

# **P R O J E C T M A N U A L**

**Volume 2 of 3**

**Design-Build**

*for*

**New Public School #16**

PROJECT NO. 4010-N09-04-00HP

PACKAGE NO. PA-0024-B01

*for*

Paterson Public Schools

PASSAIC COUNTY, NEW JERSEY

**PERFORMANCE SPECIFICATIONS  
DESIGN MANUAL FOR DESIGN-BUILD PROJECTS**

*prepared for*

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*August 26, 2013*



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**PROJECT CRITERIA**

**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. Special Construction and Demolition (F): Prefabricated, pre-engineered, and special-purpose modules and structures; facility remediation; and demolition.
  - g. 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 the most recently adopted versions of all applicable local, State, and federal regulations, unless a different version applies to this project for some documented reason, and may include those listed below:
  - a. Federal regulatory requirements, which may incorporate or amend the following:
    - (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.
    - (2) 29 CFR 1910, Occupational Safety and Health Standards, as a work place.
  - b. State of New Jersey regulatory requirements, which may incorporate and/or amend the following, with all addenda, supplements and referenced standards:
    - (1) N.J.A.C. 5:23 et seq., Uniform Construction Code, State of New Jersey, and all subcodes thereof.

- (a) Provide the construction techniques set forth in N.J.A.C. 5:23-10.4 of the Radon Hazard Subcode for this project, regardless of whether the project is located in a Tier 1 municipality as defined in Appendix 10-A.
      - (2) International Building Code, New Jersey Edition
      - (3) ANSI A117.1, Accessible and Usable Buildings and Facilities
      - (4) New Jersey Fire Code, N.J.A.C. 5:70-4, et seq.
      - (5) International Mechanical Code, New Jersey Edition
      - (6) National Standard Plumbing Code
      - (7) International Energy Conservation Code, New Jersey Edition
      - (8) International Fuel Gas Code, New Jersey Edition
      - (9) NFPA 70, National Electrical Code
    - c. Comply with all standards of the Keansburg Engineering Department.
  4. Make all portions of the project comply with the most recently adopted version of the following Standards and Standards referenced therein, unless a different version applies to this project for some documented reason:
    - 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."
  5. 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. LEED: Earn LEED Certification by the United States Green Building Council (USGBC) in accordance with project requirements and the latest version of LEED for Schools. Higher levels of certification may be earned at the Design-Builder's option. Selection of specific credits to be earned is the responsibility of Design-Builder unless otherwise indicated.
  6. 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 latest applicable design recommendations of the National Food Service Management Institute (NFSMI) and the requirements of the Educational Specifications.
- 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 the Project with a construction classification of minimum Type II-B noncombustible construction in accordance with code.
2. 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, all glazed areas at grade, and doors.
3. Lightning hazard: Construct to prevent damage to occupants, structure, services, and contents due to lightning strikes.
4. 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 code and LEED certification.
  - 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.
5. 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.
  - a. Design roof to support at least 10 pounds per square foot in excess of code requirements to support possible future installation of solar panels.
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. Wind loads, snow loads, earthquake loads and soil loads.

### E. Durability

1. Expected service life span: Expected functional service life 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.

### 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.
3. Water consumption: Minimize water consumption.
4. Waste removal and recycling: 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 district personnel in operation of equipment and systems.
6. Ease of maintenance: Minimize and facilitate the amount of maintenance required.
  - a. Provide elements designed to minimize need for maintenance.
  - b. Provide access to elements, working clearances, and access doors and panels for ease of maintenance throughout.
  - c. Provide elements and access to elements to facilitate maintenance while facility is in operation without undue disruption.

## **ELEMENTS AND PRODUCTS**

- A. Basis of Design: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.
  1. The Basis of Design for a designated product establishes the quality and salient physical, functional and performance characteristics that must be met in the design and construction of the project.
  2. It is not the intent of the Authority to limit the Design-Builder's options to a single product or manufacturer except for those items specifically called for by proprietary specification.
  3. Inclusion of a product other than that listed as the Basis of Design does not constitute a substitution so long as the submittals for the proposed product demonstrate that it will perform as well as or better than the Basis of Design.
- B. Proprietary Specification
  1. Certain products or manufacturers have been approved by the Authority for proprietary specification and use in this Project. Subject to compliance with codes and all project requirements, the Design-Builder is required to use the indicated products or manufacturers and to verify compatibility with the school district's existing systems.
- 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).

- 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, substantiation of proven-in-use or proven-by-mock up construction is not required.

**D. Products**

1. 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.
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.
7. Where manufacturers are listed for a particular product, comply with the requirements of the Agreement as well as with other requirements.

**END OF SECTION PS1030.00**



# **ELEMENT A**

# **SUBSTRUCTURE**

## **SECTION A1000.00**

### **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. Provide foundations that are consistent with the site's environmental and geotechnical constraints.
3. 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: All elements necessary for slab foundations, including trenches, pits, and sumps, equipment bases, integral thermal insulation, slab moisture protection, and subdrainage system.
4. Provide radon mitigation and engineering control as called for in the Design-Build Information Package.
5. Earthwork recommendations and foundation recommendations included in the Design-Build Information Package represent one possible approach to earthwork and foundation design. Alternate approaches are acceptable subject to compliance with all codes and project requirements and the approval of the Authority's Licensed Site Remediation Professional (LSRP).
6. Where foundations are integral with elements defined within another element group, meet requirements of both element groups.

##### **B. Amenity and Comfort**

1. Thermal Performance
  - a. Provide thermal performance values for individual foundation elements in compliance with code and project requirements.
2. Water Protection
  - a. Waterproofing: Provide permanent waterproofing at portions of foundation that extend below water table and enclose habitable space.
  - b. Drainage: Provide method of collecting and draining water from below portions of foundation that enclose habitable space.

C. Structure

1. Capacity: Provide loadbearing foundation members as required by code and project requirements.

D. Environmental Impacts

1. Construct all foundations in accordance with all codes, regulations, and the requirements and restrictions detailed in the Design-Build Information Package, specifically including the following:
  - a. Regulatory Review Report – August 2013.
  - b. Geophysical Investigation Report – July 3, 2013.
  - c. Utility Investigation Report – August 2013.
  - d. Preliminary Stormwater Management Report – August 2013.
  - e. Geotechnical Investigation Report – August 2013.
2. Construct all foundations in conformance with sitework plans and specifications approved by the Authority's LSRP, in accordance with the Post Demolition Site Conditions Report and all project requirements.

**END OF SECTION A1000.00**

**SECTION A6020.10**  
**RADON MITIGATION**

**PERFORMANCE**

A. Basic Function

1. Provide radon mitigation to prevent the entry of radon and radon progeny into the building, in accordance with the requirements of Subchapter 10 of the New Jersey Uniform Construction Code, and all other applicable codes and project requirements.
2. Notwithstanding the Project location, provide radon mitigation measures which are, at a minimum, consistent with those required in Tier One Radon Hazard Areas as established by the Department of Environmental Protection.
3. Radon mitigation includes the following elements:
  - a. Subsurface ventilation system. Provide a passive system with the capacity for addition of fans in the future.
  - b. All other construction techniques required by the Design-Build Information Package and N.J.A.C. 5:23-10.4.
4. The design of the radon mitigation system shall be consistent with other elements called for in the Design-Build Information Package, and submitted to the Authority's Licensed Site Remediation Professional (LSRP) for its review and approval.
5. Where radon mitigation elements also must function as elements defined within another element group, meet requirements of both element groups.

**END OF SECTION A6020.10**

# **ELEMENT B**

# **SHELL**

## **SECTION B2010.00**

### **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. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements. Where multiple brand names are listed, any of the listed products may be used as the Basis of Design.

##### **B. Amenity and Comfort**

1. Thermal performance: In accordance with applicable codes and project requirements and as necessary to maintain interior comfort levels specified and the following:
  - a. Condensation: None on interior surfaces under normal interior temperature and relative humidity conditions, including 98 percent of the days in the coldest 3 months of the year.
  - b. Components with both interior and exterior surfaces: Condensation Resistance Factor (CRF) as required to meet requirement above, when tested in accordance with AAMA 1503.
2. Provide continuous insulation over entire enclosure.
3. Air barrier: Continuous separate membrane over entire exterior enclosure that allows moisture vapor transmission while preventing air infiltration.

##### **C. Structure**

1. Provide engineer's certification of masonry design, including all masonry elements identified in IBC Table 1704.5.1 and others required by code or project conditions.
2. Wind design: No damage when tested in accordance with ASTM E 330 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.

### 3. Durability

- a. Provide engineered masonry design and detailing to comply with code and to minimize cracking, water penetration, and other deleterious effects of loads, thermal change, differential movement, and other forces acting on walls.
  - (1) Provide adjustable wall ties between masonry veneer and backup.
  - (2) Provide continuous reinforcing in veneer wythe at stack bond locations and elsewhere as required by engineering design.
  - (3) At locations where concrete- and clay-based materials meet, provide continuous reinforcing at joints and wall ties within 12" of top and bottom in both materials, or at joints for single-course applications.
- b. Water penetration: Drain water, moisture, and condensation entering assembly to the exterior.
- c. Weather resistance: Select materials to minimize deterioration due to precipitation, sunlight, ozone, normal temperature changes, salt air, and atmospheric pollutants.
  - (1) Deterioration includes corrosion, shrinking, cracking, spalling, delamination, abnormal oxidation, decay and rot.
  - (2) Surfaces exposed to view: Deterioration adversely affecting aesthetic life span includes color fading, crazing, and delamination of applied coatings.
    - (a) Coated finishes: Minimize use of materials with separate coated finishes.
    - (b) Coating performance: Complying with AAMA 2605 or better.
  - (3) Joint components and penetration seals: Capable of resisting expected thermal expansion and contraction; use overlapping joints that shed water wherever possible.
  - (4) Glazing: No haze, loss of light transmission, or color change, during entire expected service life.
  - (5) Freeze-thaw resistance: Adequate for climate of project site.
  - (6) Corrosion resistance: Provide only corrosion-resistant metals in locations exposed to the outdoor air or in potential contact with moisture inside shell assemblies.
  - (7) Ozone resistance: Do not use materials that are adversely affected by ozone.
- d. 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 ambient temperature expected, without causing detrimental effect to components and anchorage.
- e. Joint sealers in exterior skin: Minimize the need for joint sealers in exterior skin consistent with requirements for building movement and joining of dissimilar materials.
- f. Impact and wear-and-tear resistance: Provide materials to resist damage due to impact and wear-and-tear in accordance with code.
  - (1) Minimize damage due to potential vandalism.

