum static coefficient of friction of 0.80, measured in accordance with ASTM D 2047-2004.
   b. Stairs:
      1) Risers: Closed.
      2) Treads: Maximum bevel or radius on leading edge of 1/2 inch in, slope to drain.
   c. Guards, Guardrails, or Protective Walls:
      1) Openings: No openings large enough for a sphere with a diameter of 4 in to pass through.
      2) Minimum Height: In accordance with code.

2. Safety of Vehicular Areas:
   a. Traffic Signs and Signals: Provide highly visible signs and signals as required to regulate traffic for safety and convenience.
      1) Comply with requirements of the State Department of Transportation for placement and design.

D. Structural:

1. Exterior Stairs, Ramps, and Elevated Walkways: Capable of supporting loads in excess of those required by code.

2. Exterior Handrails, Guards, and Guardrails: Capable of resisting forces in excess of those required by code.

3. Substantiation:
   a. Construction Documents: Engineering calculations, stamped by a registered structural engineer.

E. Durability:

1. Service Life Span of Paved Surfaces: 25 years, under normally anticipatable usage.

2. Traffic Resistance: Provide pavement to accommodate traffic as follows, based on procedures in AASHTO GDPS-1993(supp98) and GDPS3-V2-1986, Guide for Design of Pavement Structures:
   a. Category A: Parking areas and access lanes for autos, pickups, and panel trucks only.
   b. Category A1: Truck access lanes for average daily truck traffic of 1 vehicle with 6 wheels or more.
   c. Category B: Parking entrance areas and major service lanes, with average daily traffic of 25 vehicles with 6 wheels or more.

d. Category B1: Parking areas and interior traffic lanes for buses or trucks, with average daily traffic of up to 25 vehicles.
e. Category C: Parking entrances and exterior traffic lanes for buses or light trucks, with average daily traffic of up to 25 vehicles.
f. Category D: Parking entrances and exterior traffic lanes for heavy trucks, with average daily traffic of up to 25 vehicles.

3. Substantiation:
   a. Design Development: Identification of proven-in-use surfaces of the same type, for inspection by NJSDA.
   b. Construction Documents: Computations to establish pavement strength and thickness, stamped by a registered civil or structural engineer.

PRODUCTS

A. Vehicular Paving:

1. Use any of the following:
   a. Asphalt paving.
   b. Concrete pavement.

2. Do not use the following:
   a. Decorative concrete topping.
   b. Brick pavers.
   c. Asphalt pavers.
   d. Concrete pavers.
   e. Stone pavers.
   f. Turf reinforcement paving system.
   g. River-washed gravel over compacted subbase.
   h. Crushed stone over compacted subbase.

B. Pedestrian Areas:

1. Use any of the following:
   a. Concrete pavement.
   b. Decorative concrete topping.
   c. Concrete pavers.
   d. Stone pavers.

2. Do not use the following:
   a. Asphalt paving.
   b. Brick pavers.
   c. Asphalt pavers.
   d. River-washed gravel over compacted subbase.

C. Exterior Sports Surfacing:

1. Use any of the following:
   a. Asphalt paving at at basketball court.
   b. Seamless rubber and polyurethane surfacing system at playground.

2. Do not use the following:

a. Concrete pavement.
b. Acrylic topping over concrete.
c. Acrylic topping over asphalt.
d. Rubber tile system.
e. Synthetic turf system.

END OF SECTION G21

SECTION G22

SITE FIXTURES AND EQUIPMENT

PERFORMANCE

A. Basic Function:

1. Provide all fixtures, equipment (other than that associated with services), and miscellaneous structures located out-of-doors that are required by the project program and that are required as a result of these and other requirements.

2. Site fixtures and equipment that shall be provided include:
   a. Fences and Barriers: As specified in Section G and as follows:
      1) Picket fences
   b. Athletic fixtures and fixed equipment, including:
      1) Bases and backstop for baseball.
      2) Soccer goals.
      3) Basketball goals and backstops.
      4) Playground equipment.
   c. Site furnishings, including:
      1) Outdoor seating and tables.
      2) Waste receptacles.
      3) Bicycle racks.
      4) Flagpole.
   d. Outdoor signs, other than roadway and parking lot signs.
      1) Main building identification sign.

3. Site fixtures and equipment that will be provided by NJSDA are as follows; Design-Builder will provide mountings and install:
   a. Playground equipment.
   b. Home plate and bases for baseball.

4. Where site fixtures and equipment elements also must function as elements defined within another element group, meet the requirements of both element groups.

5. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section G - Sitework, and Section G2 - Site Improvements.

B. Health and Safety:

1. Safety:
   a. Playground Equipment: Construct to comply with ASTM F 1487-2005.

C. Structure:

1. Bicycle Racks: Constructed of materials strong enough to resist forces generated by attempted forcible removal of bicycle.

D. Durability:

1. Service Life:

a. Minor Site Structures: Same as for equivalent building elements.
b. Other Fixed Site Improvements: 15 years under normal use and weather.
c. Athletic Nets: 5 years under continuous weather exposure.
d. Substantiation:
   1) Construction Documents: Proven-in-use data.

2. Weather Resistance: Same as specified for components of exterior shell in Section B.

PRODUCTS

A. Fences:

1. Provide the following:
   a. Prefinished power coated ornamental steel fencing.

2. Do not use:
   a. Galvanized chain link fencing.
   b. Vinyl-coated chain link fencing.
   c. Aluminized chain link fencing.
   d. Extruded aluminum fencing.
   e. Wood board fencing.
   f. Wood panel fencing.

B. Permanent Site Fixtures:

1. Provide products made of one of the following:
   a. Cast-in-place concrete.
   b. Precast concrete.
   c. Terracotta.
   d. Aluminum.

2. Do not use products made of:
   a. Bronze.
   b. Stainless steel.
   c. Cast iron.

C. Site Furnishings:

1. Provide products made of one of the following:
   a. Cast-in-place concrete.
   b. Precast concrete.
   c. Terracotta.
   d. Aluminum.
   e. Bronze.

2. Do not use products made of:
   a. Stainless steel.
   b. Cast iron.
   c. Reinforced plastic.
   d. Redwood.
   e. Western red cedar.

f. Teak.

D. Signs:

1. Provide:
   a. Dimensional letter signs using stainless steel letters.
   b. Electronic message boards (N.I.C.).

2. Do not use:
   a. Signs constructed of the same material as the exterior skin of the exterior wall.
   b. Box signs.
   c. Neon light signs.
   d. Electronic message boards.

E. Flagpoles: Type as required, fixed.

1. Provide sheathed metallic flagsnaps.

2. Use one of the following:
   a. Aluminum flagpoles.
   b. Fiberglass flagpoles.

3. Do not use:
   a. Steel flagpoles.

METHODS OF CONSTRUCTION

A. Provide the following methods:

1. Ornamental Metal Fences: Galvanized steel, of design and size indicated on drawings.
   a. Decorative Metallic-Coated Steel Tubular Picket Fences: Comply with ASTM F 2408, for commercial application (class) unless otherwise indicated.
   b. Basis of Design: Ameristar Fence Products. Aegis Plus Genesis 2 Rail style or equivalent by:
      1) Master Halco
      2) A & T Ironworks
      3) Or accepted equal
   c. Metallic-Coated Steel Sheet: Galvanized-steel sheet sheet.
   d. Fence pickets 3/4" square x 16 Ga. tubing.
   e. Posts: minimum of 2-1/2" square
   f. Interior surface of tubes formed from uncoated steel sheet shall be hot-dip zinc coated same as exterior
   g. High quality PVC grommets shall be supplied to seal all picket-to-rail intersections.
   h. Provide panels capable of supporting a 400 lb. load (applied at midspan) without permanent deformation.
   i. Gates: Matching construction.
      1) Single Gates: 2 non-removable hinges, fork-style gravity latch and padlock hasp and eye.