- (2) Minimize degradation from rubbing and scratching caused by school users and pedestrians.
- (3) Resist damage from perching, nesting, and feeding birds and animals.
- g. Moisture vapor transmission: Provide materials that prevent deterioration of materials due to condensation of moisture vapor inside assemblies.
  - (1) Provide continuous separate vapor retarder membrane over entire exterior enclosure, located on the warm side of the winter dew point.
  - (2) Use methods of sealing joints between elements that will be effective using practical field construction practices.

D. Appearance

- 1. Provide finished corner masonry units and minimum 8" CMU faces at all exposed corners.
- 2. 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.

**PRODUCTS**

A. Basis of Design for Exterior Masonry and Related Products

- 1. Concrete Masonry Units (CMU)
  - a. CM1
    - (1) Products
      - (a) Nitterhouse Masonry Products LLC; color A18; Antique face.
      - (b) York Building Products; color 01A; Rustic face.
      - (c) Westbrook Concrete Block Inc.; color 99; Decro face.
    - (2) Typical size: 8F16 (nominal 4" x 8" x 16").
    - (3) Mortar: MT1.
  - b. CM2
    - (1) Products
      - (a) Nitterhouse Masonry Products LLC; color NM141; Antique face.
      - (b) York Building Products; color Sahara; Rustic face.
      - (c) Westbrook Concrete Block Inc.; color 365; Decro face.
    - (2) Typical size: 8F16 (nominal 4" x 8" x 16").
    - (3) Mortar: MT1.



- c. CM3
    - (1) Products
      - (a) Nitterhouse Masonry Products LLC; color NM117; Antique face.
      - (b) York Building Products; color 704; Rustic face.
      - (c) Westbrook Concrete Block Inc.; color 308; Decro face.
    - (2) Typical size: 16F24 (nominal 4" x 16" x 24").
    - (3) Mortar: MT3.
  - d. CM3a
    - (1) Products
      - (a) Nitterhouse Masonry Products LLC; color NM117; ground face.
      - (b) York Building Products; color 704; Gemstone face.
      - (c) Westbrook Concrete Block Inc.; color 308; ground face.
    - (2) Typical size: 8F16 (nominal 4" x 8" x 16").
    - (3) Score: V1 (single score).
    - (4) Mortar: MT3.
  - e. CM4: Nitterhouse Masonry Products LLC.
    - (1) Products
      - (a) Nitterhouse Masonry Products LLC; color NM135; ground face.
      - (b) York Building Products; color Port; Gemstone face.
      - (c) Westbrook Concrete Block Inc.; color 309 with added sand color; ground face.
    - (2) Typical size: 8F16 (nominal 4" x 8" x 16").
    - (3) Score: V1 (single score).
    - (4) Mortar: MT4.
2. Brick
- a. B1
    - (1) Products
      - (a) Taylor Clay Products Inc.; color 316 Pink; Velour face.
      - (b) Carolina Ceramics Brick Company; color Rosewood; Velour face.
      - (c) Interstate Brick; color Terra Cotta; Velour face.
    - (2) Size: Economy (nominal 4" x 4" x 8").
    - (3) Mortar: MT1 or MT2.

- b. B2
    - (1) Products
      - (a) Cunningham Brick Co., Inc.; color Cascade White; smooth face.
      - (b) Palmetto Brick Company; color Whitestone; smooth face.
      - (c) Interstate Brick; color Artic White; smooth face.
    - (2) Size: Economy (nominal 4" x 4" x 8").
    - (3) Mortar: MT1 or MT2.
  - c. B3
    - (1) Products
      - (a) Watsonstown Brick Company; color Sand; smooth face.
      - (b) Glen-Gery Brick; color Dolomite; smooth face.
      - (c) Interstate Brick; color Desert Sand; smooth face.
    - (2) Size: Economy (nominal 4" x 8" x 8").
    - (3) Mortar: MT1 or MT2.
3. Cast Stone
- a. CS1: Rock Cast Stone Inc.
    - (1) Color: Match CM3 above.
    - (2) Finish: Smooth.
    - (3) Size: SL375; lengths as indicated.
    - (4) Mortar: MT3.
  - b. CS2: Rock Cast Stone Inc.
    - (1) Color: Match CM2 above.
    - (2) Finish: Smooth.
    - (3) Size: As indicated.
    - (4) Mortar: MT2.
  - c. CS3: Rock Cast Stone Inc.
    - (1) Color: Match CM4 above.
    - (2) Finish: Smooth.
    - (3) Size: As indicated.
    - (4) Mortar: MT4.
4. Mortar
- a. MT1: Leigh Heidelberg Cement; color BDN 509.
  - b. MT2: Leigh Heidelberg Cement; color BDN 317.
  - c. MT3: Leigh Heidelberg Cement; color BDN 741.

- d. MT4: Leigh Heidelberg Cement; color BDN 776.
- 5. Metal Copings
  - a. M1: PPG Duranar, Burlesque.
  - b. M2: PPG Duranar, Medium Gray.
  - c. M3: PPG Duranar, to match Sherwin Williams “Yellow School Bus.”
  - d. M4: PPG Duranar, Candlelight Beige.
  - e. M5: Clear anodic coating, Architectural Class I; matte finish.

**END OF SECTION B2010.00**

**SECTION B2020.00**  
**EXTERIOR WINDOWS**

**PERFORMANCE**

A. Basic Function

1. Fill, cover, close, or otherwise protect all glazed 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. Where exterior window and other opening elements also must function as elements defined in another element group, meet requirements of both element groups.
4. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

B. Amenity and Comfort

1. Thermal Performance of Elements Forming Exterior/Interior Separation: Per Code.
2. Air Infiltration: Per Code.

C. Appearance

1. Sight Lines of Glazed Areas: Provide maximum glazing area with minimum interruption by framing members.
2. Frames: Construct frames of openings to give a flush appearance without shadow lines.

D. Health and Safety

1. Fire Resistance: Rating as required to maintain fire resistance rating of exterior wall in which they occur.
2. Operable Openings
  - a. Where operable units are indicated, provide in-swinging projecting (“hopper”) units unless otherwise indicated.
  - b. Provide stops to limit openings so that a 5” diameter sphere will not pass through. Provide stops that require special tools for adjustment or removal.
  - c. Provide insect screens to keep insects, birds, and animals out.
3. Window guards and security guards are **not** required.

E. Structure

1. Lintels: Constructed to span openings and support loads imposed by exterior wall; maximum deflection of 1/720 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.
- F. Durability
1. Air Intake and Exhaust Openings: Minimize rainwater penetration and protect adjacent interior spaces from damage from water.
  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. Provide end dams and other components in compliance with Materials and Systems Standards.
- G. Operation and Maintenance
1. Operating Components: Remaining operable for 10 years under normal exposure conditions for the project site.

## **PRODUCTS**

- A. Basis of Design:
- B. Window Finish Schedule
1. Basis of Design: PPG Duranar fluoropolymer coatings; colors as follows:
    - a. Silver Gray.

**END OF SECTION B2020.00**

**SECTION B2050.00**  
**EXTERIOR DOORS AND GRILLES**

**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. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

B. Amenity and Comfort

1. Thermal performance: In accordance with codes and referenced standards.
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 B20.
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 and knobs: 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, with power-assisted operation where required by codes and referenced standards.
  - c. Power-Assisted and -Operated Door Control
    - (1) Provide local actuators on each side unless otherwise indicated.
    - (2) Use least obtrusive method of control/actuation possible.
6. Appearance
  - a. Doors at building entrances: Match glazed wall framing.
  - b. Other pedestrian doors: Provide factory-applied paint finish in custom color(s).
    - (1) Provide factory-installed insulated lites where indicated.

- c. Where vestibules are provided, provide interior doors, frames and hardware to match exterior doors unless otherwise noted.

- (1) Do not provide access control hardware on interior vestibule doors.

#### 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 butt hinges shall be non-removable from outside without use of specialized 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.

- c. For exit doors and service doors not requiring access from the exterior, provide no exposed exterior hardware.
- d. Provide code-compliant factory preparation for all security and alarm components, including wiring, in exterior doors, frames and hardware.
- e. Glazing in doors: Comply with requirements for safety glazing, security, and forced entry specified in Sections B and B20.

#### D. Structure

- 1. Lintels: Constructed to span door openings and support loads imposed by exterior wall with maximum deflection vertically and horizontally of 1/240 of span.
- 2. Door frames: Constructed to span door opening with maximum deflection vertically and horizontally of 1/240 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 kick plates/mop plates in areas where foot impact is likely; highly scratch-resistant in areas where hand contact is likely.
  - b. Door handles and knobs: Satin stainless finish unless otherwise noted; 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.
5. Corrosion: Provide stainless steel base material for hinges, fasteners, pulls, kick and push plates, strikes, and similar components at doors exposed to weather or in wet locations.