END OF SECTION G22

SECTION G23

LANDSCAPING

PERFORMANCE

A. Basic Function:

1. Provide landscaping over all areas of the site not finished with paving, surfacing, or buildings.

2. Landscape planting features that shall be provided are:
   a. Turf areas for specific activities as described in the project program.
      1) Sports and athletic surfaces.
      2) Children's play areas.
   b. Turf for ornamental or erosion-control purposes.
   c. Visual screening as described in the project program.
      1) Utility areas, including trash collection.
      2) Sewage and storm water facilities.
      3) Private outdoor activity areas.
   d. Shade for outdoor activities.
   e. Permanent erosion control plantings in accordance with Section G.

3. A permanently installed irrigation system shall not be provided; provide conveniently located and appropriately sized irrigation water connections for hose-and-sprinkler equipment provided by NJSDA.

4. Design-Builder will provide non-permanent irrigation equipment as required to accomplish his maintenance activities.

5. Where landscaping elements also must function as elements defined within another element group, meet the requirements of both element groups.

6. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section G - Sitework, and Section G2 - Site Improvements.

B. Amenity and Comfort:

1. Convenience:
   a. Irrigation Connections For NJSDA-Furnished Equipment: At intervals as required so that sprinklers can reach all areas to be watered, using hoses of not more than 100 feet in length.
   b. Substantiation:
      1) Closeout: Annual irrigation program, with monthly schedules and interim procedures for plant establishment period.

2. Appearance:
   a. Plants: Selected, arranged, and planted for pleasant appearance throughout the year.
      1) Provide a naturalized landscape using native trees, shrubs, and ground covers, with as little lawn as possible.

2) Provide a neat and tidy urban landscape with ornamental feature plants.
3) Pleasant appearing evergreens, perennial flowers, annual flower beds, and ground covers shall be provided.
4) Provide a landscape that will look complete within a year after planting and to remain of basically the same appearance indefinitely without significant pruning.
5) Plantings that look incomplete in the winter or between seasons, including deciduous shrubs in winter, shall not be used.
6) Do not use any grass at all.

b. Plants in Beds: Bordered with permanent mulch or paving for tidy appearance.
c. Mulch: Use only types of pleasant appearance.

C. Health and Safety:

1. Accidental Injury:
   a. Do not locate irrigation equipment within the field of turf intended for foot traffic.
   b. Plants Used to Inhibit Foot Traffic: Spiny leaves, such as on holly, will be used, but spines, like on spiny honey locust, shall not.

2. Potable Water Contamination:
   a. Prevent contamination of potable water supply by irrigation water.

D. Durability:

1. Service Life: It is understood that ultimate survival of plants will depend on weather conditions as well as maintenance; however, the Design-Builder is responsible for providing plants that will survive under the specified conditions when maintained according to both the procedures specified and the procedures furnished by the Design-Builder at closeout.
   a. Soil: Suitable for growing the plants provided, with adequate nutrients for the first year of growth, based on recommendations of established authorities.
      1) Substantiation:
         a) Design Development: Existing soil tests for pH, nutrients, and texture; identification of necessary soil amendments, or replacement with other suitable soil.
         b) Construction: Soil tests of replacement soil.
         c) Closeout: Recommended fertilizer types and application rates for each type of plants.
   b. The Design-Builder will provide maintenance of all plants, including irrigation, during the first year after completion.
   c. At the end of one year after completion, if any plants are dead, dying, or wilting, the Design-Builder will replace them with other plants of better weather resistance, care for the replacement plants during their establishment period, and furnish maintenance data to the NJSDA.

2. Weather Resistance:
   a. Trees and Woody Shrubs: Sustainable without supplemental irrigation.
   b. Mulch: Where soil would otherwise be exposed around individual plants, cover soil with mulch that allows penetration of precipitation but minimizes evaporation; type of mulch coordinated with erosion resistance requirements.

3. Accidental Damage:
   a. Plants in Beds: Where planting beds adjoin turf areas, edge of turf shaped for ease of mowing with motorized equipment without damage to plants in beds.
   b. Street Trees in Pavement Wells: Root area protected from mechanical damage.
   c. Irrigation Equipment: Designed and located to prevent damage by normal user traffic and plant maintenance equipment.
   d. Irrigation Equipment: Concealed in ground or out of way of landscape maintenance equipment.