F. Operation and Maintenance

1. Service life span of operating components: Remaining operable for service life of enclosure elements specified in Section B20 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. Proprietary Specifications

1. The following products or manufacturers have been approved by the Authority for proprietary specification and use in this Project:
  - a. Exit devices: Von Duprin.
  - b. Door closers: LCN.
  - c. Locksets and keying: Schlage Primus system.
2. Subject to compliance with codes and all project requirements, the Design-Builder is required to use the indicated products or manufacturers and to verify compatibility with the school district's existing systems.

B. Entrance Doors and Storefront

1. Provide:
  - a. Glazed aluminum doors with thermally broken frames.



- b. Factory finish in custom colors where indicated.
- C. Other Pedestrian Doors
- 1. Provide weatherstripping and thresholds.
  - 2. Provide keyed removable mullions at double doors.
  - 3. Unless otherwise indicated, provide FRP doors as follows:
    - a. Heavy-wall aluminum frames.
    - b. Insulated fiberglass reinforced polyester faced flush doors.
    - c. Factory finish in custom colors where indicated.
    - d. Sandstone texture.
    - e. Basis of Design: Special-Lite, Inc. FRP doors and heavy wall aluminum frames.
  - 4. Where indicated, provide steel doors and frames as follows:
    - a. Extra-heavy-duty, galvanized, insulated construction.
      - (1) Doors: Minimum 16-gauge.
      - (2) Frames: Minimum 14-gauge.
    - b. Factory finish in custom colors where indicated.
- D. Lintels
- 1. Use one of the following:
    - a. Precast concrete.
    - b. Galvanized steel.
- E. Sills
- 1. Use one of the following:
    - a. Precast concrete.
    - b. Cast stone.
- F. Concealed Flashings
- 1. Use:
    - a. Stainless steel flashing.
- G. Joint Sealers: Same as specified in Section B2010.
- H. Glazing in Doors
- 1. Double pane insulated glass units, tempered and/or laminated as required by code.
- I. Hardware for Swinging Doors
- 1. Use satin stainless steel finish, BHMA 630, US32D.
    - a. Do not use plated or coated finishes.
  - 2. Use fire-rated hardware on fire-rated doors.
  - 3. Hinges: Continuous hinges.

4. Exit devices: Unless specifically indicated as one type, provide surface mounted vertical rods.
  5. 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).
  6. Door closers: Unless specifically indicated as one type, surface overhead frame-mounted type or surface overhead door-mounted type.
    - a. Unless specifically indicated, do not use concealed overhead type, floor mounted type, or spring hinges.
    - b. Mount closer on interior/room side of door.
  7. Door stops: Unless specifically indicated as one type, overhead door/frame mounted type.
    - a. Do not use floor-mounted type or wall-mounted type.
  8. Door hold-opens: Unless specifically indicated as one type, overhead door/frame mounted type.
  9. Protection: Provide mechanically fastened stainless steel push plates and/or kick plates/mop plates at locations subject to service use or use by wheeled carts.
  10. Silencers: Provide three silencers on each door frame.
- J. 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.
- K. Frames
1. Provide steel or aluminum frames in accordance with door material and appearance.
    - a. Aluminum shall be a minimum of 1/8 inch (.125) thick, 6063 alloy T5 and 6061 alloy T6, for all aluminum entrance door and frame sections.
  2. Frame corners shall be internally reinforced and fully welded unit construction, with corners mitered and continuously welded full depth and width of frame. Frame shall be back welded.
  3. Entrance frames shall be mortised, reinforced, drilled and tapped for all mortise hardware per templates from the hardware supplier.
  4. Exterior doors and frames shall be weatherstripped at head, jambs, sills and meeting rails. Weatherstrip shall be continuous, vandal-resistant and field replaceable.
  5. Knock-down frames will not be accepted.
  6. Entrance door frames shall have continuous internal 12 gauge steel channel in hinge stile and jamb, arranged to reinforce mounting hinges.
  7. Provide frames at masonry openings with UL type masonry anchors, minimum of three per frame at each jamb.
  8. Provide caulking stops, filler pieces and trim where required, integrally formed as part of the frame.

9. Provide hardware reinforcement where specified by hardware manufacturer.
10. Provide cutouts and reinforcing for security devices as required.

L. Door Security Access System Requirements

1. Software package to be coordinated with District requirements.
2. Proximity card readers: Provide card readers as identified per Finish Hardware Schedule locations.
3. Proximity key tags: Provide quantity as required by District requirements.
4. Controller to be coordinated with District requirements.
5. Satellite expansion board: Verify requirements with District.
6. Power supply to be provided for all equipment.
7. Provide door position switch at all exterior doors.

M. Door Finish Schedule (Basis of Design)

1. Basis of Design: PPG Duranar fluoropolymer or manufacturer’s similar standard coating system; colors as follows:

**TABLE B2050.00-1  
 EXTERIOR DOORS AND FRAMES**

Door Type	Configuration	Door Material	Door Color	Frame Material	Frame Color
D1	Single or Pair	Alum/Glass	Silver Gray	Alum	Silver Gray
D2	Single or Pair	FRP	Silver Gray	Alum	Silver Gray

N. Finish Hardware Schedule

1. Basis of Design: The following hardware schedule represents the Basis of Design. Where an approved proprietary specification lists a product or manufacturer different from the product or manufacturer indicated below, comply with the proprietary specification and provide an item equivalent in performance to that listed below.
2. Not every type of hardware set that may be required is indicated on this schedule; nor is every necessary hardware component indicated. A complete door and hardware schedule, including all door openings and hardware components, shall be provided at the Preliminary Design phase for the Authority’s approval.
  - a. **HARDWARE SET #1:** Active leaf at entrance doors, Multi-Purpose Room to exterior, Cafetorium to exterior, and similar locations.
    - (1) Continuous hinge: Markar FM 300 edge mount stainless steel continuous hinge.
    - (2) Exit device: BEST Apex FL2200 fire exit series surface vertical rod exit device with BEST Apex 2110 rim device and 1E72 rim cylinder.
    - (3) Closer: LCN 2016 concealed door closer.
    - (4) Overhead stop with holder: Glynn-Johnson 80 Series HD.
    - (5) Lockset: BEST Apex 4900 A "A" lever.

- (6) Actuator: Code-compliant wall or pedestal mounted door actuator, location as directed by District.
  - (7) Silencers: Ives SR64 door silencers (3 per door).
  - (8) Power transfer: Power transfer to be provided in hinge.
  - (9) Power supply: Coordinate power supply requirement with all designated equipment.
  - (10) Mounting plate: Provide if required by manufacturer.
  - (11) Kick plate: Door mounted kick plate to be stainless steel 304 finish.
  - (12) Door sweep: Provide door manufacturer's standard sweeps.
  - (13) Electric strikes: Provide electric strikes per door access systems.
  - (14) Door opening
    - (a) Keyed removable mullion.
    - (b) Threshold: Code-compliant aluminum threshold, 6" x total door width.
    - (c) Weatherstripping: Provide manufacturer's standard.
    - (d) Proximity card reader: Verify location with District requirements.
- b. **HARDWARE SET #1A:** Inactive leaf at entrance doors, Multi-Purpose Room to exterior, Cafetorium to exterior, and similar locations.
- (1) Continuous hinge: Markar FM 300 edge mount stainless steel continuous hinge.
  - (2) Exit device: BEST Apex FL2200 fire exit series surface vertical rod exit device with BEST Apex 2110 rim device and 1E72 rim cylinder.
  - (3) Closer: LCN 2016 concealed door closer.
  - (4) Overhead stop with holder: Glynn-Johnson 80 Series HD.
  - (5) Lockset: BEST Apex 4900 A "A" lever.
  - (6) Silencers: Ives SR64 door silencers (3 per door).
  - (7) Mounting plate: Provide if required by manufacturer.
  - (8) Kick plate: Door mounted kick plate to match door material and finish.
  - (9) Door sweep: Provide door manufacturer's standard sweeps.
- c. **HARDWARE SET #2:** Each door at stair doors, Multi-Purpose Room exit doors, and other exterior doors without cylinders.
- (1) Butts: McKinney T4A3786, 4½" x 4½" (1½ pair per door).
  - (1) Exit device: BEST Apex FL2200 fire exit series surface vertical rod exit device with BEST Apex 2100 rim device and 1E72 rim cylinder.
  - (2) Closer: LCN 4040 surface mounted with extra duty arm 4040XP with EDA arm.
  - (2) Overhead stop with holder: Glynn-Johnson 80 Series.
  - (3) Lockset: Best 93 Series heavy duty locks, D function storeroom lockset.
  - (4) Silencers: Ives SR64 door silencers (3 per door).

- (5) Mounting plate: Provide if required by manufacturer.
- (6) Kick plate: Door mounted kick plate to match door material and finish.
- (7) Door sweep: Provide door manufacturer's standard sweeps.
- (8) Door Opening
  - (a) Keyed removable mullion
  - (b) Threshold: Code-compliant aluminum threshold, 6" x total door width.
  - (c) Weatherstripping: provide manufacturer's standard.
- d. **HARDWARE SET #3:** Each door at exterior Storage Room, Water Service Room, Utility Room and similar locations.
  - (1) Butts: McKinney T4A3786, 4½" x 4½" (1½ pair per door).
  - (3) Closer: LCN 4040 surface mounted with extra duty arm 4040XP with EDA arm.
  - (2) Lockset: Best 93 series heavy duty locks, D function storeroom lockset.
  - (3) Overhead stop with holder: Glynn Johnson 80 Series.
  - (4) Silencers: Ives SR64 door silencers (3 per door).
  - (5) Mounting plate: Provide if required by manufacturer.
  - (6) Kick plate: Door mounted kick plate to match door material and finish.
  - (7) Door sweep: Provide door manufacturer's standard sweeps.
  - (8) Gasketing: Provide door manufacturer's standard gasketing systems.
  - (9) Door Opening
    - (a) Keyed removable mullion (where applicable).
    - (b) Threshold: Code-compliant aluminum threshold, 6" x total door width.
    - (c) Weatherstripping: Provide manufacturer's standard.
- e. **HARDWARE SET #4:** Corridor to Roof Access
  - (1) Butts: McKinney T4A3786, 4½" x 4½" (1½ pair per door).
  - (2) Closer: LCN 4040 surface mounted with extra duty arm 4040XP with EDA arm.
  - (3) Lockset: Best 93 series heavy duty lock, G function communicating lockset.
  - (4) Overhead stop with holder: Glynn Johnson 80 series.
  - (5) Silencers: Ives SR64 door silencers (3 per door).
  - (6) Mounting plate: Provide if required by manufacturer.
  - (7) Kick plate: Door mounted kick plate to match door material and finish.
  - (8) Door sweep: Provide door manufacturer's standard sweeps.
  - (9) Gasketing: Provide door manufacturer's standard gasketing systems.
  - (10) Door Opening

- (a) Threshold: Code-compliant aluminum threshold, 6" x total door width.
- (b) Weatherstripping: Provide manufacturer's standard.

## **METHODS OF CONSTRUCTION**

- A. Perform work in accordance with the following:
  - 1. Door hardware: See Section C1030, Interior Doors.
- B. Metal-framed storefront doors: Extruded aluminum, factory-engineered, -fabricated, and -finished, fixed thermal framing supporting glazing, panels, and doors, complete with glazing, glazing seals, flashings, and anchors.
  - 1. Glazing method: Glazing caps with gaskets; allow for reglazing individual panes from exterior without disturbing adjacent panes.
  - 2. Gaskets and setting blocks: EPDM, ASTM C 864-2005; or silicone rubber, ASTM C 1115-2006.
  - 3. Structural glazing sealant: ASTM C 1184-2005 silicone.
  - 4. Designer qualifications: Licensed professional engineer.
- C. Insulated Fiberglass Reinforced Polyester Faced Doors
  - 1. Fiberglass reinforced polyester face material: 0.120-inch minimum thickness, with color integral through full thickness of face sheet and sandstone texture finish.
  - 2. Core material: Urethane foam of 5 pounds per cubic foot density for doors.
  - 3. Frames: Heavy-wall aluminum.
- D. Insulated Steel Doors and Frames
  - 1. Minimum 14-gauge doors and frames.
  - 2. Fully welded construction.
  - 3. Provide hot-dipped zinc-coated steel complying with ASTM A653-G90 or equivalent.

**END OF SECTION B2050.00**

**SECTION B2050.30**  
**EXTERIOR OVERSIZE DOORS**

**PERFORMANCE**

A. Basic Function

1. Secure oversize openings in the exterior wall as indicated to permit and control service access to the building.
  - a. Provide electrically operated insulated steel overhead coiling doors where indicated at loading dock and storage shed.
  - b. Provide oversize flush structural steel doors where indicated at generator and transformer enclosures.
2. The elements comprising exterior oversize doors include door components that form or complete the openings, unless an integral part of another element.
3. Where exterior oversize door elements also must function as elements defined within another element group, meet requirements of both element groups.
4. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

B. Amenity and Comfort

1. Overhead Coiling Doors
  - a. Thermal Performance: R-value minimum 14.86 and in accordance with codes and referenced standards.
  - b. Air Infiltration: Maximum of .08 cfm/ft<sup>2</sup> at 15 and 25 mph, measured in accordance with ASTM E 283.
  - c. Convenience and Accessibility
    - (1) Mode of Operation: Electrically operated, with exterior card operation integral with security system.
2. Oversize structural steel doors: Provide manually operated doors, insulated where appropriate.
3. Appearance: Provide manufacturer's heaviest-duty factory-applied baked-on finish in custom color(s) as indicated.

C. Health and Safety

1. Emergency Egress
  - a. Do not use oversize doors to satisfy egress requirements.
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.

3. Physical Security
  - a. Provide locking mechanism designed to maintain building security and prevent unauthorized access from exterior.
  - b. For doors not requiring access from the exterior, provide no exposed exterior hardware.
  - c. Provide code-compliant factory preparation for all security and alarm components, including wiring, in exterior oversize doors, frames and hardware.
- D. Structure
  1. Lintels: Constructed to span door openings and support loads imposed by exterior wall with maximum deflection vertically and horizontally of 1/240 of span.
  2. Door frames: Constructed to span door opening with maximum deflection vertically and horizontally of 1/240 of span.
- E. Durability
  1. Structural performance: Provide doors and frames capable of withstanding design wind loads.
  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.
  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 B20 under normal exposure conditions for the project site.
  2. Ease of use and repair: Provide oversize doors that will be easy to use by occupants, easy to repair or service, and with operating components easy to replace.

## **PRODUCTS**

- A. Overhead Coiling Doors
  1. Basis of Design: 625 Series Insulated Service Door by Overhead Door Corporation
- B. Oversize Structural Steel Doors
  1. Basis of Design: Ambico structural galvanized steel doors and frames.
  2. Provide keyed removable mullions at double doors.



3. At transformer enclosure, provide infill panels to match welded wire site fencing.
- C. Lintels
1. Use one of the following:
    - a. Precast concrete.
    - b. Galvanized Steel.
- D. Sills
1. Use one of the following:
    - a. Precast concrete.
    - b. Cast stone.
- E. Concealed Flashings
1. Use:
    - a. Stainless steel flashing.
- F. Joint sealers: Same as specified in Section B2010.
- G. Hardware for Swinging Doors
1. Provide factory-supplied and pre-installed heavy weight hinges and door latches.
    - a. Do not use plated or coated finishes.
  2. Use hardware consistent and compatible with the requirements of Section B2050.00, Exterior Doors and Grilles.
- H. 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.
- I. Frames
1. Provide manufacturer's standard galvanized steel frames in accordance with door opening requirements, material and appearance.
  2. Frame corners shall be internally reinforced and fully welded unit construction, with corners mitered and continuously welded full depth and width of frame. Frame shall be back welded.
  3. Entrance frames shall be mortised, reinforced, drilled and tapped for all mortise hardware per templates from the hardware supplier.
  4. For insulated units, provide manufacturer's standard weather seals at head, jambs, sill and meeting rails. Weather seals shall be continuous, vandal-resistant and field replaceable.
  5. Knock-down frames will not be accepted.
  6. Provide frames at masonry openings with UL type masonry anchors, minimum of three per frame at each jamb, and as required by door manufacturer for size of door provided.
  7. Provide caulking stops, filler pieces and trim where required, integrally formed as part of the frame.

8. Provide hardware reinforcement where specified by hardware manufacturer.
  9. Provide cutouts and reinforcing for security devices as required.
- J. Door Finish Schedule
1. Basis of Design: G90 galvanizing; factory prime coat(s) and manufacturer's heaviest-duty factory-applied finish system; color Silver Gray.

**END OF SECTION B2050.30**

**SECTION B2080.00**  
**EXTERIOR WALL APPURTENANCES**

**PERFORMANCE**

**A. Basic Function**

1. Exterior wall appurtenances include all elements attached to the outside of the exterior walls, except where an integral part of equipment or service elements. Appurtenances required are those made necessary by the design and may include the following:
  - a. Exterior louvers.
  - b. Exterior canopies.
  - c. Exterior railings and handrails.
  - d. Main building identification signs.
  - e. Wall-mounted flagpole.
2. Where exterior wall appurtenances 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. Do not provide exterior wall appurtenances that are lower than 12 feet above adjacent grade, with the exception of railings and handrails.
4. Basis of Design: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

**B. Amenity and Comfort**

1. Railings and handrails
  - a. Provide exterior tube railings, balusters, guard rails, wall railings, infill panels and fittings at all stairs, ramps, and other locations to protect, assist and guide people and as required to meet all applicable codes and standards.
  - b. Provide railings and handrails that are in full compliance with barrier-free and all other codes and standards.
  - c. Provide railings and handrails that are smooth in texture, with formed radius ends and bends and all joints welded and ground smooth.
2. Signs: Provide signs that are legible during daylight and nighttime hours by pedestrians and motorists from far side of adjacent street.

**C. Structure**

1. Provide engineered anchorage for all wall appurtenances, to support all dead and applied loads in accordance with codes and other standards.
2. For louvers, sunscreens, canopies, and other large appurtenances subjected to significant gravity, wind, snow or other loading, provide for structural support from building structural frame and/or foundation rather than from exterior wall.
3. For railings, signs, and other small appurtenances attached to exterior wall, provide embedments installed during wall construction wherever possible.