4. Traffic Damage:
   a. Turf: Do not use turf for regularly used vehicular or pedestrian traffic surfaces, except where turf is specifically required for foot traffic use (such as playfields).
   b. Turf for Functional Traffic Surfaces: Grass type selected for best resistance to wear; NJSDA understands turf specifically required for traffic purposes is subject to unavoidable damage that may result in the need to replace sod.

5. Insect and Disease Resistance: Avoid the use of plants and turf that are known to be subject to insect damage or disease.

6. Underground Irrigation Piping and Equipment: Comply with requirements of Section D for water and drainage systems.
   a. Prevent freezing of water-containing components.

E. Operation and Maintenance:

1. Irrigation Water Source: Same as building supply.

2. Water Conservation: See Section G for basic water conservation requirements.
   a. Despite the fact that a permanent irrigation system is not required, design to minimize the potential water usage by selection of appropriate plants.
   b. Maximum Turf Area: 25 percent of land area of site not occupied by buildings or pavements.

3. Ease of Maintenance:
   a. Turf: do not use areas of turf that cannot be mowed with motorized equipment.
   b. Plants: Arranged for ease of access for weeding, mulching, and watering.
   c. Shrubs and Woody Plants: do not use plants that require routine annual or seasonal pruning.
   d. Non-Woody Plants: do not use plants that are not perennial.
   e. Plants in Planters: Permanent irrigation and drainage system.

PRODUCTS

A. Turf:

1. Provide one of the following:
   a. Bermuda grass.
   b. Bluegrass.
   c. Fine fescue.
   d. Perennial ryegrass.
   e. Tall fescue.
   f. A mixture of any of the above.

2. Do not use:
   a. Buffalo grass.
   b. Centipede grass.
   c. St. Augustine grass.
   d. Zoysia grass.

B. Evergreen Shrubs:

1. Provide one of the following:
   a. Boxwood.
   b. Holly.
   c. Juniper.
   d. Live oak.
   e. Manzanita.
   f. Oleander.
   g. Photinia.
   h. Rhododendron.

2. Do not use:

C. Deciduous Shrubs:

1. Provide one of the following:
   a. Azalea.
   b. Barberry.
   c. Cotoneaster.
   d. Crepe myrtle.
   e. Euonymus.
   f. Flowering quince.
   g. Forsythia.

2. Do not use:
   a. Privet.
   b. Mahonia.
   c. Nandina.
   d. Oleander.
   e. Pampas grass.
   f. Russian olive.
   g. Scotch broom.
   h. Spirea.
   i. Viburnum.

D. Shade Trees:

1. Provide one of the following:
   a. Live oak.
   b. White ash.
   c. White oak.

2. Do not use:
   a. Gingko.

b. Honeylocust.
c. Kentucky coffee tree.
d. Tulip poplar.
e. Sophora japonica (Japanese pagoda tree).
f. Sweet gum.
g. Sycamore.
h. Water oak.
i. Zelkova.

E. Specimen Trees:

1. Provide one of the following:
   a. Birch, ornamental.
   b. Dogwood.
   c. Flowering cherry.

2. Do not use:
   a. Bradford pear.
   b. Holly.
   c. Magnolia.
   d. Mimosa.
   e. Palms.
   f. Redbud.
   g. Willow.

F. Mulch:

1. Provide one of the following:
   a. Ground or shredded bark.
   b. Chipped bark or wood.
   c. Rounded riverbed gravel.

2. Do not use:
   a. Pine needles.
   b. Peanut, pecan, or cocoa-bean shells.
   c. Peat moss.
   d. Crushed or chipped marble or granite.
   e. Nonwoven polypropylene or polyester fabric.

G. Edgings for Beds:

1. Provide one of the following:
   a. Concrete.
   b. Extruded aluminum.

2. Do not use:
   a. Brick.
   b. Redwood.
   c. Western red cedar.
   d. Polyethylene plastic.
   e. Galvanized steel, painted.