4. Assemble units in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces
  5. Thermal Movements: Provide expansion joints that allow for thermal movements resulting from locally anticipated change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
- D. Durability
1. Water Penetration Resistance
    - a. Maintain integrity of exterior wall envelope at all points of wall appurtenance penetration and attachment.
    - b. Air intake and exhaust openings: Minimize rainwater penetration and protect adjacent interior spaces from damage from water.
      - (1) Provide louvers in compliance with AMCA 511 Penetration Class A for wind-driven rain.
- E. Material and Finish
1. Provide appurtenances with all exposed components constructed of stainless steel, aluminum, or other noncorrosive materials.
  2. For all natural aluminum finishes, provide matte finish Architectural Class I clear finish.
  3. For all painted finishes, provide mica fluoropolymer or metallic fluoropolymer finish complying with AAMA 2605, in manufacturer's standard range of colors.
  4. For all other noncorrosive materials, provide exposed surfaces without painted or coated finishes wherever possible.
- F. Impact Resistance
1. Locate, fabricate and install all exterior wall appurtenances to resist damage from vandalism.
  2. Locate, fabricate and install all exterior wall appurtenances to protect building users and passersby, and to resist damage from vehicles and pedestrians.

## **PRODUCTS**

- A. Exterior Louvers
1. Provide custom aluminum louvers as follows:
    - a. AMCA 511 Class A for wind-driven rain.
    - b. Sightproof for first floor installations.
  2. Provide interior bird screens.
  3. Provide insulated blank-off panels to close portions not needed for ventilation.
  4. Provide motor-operated dampers and other features as required by HVAC design.

5. Provide factory-applied fluoropolymer finish in manufacturer's standard colors.
- B. Canopies
1. Basis of Design: MASA Architectural Canopies, Avenel NJ.
  2. Provide custom aluminum canopies as indicated and as follows:
    - a. Aluminum extrusions: ASTM B221 and ASTM B429 6061-T6; 6063-T6 for anodized finish.
    - b. Ground supports: Galvanized steel pipe with concrete foundation; minimum size 6" diameter.
    - c. Building supports: Minimum 1" diameter steel hangar rod; anchored to building framing.
    - d. Decking: Interlocking extruded aluminum decking.
      - (1) Provide panel width and thickness as required to prevent deformation, oilcanning and ponding.
      - (2) Provide positive slope to drainage system.
    - e. Fascia: Extruded aluminum; minimum thickness .125".
    - f. Drainage: Concealed to underground drainage system.
    - g. Finish: Duranar XL (three-coat system) unless otherwise noted.
      - (1) Canopy color: As indicated.
      - (2) Pipe column color: As indicated.
- C. Railings and Handrails
1. Provide aluminum railings, balusters, guard rails, wall railings, infill panels and fittings at all stairs, ramps, and other locations to protect, assist and guide people and as required to meet all applicable codes and standards.
    - a. Provide railings that are in full compliance with barrier-free codes and standards.
    - b. Provide railings that are smooth in texture, with formed radius ends and bends and all joints welded and ground smooth.
    - c. Fabricate railings in maximum practical lengths to minimize field connections.
    - d. Provide anchorage for railings with sufficient strength and rigidity to withstand loads prescribed by code.
  2. Provide ASTM B 221, Alloy 6063-T6 or 6005A-T5; Standard Weight (Schedule 40) pipe for handrail, Schedule 80 for posts.
  3. Provide vertical intermediate pickets welded to rails or guards; minimum diameter 3/4".
  4. Basis of Design: HDI Railing Systems or Hollaender Architectural Handrail Systems.
- D. Signs
1. Mount signs as indicated, for visibility from adjacent street.
  2. Provide dimensional letter signs using stainless steel letters.
    - a. Typeface: As indicated.

- b. Letter Height: As indicated.
- c. Depth: Three inches.
- d. Finish: Similar to PPG Duranar XL with clear finish coat; color(s) as indicated.
- e. Sign Message: [NAME OF SCHOOL].

## **METHODS OF CONSTRUCTION**

### **A. Materials**

- 1. Provide hot-dip galvanizing or stainless steel for all ferrous components.
- 2. Provide positive separation of dissimilar metals.

### **B. Anchorages and Attachments**

- 1. Provide anchorages and attachments that permit and facilitate removal if repair or replacement becomes necessary.
- 2. Provide concealed fasteners, anchorages and attachments wherever feasible. Where fasteners, anchorages and attachments must be exposed, provide tamperproof systems.
- 3. To the extent possible, provide anchorages for embedment at time of masonry construction.

### **C. Louvers and other openings**

- 1. Construct openings and components of openings to provide positive drainage of water to exterior of the building.
- 2. 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.
- 3. 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. Provide end dams and other components in compliance with Materials and Systems Standards.

**END OF SECTION B2080.00**

**SECTION B3010.50**  
**LOW SLOPE ROOFING**

**PERFORMANCE**

**A. Basic Function**

1. Provide a weather-resistive covering for low-slope roofing where indicated, over the top side of the roof superstructure and any exposed floor superstructure.
2. Provide low-slope roofing to resist the effects of weather and loading conditions without excessive deflection, destruction of adhesive bond, fracture of insulation, or premature failure of the roof system.
3. Provide a coordinated system of all weather-resistive components, including the primary weather barrier, vapor retarders, insulation, water collectors and conductors, wearing surfaces, trim and accessories, fully compatible with one another and adjacent materials and with all roof opening elements and roof fixtures under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.
4. Where roof covering elements also must function as elements defined within another element group, meet requirements of both element groups.
5. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

**B. Amenity and Comfort**

1. Thermal performance and solar reflectance: In accordance with applicable codes and project requirements, including LEED certification.
2. Provide continuous moisture barrier and thermal insulation over entire enclosure.

**C. Health and Safety**

1. Roofing, base flashings, and component materials shall comply with requirements in FM Global 4450 or FM Global 4470 as part of a roofing system, and shall be listed in FM Global's "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
  - a. Fire/windstorm classification: Class 1A-90.
  - b. Hail resistance: MH.

**D. Structure**

1. Provide roofing structure and substrate sufficiently rigid or dense to support water barrier in a manner that prevents damage due to traffic on roof.
2. Provide roofing capable of withstanding the effects of gravity loads and other loads and stresses within limits and under conditions required by code and referenced standards.
  - a. Wind and snow loads: Determine loads based on code requirements and the project's specific location and design.

- b. Deflection limits: Roofing assemblies shall withstand wind and snow loads with vertical deflections no greater than 1/240 of the span.
    - (1) Provide roofing assemblies that will sustain the anticipated live load if drainage is obstructed.
  - c. Allow for thermal movements resulting from ambient and surface temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
    - (1) Minimum temperature change (range): 120 deg F (67 deg C), ambient on material surfaces.
  - 3. Provide minimum design slope of ¼" per foot (1:48). To the extent possible, slope roof structure to provide positive drainage under design loading conditions.
- E. Weather Resistance
- 1. General performance: Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and base flashings shall remain watertight.
    - a. Accelerated weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
    - b. Impact resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.
- F. Durability
- 1. Life span: In accordance with project requirements and the following:
    - a. Manufacturer approval of design: Where roof covering manufacturer recommends or requires certain design features for satisfactory performance or for warranty, comply with manufacturer's requirements.
    - b. Manufacturer Warranty
      - (1) Special weathertightness warranty for roofing system: Manufacturer's standard form in which manufacturer agrees to repair or replace roof assemblies that fail to remain weathertight, including leaks, within specified warranty period.
        - (a) Warranty Period: 20 years from date of Substantial Completion.

## PRODUCTS

- A. Basis of Design: EPDM Roofing System
- 1. Provide a complete roofing assembly including but not limited to EPDM roofing, auxiliary roofing materials, substrate board, vapor retarder, insulation, walkway pavers, and all related accessories.
  - 2. Provide the following:
    - a. Fully Adhered EPDM Roofing
      - (1) Fabric-backed EPDM: ASTM D 4637, Type III, nonreinforced, uniform, flexible EPDM sheet, laminated to a nonwoven polyester fabric backing except at selvages.



- (2) Composite thickness: 105 mils (2.7 mm) nominal.
- (3) Exposed face color: White.
- b. Auxiliary roofing materials: As provided or approved by the roofing manufacturer for compatibility with all roofing system components.
- c. Substrate board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, ½" (13 mm) thick.
- d. Insulation Board
  - (1) Polyisocyanurate board insulation: ASTM C 1289, Type II, Class 1, Grade 3, felt or glass-fiber mat facer on both major surfaces.
  - (2) Thickness: As required for compliance with all codes and project requirements.
  - (3) Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where necessary for sloping to drain.
- e. Flexible Walkways
  - (1) Walkway material: Factory-formed, nonporous, heavy-duty, solid-rubber, slip-resisting, surface-textured walkway rolls, approximately 3/16 inch (5 mm) thick and acceptable to roofing system manufacturer.
  - (2) Install walkways where necessary to provide access to all rooftop equipment, including all connections, controls and access panels.
  - (3) Adhere walkways to roofing membrane in a manner acceptable to the roofing system manufacturer.
  - (4) Ensure that edges and corners are secured and will not curl.
  - (5) Install walkways so as to avoid interference with roof drainage.

**END OF SECTION B3010.50**

# **ELEMENT C**

# **INTERIORS**

**SECTION C1000.00**  
**INTERIOR CONSTRUCTION**

**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. Provide all elements necessary to subdivide and finish space enclosed within the shell, including applied interior surfaces of the exterior enclosure, as well as 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. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

**B. Amenity and Comfort**

1. Access: Provide access to all primary interior spaces from circulation spaces. Avoid primary interior spaces that may be accessed exclusively through another primary interior space.
2. View: Provide child-height views to the building exterior from most locations within primary interior spaces.
3. Natural Light
  - a. Light Levels: Provide minimum light levels for activities as indicated in referenced standards.
  - b. Visual Comfort: Provide ambient natural light in primary spaces that is free of excessive direct or reflected glare, as defined in IESNA Recommended Practice of Daylighting.
4. Acoustical Performance
  - a. Background Noise: Provide interiors that maintain ambient sound levels within primary spaces at levels recommended in ANSI /ASA Standard S12.60 and other referenced standards.

5. 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) Kitchens.
      - (2) Toilet rooms.
      - (3) Locker or changing rooms.
      - (4) Custodial rooms.
      - (5) Trash collection and recycling spaces.
  6. Appearance: Provide interiors that are pleasing in appearance and do not detract from the primary functions performed in each space.
  7. 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 construction proven by mock-up to be compliant with codes and referenced standards.
    - b. For construction proven by mock-up, acceptable testing agencies are Underwriters Laboratories Inc., Intertek/Warnock-Hersey, and Factory Mutual.
    - c. Minimum performance values for individual interior elements are also specified in other Sections.
- D. Structure
1. Structural Performance: Provide interior construction and fixtures to support without damage all loads required by code.
    - a. Special Loads
      - (1) 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.
- E. Durability
1. Wear Resistance: Provide interiors that are suitable in durability for the degree and type of traffic to be anticipated in each space.

2. **Water Resistance:** At toilet rooms, utility rooms, mechanical rooms and custodial spaces, provide interiors that will not be damaged by water or high humidity, and withstand continuous or intermittent exposure without significant changes in dimension.
  3. **Corrosion Resistance:** At kitchen and toilet rooms, provide interiors that are inherently resistant to corrosion and rot.
  4. **Ultraviolet Resistance:** In interior spaces exposed to direct sunlight, provide interiors that are inherently resistant to fading and discoloration.
  5. **Vandal Resistance:** In spaces accessible to the public and not subject to continuous surveillance, provide interiors that are inherently vandal-resistant or designed to be difficult to access or damage.
- F. **Operation and Maintenance**
1. **Cleaning:** Provide interiors throughout that will not be damaged by ordinary cleaning and maintenance operations.
  2. **Special Cleaning:** At toilet rooms, shower rooms, trash collection rooms, and janitorial closets, provide interiors that will allow harsh chemical cleaning without damage.

**END OF SECTION C1000.00**

**SECTION C1010.00**  
**INTERIOR 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. Where partition elements also must function as elements defined within another element group, meet requirements of both element groups.
3. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

B. Amenity and Comfort

1. 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.

2. Health and Safety

- a. Fire resistance: Provide fire ratings as required by code.
- b. 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.

3. Structure

- a. Lintels: Constructed to span openings in partitions and support imposed loads with maximum deflection vertically and horizontally of 1/360 of span.
- b. 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.
- c. Horizontal loads: Provide partitions with sufficient strength and rigidity to withstand anticipated Code prescribed horizontal loading conditions without excessive deflection or structural damage.

**PRODUCTS**

A. Fixed Partitions

1. Construct all partitions in a manner consistent with Materials and Systems Standards and all project requirements.

2. Construct partitions using the following:
  - a. Drywall shall be used for partitions at the following locations:
    - (1) Between classrooms and other classrooms.
    - (2) Between classrooms and individual toilet rooms within classrooms.
    - (3) Between offices and corridors within office suites.
    - (4) Between offices and other offices.
    - (5) Between rooms within the Media Center.
  - b. Concrete masonry units shall be used for partitions at the following locations:
    - (1) At interior surfaces of exterior walls.
    - (2) At all corridors, stairways and vestibules (except as noted above).
    - (3) At Gymnasium, Cafetorium and Stage.
    - (4) At Art and Music Classrooms.
  - c. Concrete masonry units or drywall may be used at all other locations.
3. Drywall finish is not required for masonry surfaces where its sole purpose would be to achieve consistency with neighboring drywall finishes.

**END OF SECTION C1010.00**

**SECTION C1010.50**  
**INTERIOR OPERABLE PARTITIONS**

**PERFORMANCE**

**A. Basic Function**

1. Provide interior operable partitions between adjacent spaces where required by the program or where proper functioning of adjacent spaces requires limited visual or physical connection between them.
  - a. Provide operable partition at Stage proscenium.
2. Interior operable partitions comprise the following elements:
  - a. Movable barriers that form solid, visual and acoustical subdivisions of a space.
3. Where interior operable partitions are integral with elements defined within another element group, meet requirements of both element groups. Operable partitions, when closed, function as partition elements and must not degrade performance of adjoining partitions below the levels specified.
4. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

**B. Amenity and Comfort**

1. Acoustical Performance:
  - a. FSTC values: Provide in-place FSTC values for interior operable partitions that are not less than NIC values specified for interior construction.
  - b. STC rating: Minimum 53-57, calculated in accordance with ASTM E413-2004.
2. Appearance
  - a. Compatibility: Provide interior operable partitions that are compatible in appearance with surrounding construction, employing similar materials, colors, and textures.

**C. Health and Safety**

1. Fire resistance: Provide ratings as required to maintain fire resistance rating of surrounding partitions.
2. Provide safety and operating features as required by code and industry standards.

**D. Structure**

1. Lintels: Constructed to span openings and support loads imposed by partitions, with maximum deflection in accordance with code and manufacturer's requirements, vertically and horizontally.

**PRODUCTS**

**A. Operable Interior Partitions**

1. Basis of Design: Moduflex Series 600 by Panelfold Corporation.



- a. Provide continuously hinged electrical operation with two key-operated hand-held control stations at either side of Stage.
- b. Provide code-compliant safety devices including limit switches and obstruction detection devices for panel path and storage pocket.
- c. Provide matching locking storage pocket door, keyed with school master keying system.
- d. Provide impact-resistant panel faces and edge trim on both sides and all edges of panels.

**END OF SECTION C1010.50**

## **SECTION C1020.00**

### **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.
  - 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. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

##### **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.
2. Appearance
  - a. Frames: Designed and constructed to give a flush appearance with minimal shadow lines.
  - b. Muntins: Do not use muntins to subdivide interior windows.

##### **C. Health and Safety**

1. Fire Resistance: Provide window rating as required to maintain fire resistance rating of surrounding partition.

##### **D. Structure**

1. Lintels: Constructed to span openings and support loads imposed by partition, with maximum deflection of 1/360 of span, vertically and horizontally.

#### **PRODUCTS**

##### **A. Operable Windows**

1. Provide all-metal frame, hardware and lock for sliding panel at transoms windows.
2. Glazing: Provide single-pane laminated safety glass.

B. Fixed Windows

1. Glazing: Single-pane glazing, unless otherwise required to comply with acoustical or code requirements.
2. Provide:
  - a. Metal windows.
  - b. Windows matching operable windows, but without operating sash, at openings not requiring operation.

C. Glazing

1. Provide one of the following:
  - a. Fully tempered glass.
  - b. Laminated glass.
  - c. Ceramic glass at fire rated openings.
  - d. Other glazing materials where required by code.

D. Interior Window Supplementary Components: All components required to complete the opening.

E. Lintels

1. Use one of the following:
  - a. Steel.
  - b. Precast concrete.
  - c. Masonry bond beams.

**END OF SECTION C1020.00**

## **SECTION C1030.00**

### **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. 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.
3. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

##### **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.

###### **2. Convenience**

- a. Dimensions: Provide interior doors that are sized appropriately for people, vehicles, and goods likely to move between adjacent spaces.
  - (1) Height: Not less than 84 inches in height.
  - (2) Width: Not less than 36 inches in width, except for doors to shallow closets.
  - (3) For doors in masonry walls, provide overall door and frame dimensions that conform to masonry dimensions and coursing. Locate doors to minimize cutting of masonry units.
- b. Closing Devices: Required on all doors; provide smooth closing motion, with slower latching speed than closing speed (no slamming).

###### **3. Appearance**

- a. Provide interior doors coordinated with adjacent wall surfaces, using coordinated materials, colors, and textures.

##### **C. Health and Safety**

1. Fire safety: Protect door openings in fire-rated walls and partitions in accordance with codes and the following:
  - a. Hold-open function: Unless otherwise indicated at fire doors and other doors in corridors, provide code-compliant wall-mounted hold-open function device that allows the door to swing freely and that automatically closes door upon initiation of alarm.
  - 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 permitted.
    - b. Where required by codes or referenced standards, provide code-compliant exit hardware that releases the locking/latching mechanism upon the application of a force in the direction of egress travel.
  3. Physical Security
    - a. Locksets: 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:
          - (i) Doors into exit stairwells.
          - (ii) Doors across corridors that impede egress.
        - (b) The following may have privacy lock function (without key):
          - (i) Doors to water closet compartments, shower compartments, or single person restrooms.
      - (2) Keys: As specified in Section B2050.00.
        - (a) Keying: Key to the district's 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.
        - (a) Provide the services of a Door and Hardware Institute Architectural Hardware Consultant to schedule lock functions in accordance with district hardware standards.
        - (b) Provide "Intruder" lock function at all classrooms and pupil occupied spaces.
        - (c) Provide exit devices at all stairs and pairs of doors servicing occupied spaces.
        - (d) Exterior doors: See Section B2050.
    - b. Provide code-compliant factory preparation for all security and alarm components, including wiring, in interior doors, frames and hardware.
    - c. Glazing in doors: Comply with all code and project requirements for fire ratings, safety glazing, security, and forced entry.
- D. Structure
1. Lintels: Constructed to span door openings and support loads imposed by exterior wall with maximum deflection vertically and horizontally of 1/240 of span.
  2. Door frames: Constructed to span door opening with maximum deflection vertically and horizontally of 1/240 of span.