METHODS OF CONSTRUCTION

A. Turf:

1. Provide one of the following methods of installation:
   a. Sodding.
   b. Seeding.
   c. Hydroseeding.

2. Do not use:
   a. Sprigging.
   b. Plugging.

END OF SECTION G23

SECTION G3

SITE SERVICES

PERFORMANCE

A. Basic Function:

1. See Section D for basic requirements for services.
2. Provide the following site services:
   a. Water Supply (G31): Means of distributing water for all purposes required in buildings and on site. See Section D2, and Sections D2 and D21 for additional requirements.
   b. Sanitary Sewer (G32): Means of removing liquid waste generated in buildings on site. See Section D2 for additional requirements.
   c. Storm Sewer (G33): Means of removing, controlling, and storing rainwater runoff from buildings and site areas. See Section D2 for additional requirements.
   d. Site Elements of Energy Supply: See Section D31 for means of storing and distributing natural gas, and fuel oil for energy-using services.
   e. Electrical Power (G34): Adequate supply of power for project functions. See Sections D5 and D51 for additional requirements.
      1) Provide underground electrical distribution system for all buildings on site.
   f. Site Elements of Artificial Lighting: See Section D6, D62, and D63.
   g. Site Elements of Telecommunications: See Section D7, D71, D72, and D73.
   h. Site Elements of Surveillance and Security Controls: See Section D9 and D92.
3. Where site services elements must also function as elements defined within another element group, meet requirements of both element groups.
4. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section D - Services, and Section G - Site Work.

B. Amenity and Comfort:

1. Leakage: Provide distribution systems which are leak-free.
2. Accessibility: Provide clearances around components that are adequate for service and use.

C. Health and Safety:

1. Safety Hazards: Avoid using products that create safety hazards wherever possible; where services must involve flammable materials or hazardous operations, comply with code.
2. Unauthorized Access: Provide locking devices to stop unauthorized access.
3. Excess Pressure: Provide pressurized components that will withstand operational pressures without failure and to relieve or reduce excessive pressure to prevent failure.

4. Electrical Shock: Isolate electrical conductors from personnel.
5. Accidental Explosion: Provide equipment designed to withstand electromotive forces without catastrophic failure.
6. Misuse: Minimize misuse that could result in damage to property, injury, or loss of life.
7. Hazardous Materials: Piping carrying flammable liquids and toxic materials clearly labeled.
8. Vermin Resistance: Provide components that are resistant to the entry of rodents and insects.

D. Structure:

1. Concealed or Buried Piping and Components: Provide cover or concealment so that they are not subjected to damaging stresses due to applied loads.
2. Supports for Piping and Components: Support piping and components using the following:
   a. Supports that allow movement of the pipe without undue stress on the piping, tubes, fittings, components, or foundations.
   b. Substantiation:
      1) Design Development: Details of supports, including engineering analysis.
3. Structural Design of Components and Their Supports: In accordance with code.

E. Durability:

1. Service Life Span: As specified in Section D.
2. Weather Resistance:
   a. Storage Tanks and Distribution Components: Prevent freezing. Provide automatically controlled supplemental heating.
   b. Burial Depth of Piping: 6 inches below lowest recorded level at which the ground freezes. Minimum burial depth of 36 inches.
   c. Electrical Equipment: Provide equipment which is waterproof.
3. Corrosion Resistance: Prevent corrosion by using corrosion-resistant materials, by preventing galvanic action, by preventing contact between metals and concrete and masonry, and by preventing condensation on metals.
   a. Metals Considered Corrosion-Resistant: Aluminum, stainless steel, brass, bronze, cast iron, ductile iron, malleable iron, hot-dipped galvanized steel, chrome-plated steel, cadmium-plated steel, and steel coated with high-build epoxy or coal tar-based paint.
   b. Underground Elements: Provide supplementary protection for underground metal pipes and tanks, sufficient to prevent corrosion completely, for the service life of the element without maintenance.
      1) 3 inches of concrete cover is considered to be permanent protection.

2) Bituminous or other waterproof coating or wrapping is considered permanent protection unless cathodic protection is required and unless underground element is subject to movement due to structural loads or thermal expansion or contraction.
3) Provide cathodic protection if any of the following is true; coatings or wrappings will not be considered sufficient protection for elements falling under these criteria:
   a) Metal elements are submerged or buried in a soil environment known to cause corrosion on similar nearby structures.
   b) Metal elements are submerged and buried in a soil environment in which stray DC electrical currents are present.
4) See Section D94 for cathodic protection requirements.