E. Durability

1. 1. Wear Resistance

- a. Door surfaces: Scuff-resistant kick plates and mop plates in areas where foot impact is likely; highly scratch-resistant in areas where hand contact is likely; mechanically fastened applied protective surfaces for vulnerable areas are acceptable.
  - b. Door handles and knobs: Brushed/satin stainless finish unless otherwise noted; highly scratch-resistant and of finish that will minimize appearance changes due to wear; no plated or coated finishes.
2. Flexible seal materials: Select materials and design to 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.
  4. Corrosion: Provide stainless steel base material for hinges, fasteners, pulls, kick and push plates, strikes, and similar components at doors exposed to weather or in wet locations.

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 B20 under normal exposure conditions for the project site.

**PRODUCTS**

A. Proprietary Specifications

1. The following products or manufacturers have been approved by the Authority for proprietary specification and use in this Project:
  - a. Exit devices: Von Duprin.
  - b. Door closers: LCN.
  - c. Locksets and keying: Schlage (Primus System).
2. Subject to compliance with codes and all project requirements, the Design-Builder is required to use the indicated products or manufacturers and to verify compatibility with the school district's existing systems.

B. Interior Pedestrian Doors

1. Use one of the following:
  - a. Hollow steel flush doors and frames at utility and maintenance areas.
  - b. Solid-core flush wood doors for all other areas.
  - c. Glazed aluminum doors of heavy wall design at entrances and vestibules.

C. Interior Coiling Doors and Counter Doors

1. Use the following:
  - a. Overhead coiling doors and counter doors.

D. Closet Doors

1. Use the following:
  - a. Flush wood doors.

E. Door Frames

1. Use the following:
  - a. Steel frames.

F. Sills

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

G. Glazing in Doors

1. Use one of the following:
  - a. Fully tempered glass.
  - b. Laminated glass.
  - c. Ceramic glass meeting impact requirements at fire rated doors.
  - d. Security glazing where specified.
2. Provide blackout shades for glazing in doors or sidelights at classroom toilet room doors and classroom doors.

H. Door Louvers

1. Louvers in metal doors: Same material as doors.
2. Louvers in wood doors: Use one of the following:
  - a. Steel louvers.
  - b. Wood louvers.

I. Hardware for Swinging Doors

1. Use satin stainless finish, BHMA 630, US32D.
2. Use fire-rated, UL listed hardware on fire-rated doors. Provide UL listing on all appropriate frame and hardware locations.
3. Hinges: Ball-bearing butt hinges or continuous hinges.
4. Exit devices: Unless specifically indicated, provide surface-applied vertical rod.
5. Locksets: Unless specifically indicated as one type, mortise or bored (cylindrical).
  - 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.
  - 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. Provide door stops at all locations where door swing may hit a wall or other fixed object, or where extended door swing may damage door or hardware.
    - b. Do not use floor-mounted door stops where they present a trip hazard.
  8. Door hold-opens: Unless specifically indicated as one type, provide magnetic wall-mounted type.
    - a. Do not use floor-mounted type, overhead-mounted type, or hold-open feature in closer alone without a separate stop.
  9. Protection: Provide mechanically fastened stainless steel push plates and/or kick plates at locations subject to service use or use by wheeled carts or heavy usage.
  10. Gaskets and sweeps: Provide gaskets and sweeps to provide thermal, fire and smoke, and acoustical isolation as required by code and project requirements.
    - a. Provide aluminum gaskets and sweeps with concealed mechanical fasteners and replaceable brushes and seals.
    - b. Basis of Design
      - (1) Perimeter gaskets: Pemko 29310CP or 29344CSB
      - (2) Sweep: Pemko 293100CNB
- J. Frames
1. Provide steel frame construction to comply with Steel Door Institute standards for interior applications.
  2. The face width of all frames for doors, transoms, sidelights and borrowed lights shall be 2 inches.
  3. Minimum frame gauges shall be 16-gauge.
  4. Frames shall be welded one-piece unit types.
  5. Removable glazing stops shall be applied with cadmium-plated, small head Jackson screws. Removable stops shall be located on the secure side of controlled access openings.
  6. Frames shall be accurately formed to indicated profiles and assembled with hairline joints. Faces shall be mitered at corners. Corners shall be continuously back-welded full depth and width of frame. Exposed welds shall be ground smooth. Final assembly shall be square and true, with no evidence of welds on exposed faces.
  7. Knock-down frames will not be accepted.
  8. Frame material shall be mortised, reinforced, drilled and tapped for all mortise hardware using templates that the hardware supplier provides. Steel reinforcements, welded to frames, shall be provided at hinge and pivot reinforcement (3/16" x 1-1/2" x 9"); closer and holder locations (12 gauge x 14" by frame width) and floor clips (16 gauge x 3-1/2").
  9. Provide frames at masonry openings with adjustable, 18-gauge, UL type masonry anchors, minimum of three per frame at each jamb. Maximum spacing shall not exceed 6" at center.



10. Provide caulking stops, filler pieces and trim where required, integrally formed as part of the frame.
  11. Provide three mechanically fastened rubber silencers at the strike jambs for all door frames.
  12. Provide factory-fabricated cutouts and reinforcing for security devices as required.
- K. Door Security Access System Requirements
1. Coordinate hardware and software with district requirements.
  2. Proximity card readers: Provide card readers as identified in Finish Hardware Schedule locations.
  3. Proximity key tags: Provide quantity as required by district.
  4. Controller shall be coordinated with district requirements.
  5. Satellite expansion board: Verify requirements with district.
  6. Power supply shall be provided for all equipment.
  7. Provide door position switches per district requirements.
- L. Finish Hardware Schedule
1. Basis of Design: The following hardware schedule represents the Basis of Design. Where an approved proprietary specification lists a product or manufacturer different from the product or manufacturer indicated below, comply with the proprietary specification and provide an item equivalent in performance to that listed below.
  2. Not every type of hardware set that may be required is indicated on this schedule; nor is every necessary hardware component indicated. See also additional information on Design-Build drawings. A complete door and hardware schedule, including all door openings and hardware components, shall be provided at the Preliminary Design phase for the Authority's approval.
    - a. **HARDWARE SET #1:** Active leaf at pairs of doors at interior entrances, Main Office, Cafetorium entrance, and other locations as noted.
      - (1) Continuous hinge: Markar FM 300 edge mount stainless steel continuous hinge.
      - (2) Exit device: BEST Apex FL2200 fire exit series surface vertical rod exit device with BEST Apex 2110 rim device and 1E72 rim cylinder.
      - (3) Closer: LCN 2016 concealed door closer.
      - (4) Overhead stop with holder: Glynn-Johnson 80 Series HD.
      - (5) Lockset: BEST Apex 4900 A "A" lever.
      - (6) Actuator: Code-compliant wall or pedestal mounted door actuator at interior Entrance Lobby door only.
      - (7) Silencers: Ives SR64 door silencers (3 per door).
      - (8) Power transfer: Power transfer to be provided.
      - (9) Power supply: Coordinate power supply requirements with all designated equipment.

- (10) Mounting plate: Provide if required by manufacturer.
- (11) Kick plate: Door mounted kick plate to match door material and finish.
- (12) Electric strikes: Provide per hardware requirements.
- (13) Door Opening
  - (a) Keyed removable mullions
  - (b) Threshold: Code-compliant aluminum threshold, 6" x total door width.
  - (c) Weatherstripping: Manufacturer's standard.
  - (d) Proximity card reader: Verify location with district requirements.
- b. **HARDWARE SET #1A:** Inactive leaf at pairs of doors at interior entrances, Main Office, Cafetorium entrance, and other locations as noted.
  - (1) Continuous hinge: Markar FM 300 edge mount stainless steel continuous hinge.
  - (2) Exit device: BEST Apex FL2200 fire exit series surface vertical rod exit device with BEST Apex 2110 rim device and 1E72 rim cylinder.
  - (3) Closer: LCN 2016 concealed door closer.
  - (4) Overhead stop with holder: Glynn-Johnson 80 Series HD.
  - (5) Lockset: BEST Apex 4900 A "A" lever.
  - (6) Silencers: Ives SR64 door silencers (3 per door).
  - (7) Mounting plate: Provide if required by manufacturer.
  - (8) Kick plate: Door mounted kick plate to match door material and finish.
- c. **HARDWARE SET #2:** Each door at stair doors and other doors without cylinders
  - (1) Butts: McKinney T4A3786, 4½" x 4½" (1½ pair per door).
  - (2) Exit device: BEST Apex FL2200 fire exit series surface vertical rod exit device with BEST Apex 2100 rim device and 1E72 rim cylinder.
  - (3) Closer: LCN 4040 surface mounted with extra duty arm 4040XP with EDA arm.
  - (4) Overhead stop with holder: Glynn-Johnson 80 Series.
  - (5) Lockset: Best 93 series heavy duty lock, N function passage lock.
  - (6) Silencers: Ives SR64 door silencers (3 per door).
  - (7) Mounting plate: Provide if required by manufacturer.
  - (8) Kick plate: Door mounted kick plate to match door material and finish.
- d. **HARDWARE SET #3:** Doors at Storage Rooms, Closets, Mechanical and Electrical Rooms, and Utility Rooms
  - (1) Butts: McKinney TA2714, 4½" x 4½" (1½ pair per door).
  - (2) Closer: LCN 4040 surface mounted with extra duty arm 4040XP with EDA arm.
  - (3) Lockset (1): Best 93 series heavy duty locks, D function storeroom lockset.