4. Resistance to Accidental Damage and Abuse:
   a. Provide barriers or protected locations for services, to prevent damage due to vehicular traffic.
   b. Buried Components: Minimum of 12 inches below surface of ground.
   c. Underground Piping: Watertight and rootproof.

F. Operation and Maintenance:

1. Capacity:
   a. Water and Drainage: As required by code and as specified in Section D2.
   b. Heating, Cooling, and Ventilating: Provide site services sufficient to maintain interior environment within ranges specified in Section 111.
   c. Fire Protection: As required by code and as specified in Section D4.
   d. Substantiation:
      1) Design Development: Engineering calculations showing input- and output-side capacities and loads and sizes of distribution elements.
      2) Construction Documents: Complete system details.
      3) Construction and Closeout: Functional performance testing, as specified in Section 00830.

2. Ease of Use: Provide easy access to and working clearances around system components.

3. Minimization of Misuse: Provide locking devices to stop unauthorized access.

4. Ease of Maintenance:
   a. Piping: Provide means of isolating portions of piping system, so that small portions may be shut down leaving the remainder in operation, by using isolation valves located so that drainage of the entire system is not required for repair.

5. Provision for Change and Future Capacity:
   a. Provide electrical equipment which can be modified to increase service capacity in the future.

6. Maintenance Service: Maintain services as specified in Section 00830, including periodic inspections, routine maintenance recommended by manufacturers, and

repair and replacement of defective elements; maintenance is required only for systems so specified.

END OF SECTION G3

SECTION G31

WATER SUPPLY

PERFORMANCE

A. Basic Function:

1. Provide means of distributing water from city water system for all purposes required in buildings and on site.
2. Where water supply elements must also function as elements defined within another element group, meet requirements of both element groups.
3. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section G - Sitework, and Section G3 - Site Services.

B. Structure:

1. Seismic Protection:
   a. Provide a water supply tank with flexible joints where differential movement is anticipated.
   b. Provide seismic supports in compliance with local code requirements.

C. Durability:

1. Water Supply Tank: 20 year minimum life span.
2. Wear Resistance: Provide water supply tank which is resistant to corrosion and breakage due to exposure to weather.
3. Corrosion Resistance: Provide a corrosion resistant coating on the tank and piping.
4. Freeze Protection: Protect water supply tank from freezing.
   a. Heat water in the water supply tank with electric immersion heaters to maintain water temperature above freezing.

D. Operation and Maintenance:

1. Ease of Service: Provide a shutoff valve at the utility service main and the service entry point.
2. Ease of Repair:
   a. Provide access around water supply tank.
   b. Do not locate water supply tank near chemical storage areas, in view of building occupants, or septic tank.

END OF SECTION G31

SECTION G32

SANITARY SEWER

PERFORMANCE

A. Basic Function:

1. Provide connection to city services to meet building sanitary sewer requirements.
2. Sanitary Sewer Utility: See Section D - Services.
3. Where sanitary sewer elements must also function as elements defined within another element group, meet requirements of both element groups.
4. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section G - Sitework, and Section G3 - Site Services.

B. Durability:

1. Life Span: Provide a sanitary sewer which will be viable for the life of building.

C. Operation and Maintenance:

1. Maximum Manhole Spacing: 300 feet.
2. Maximum Cleanout Spacing: 100 feet.

PRODUCTS

A. Pipe:

1. Use one or more of the following:
   a. Cast iron soil pipe and fittings, hub and spigot.
   b. PVC pipe and fittings.
2. Do not use:
   a. Cast iron soil pipe and fittings, hubless.
   b. Concrete pipe.
   c. Clay pipe.
   d. Copper tube or pipe.
   e. ABS pipe and fittings.

B. Manholes:

1. Use one or more of the following:
   a. Prefabricated concrete.
   b. Poured-in-place concrete.
2. Do not use:

C. Sump Pumps:

1. Use one or more of the following:
   a. Submersible pumps.
   b. Sewage pumps.

c. Grinder pumps.

2. Do not use:
   a. Pedestal pumps.

END OF SECTION G32

SECTION G33

STORM SEWER

PERFORMANCE

A. Basic Function:

1. Provide a storm sewer to meet project storm drainage requirements.
   a. Type of Drainage: Gravity drain connected to the public utility system.
2. Where storm sewer elements must also function as elements defined within another element group, meet requirements of both element groups.
3. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section G - Sitework, and Section G3 - Site Services.

B. Amenity and Comfort:

1. Odor: Provide a trap at connection of the storm sewer to the sanitary sewer.

C. Structure:

1. Provide storm grates with the strength to withstand repetitive loading without damage or undue wear.
2. Provide storm grates with the strength to withstand concentrated loads up to 2000 psig.

D. Durability:

1. Provide storm grates which resist corrosion in dock areas.
2. Vandalism: Provide tamper-resistant anchors on trench drain gratings.

E. Operation and Maintenance:

1. Maximum Cleanout Spacing: 100 feet.
2. Ease of Repair: Provide trench drains with replaceable covers or grates.

PRODUCTS

A. Pipe:

1. Use one or more of the following:
   a. Cast iron soil pipe and fittings, hub and spigot.
   b. Concrete pipe.
   c. PVC pipe and fittings.
   d. PE.
2. Do not use:
   a. Cast iron soil pipe and fittings, hubless.
   b. Clay pipe.
   c. Copper tube or pipe.
   d. ABS pipe and fittings.

B. Culverts:

1. Use one or more of the following:
   a. Concrete pipes.

C. Storm Drains:

1. Use one or more of the following:
   a. Cast iron.
   b. Stainless steel.
   c. Plastic.

2. Do not use:
   a. Bronze.
   b. Wrought iron.

D. Manholes:

1. Use one or more of the following:
   a. Prefabricated concrete.
   b. Cast-in-place concrete.

2. Do not use:

END OF SECTION G33

SECTION G34

ELECTRICAL POWER

PERFORMANCE

A. Basic Function:

1. Provide electrical power supply and distribution elements.
2. Where site electrical power elements must also function as elements defined within another element group, meet requirements of both element groups.
3. In addition to the requirements of this section, comply with all applicable requirements of Section 111 - Facility Performance, Section G - Sitework, and Section G3 - Site Services.

B. Amenity and Comfort:

1. Appearance:
   a. Provide underground electrical power distribution with pad mounted transformers.

C. Health and Safety:

1. Fire Source: Provide site electrical elements which are incombustible.
2. Electrical Shock Prevention:
   a. Provide a means of disconnecting power at each piece of equipment.

D. Durability:

1. Life Span: Provide a system which will be viable for the life of building.
2. Corrosion: Provide buried conduits which are resistant to corrosion.

E. Operation and Maintenance:

1. Capacity: As required by code.
2. Transformer Ratings:
   a. Primary Voltage/Phase/Frequency: 600 volt/3 phase/60 Hz.
   b. Secondary Voltage/Phase/Frequency: 480 volt/3 phase/60 Hz.
   c. Maximum Temperature Rise: 115 Deg C.
   d. Number of Wires: 3 wire.
   e. Capacity: 500 kVA.
   f. Efficiency: 99 percent.
3. Ease of Cleaning: Provide electrical distribution elements with removable access panels to allow cleaning.
4. Ease of Maintenance: Provide electrical distribution elements which are modular in design.

PRODUCTS

A. Transformers:

1. Use one or more of the following:
   a. Autotransformers.
   b. Dry-type transformers.
   c. Liquid-filled transformers.
   d. Oil-insulated transformers.
   e. Pad mounted transformers.
2. Do not use:
   a. Pole mounted transformers.

B. Conductors:

1. Use one or more of the following:
   a. Solid copper.
   b. Copper-clad aluminum.
   c. Aluminum.
2. Do not use:

C. Conduits:

1. Use one or more of the following:
   a. Nonmetallic conduit with wires for direct burial.
   b. Nonmetallic conduit with wires to be encased in concrete.
   c. Intermediate metal conduit.
2. Do not use:
   a. Rigid metal conduit.
   b. Rigid nonmetallic conduit.
   c. Electrical metallic tubing.

END OF SECTION G34