- (4) Overhead stop with holder: Glynn Johnson 80 series.
  - (5) Silencers: Ives SR64 door silencers (3 per door).
  - (6) Mounting plate: Provide if required by manufacturer.
  - (7) Kick plate: Door mounted kick plate to match door material and finish.
- e. **HARDWARE SET #4: Main Office Door**
- (1) Butts: McKinney T4A3786, 4½" x 4½" (1½ pair per door).
  - (2) Closer: LCN 4040 surface mounted with extra duty arm 4040XP with EDA arm.
  - (3) Lockset (1): Best EXBV Series BASIS V, proximity card reader, TV function deadbolt w/key override; mortise lock.
  - (4) Overhead stop with holder: Glynn Johnson 80 series.
  - (5) Silencers: Ives SR64 door silencers (3 per door).
  - (6) Mounting plate: Provide if required by manufacturer.
  - (7) Kick plate: Door mounted kick plate to match door material and finish.
- f. **HARDWARE SET #5: Doors at individual faculty Toilet Rooms**
- (1) Butts: McKinney TA2714, 4½" x 4½" (1½ pair per door).
  - (2) Closer: LCN 4040 surface mounted with extra duty arm 4040XP with EDA arm.
  - (3) Lockset (1): Best 93 series heavy duty locks, L function privacy lockset.
  - (4) Overhead stop with holder: Glynn Johnson 80 series.
  - (5) Silencers: Ives SR64 door silencers (3 per door).
  - (6) Mounting plate: Provide if required by manufacturer.
  - (7) Kick plate: Door mounted kick plate to match door material and finish.
- g. **HARDWARE SET #6: Doors at multi-user Toilet Rooms**
- (1) Butts: McKinney T4A3786, 4½" x 4½" (1½ pair per door).
  - (2) Closer: LCN 4040 surface mounted with extra duty arm 4040XP with EDA arm.
  - (3) Push plate.
  - (4) Pull.
  - (5) Overhead stop with holder: Glynn Johnson 80 series.
  - (6) Silencers: Ives SR64 door silencers (3 per door).
  - (7) Mounting plate: Provide if required by manufacturer.
  - (8) Kick plate: Door mounted kick plate to match door material and finish.
- h. **HARDWARE SET #7: Classroom Doors**
- (1) Butts: McKinney T4A3786, 4½" x 4½" (1½ pair per door).

- (2) Closer: LCN 4040 surface mounted with extra duty arm 4040XP with EDA arm.
  - (3) Lockset (1): Best 93 series heavy duty locks, INA Function Intruder lockset.
  - (4) Overhead stop with holder: Glynn Johnson 80 series.
  - (5) Silencers: Ives SR64 door silencers (3 per door).
  - (6) Mounting plate: Provide if required by manufacturer.
  - (7) Kick plate: Door mounted kick plate to match door material and finish.
  - (8) Hinge Guard: Provide hinge guard.
- i. **HARDWARE SET #8:** Toilet Rooms at Pre-K and Kindergarten Classrooms
- (1) Butts: McKinney TA2714, 4½" x 4½" (1½ pair per door).
  - (2) Closer: LCN 4040 surface mounted with extra duty arm 4040XP with EDA arm.
  - (3) Lockset (1): Best 93 series heavy duty locks, N function passage lockset.
  - (4) Overhead stop with holder: Glynn Johnson 80 series.
  - (5) Silencers: Ives SR64 door silencers (3 per door).
  - (6) Mounting plate: Provide if required by manufacturer.
  - (7) Kick plate: Door mounted kick plate to match door material and finish.
  - (8) Hinge Guard: Provide hinge guard.
- j. **HARDWARE SET #9:** Cafetorium
- (1) Butts: McKinney T4A3786, 4½" x 4½" (1½ pair per door).
  - (2) Closer: LCN 4040 surface mounted with extra duty arm 4040XP with EDA arm.
  - (3) Lockset (1): Best 93 series heavy duty locks, S function storeroom lockset.
  - (4) Overhead stop with holder: Glynn Johnson 80 series.
  - (5) Silencers: Ives SR64 door silencers (3 per door).
  - (6) Mounting plate: Provide if required by manufacturer.
  - (7) Kick plate: Door mounted kick plate to match door material and finish.
  - (8) Acoustical gasket
- k. **HARDWARE SET #10:** Doors at Music Rooms, Gymnasium, and Cafetorium to Corridors
- (1) Butts: McKinney T4A3786, 4½" x 4½" (1½ pair per door).
  - (2) Closer: LCN 4040 surface mounted with extra duty arm 4040XP with EDA arm.
  - (3) Lockset: Best EXBV series BASIS V, proximity card reader, TV function deadbolt w/key override; mortise lock.

- (4) Exit device: Apex FL2200 fire exit series surface vertical rod exit device with Apex 2110 rim device and 1E72 rim cylinder.
- (5) Overhead stop with holder: Glynn Johnson 80 series.
- (6) Silencers: Ives SR64 door silencers (3 per door).
- (7) Mounting plate: Provide if required by manufacturer.
- (8) Kick plate: Door mounted kick plate to match door material and finish.
- (9) Acoustical gasket.

## **METHODS OF CONSTRUCTION**

### **A. Use the following:**

1. Aluminum doors: see Section B2050.00.
2. Steel Doors
  - a. Grade: ANSI A250.8-1998.
    - (1) Fire doors and stairwell doors: Level 3, model 2, seamless (16-gauge).
    - (2) Interior doors: Level 3, model 1, full flush (16-gauge).
  - b. Finish: Prime painted, unless otherwise indicated.
    - (1) Doors at kitchens and other wet areas: Galvanized G60/Z180 per ASTM A653/A653M-2006a.
  - c. Factory-prepare and reinforce for hardware specified in accordance with referenced codes and standards; 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, gauge as required by standards for the grade steel door specified; provide anchors as specified by standards.
  - b. Finish: Prime painted, unless otherwise indicated.
    - (1) Doors at kitchens and other wet areas: Galvanized G60/Z180 per ASTM A653/A653M-2006a.
  - c. Factory-prepare and reinforce for hardware specified; 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 for transparent finish.
  - b. Construction: Provide doors and frames with UL label where required and with internal blocking for surface mounted hardware
    - (1) Provide minimum 5-1/2" top blocking; 10" blocking for lock sets and exit devices.
    - (2) Fire doors rated over 20 minutes: FD-5.

- (3) 20-minute rated doors: PC-5.
- (4) Other interior doors: PC-5.
- (5) Beveled meeting stiles.
- c. Veneer: Oak, red.
  - (1) Cut: Rift cut.
  - (2) Provide stile edge banding on doors with transparent finish to match face veneer.
- d. Finish: Factory-applied, TR-6 catalyzed polyurethane.
- e. Accessories: As required by code, AWI grade, or as indicated on drawings, including wood glazing stops.
- f. Warranty: Lifetime.

**END OF SECTION C1030.00**

## SECTION C1030.80

### INTERIOR ACCESS DOORS AND PANELS

#### 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. Provide components to form complete 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. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

##### 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. Lintels: Constructed to span openings and support loads imposed by partition, with maximum deflection of 1/360 of span, vertically and horizontally.

#### PRODUCTS

##### A. Access Doors and Panels

1. Sizes: Provide sizes necessary to afford full working access to all serviceable components within; minimum sizes 16 x 16 inches at masonry walls and 12 x 12 inches at other locations.
2. Flush framed access doors: Frames and nominal 1-inch wide exposed flanges of 16-gage steel and door panels of 14-gage steel.
3. Plaster access doors: Frames and nominal 1-inch wide flanges of 16-gage steel and door panels of 14-gage steel. Design flanges shall be concealed by plaster.

4. Gypsum board access doors: Frames and nominal 1-inch wide flanges of 16-gage steel and door panels of 14-gage steel. Design flanges shall be concealed by gypsum board joint finishing compound.
5. Fire rated access doors: Frames and nominal 1-inch wide exposed flanges of minimum 16-gage steel and door panels of 20-gage steel. Provide self-closing and latching doors with keyed lock to match cylinders specified elsewhere. Attach label to fire rated doors for rating indicated.
6. Hardware: Stainless steel hinges with removable pin, screw driver slot with quarter turn cam lock, except for fire rated access doors.
7. Finishing
  - a. Factory prime coat units with baked-on primer.
  - b. Provide all access doors with two coats of finish paint matching adjacent surface color.

**END OF SECTION C1030.80**



**SECTION C1090.00**  
**INTERIOR SPECIALTIES**

**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. Interior Specialties include, without limitation, the following elements:
  - a. C1090.10: Interior Railings and Handrails.
  - b. C1090.20: Information Specialties, including markerboards, tackboards, display units, display rails, directories, and interior signage.
  - c. C1090.25: Compartments and Cubicles, including toilet partitions and cubicle curtains.
  - d. C1090.40: Toilet Accessories
  - e. C1090.60: Safety Specialties
  - f. C1090.70: Storage Specialties, including lockers.
3. Where interior fixtures are integral with elements defined within another element group, meet requirements of both element groups.
4. Basis of Design: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

B. Amenity and Comfort

1. Accessibility: Provide interior fixtures that are easily usable by all persons without outside assistance.
  - a. Provide interior fixtures that comply with ADAAG-1994 and ANSI A117.1.
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.
  - a. Where coated finishes are used, use factory-applied coatings where available.
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. Hardware and other rounded metal surfaces: Finishes that are satin or brushed chrome. Coatings are not permitted.

- c. Plastic surfaces: Matte, rather than glossy or polished finishes.
- d. Flat wood surfaces: Low-gloss finishes, transparent.
- e. 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 comply with code and to withstand 1.5 times the anticipated live loads without excessive deflection or permanent distortion.
- 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 non-concurrently 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.
- 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 C1090.00**

**SECTION C1090.10**  
**INTERIOR RAILINGS AND HANDRAILS**

**PERFORMANCE**

- A. Basic Function
  - 1. Provide interior steel tube railings, balusters, guard rails, wall railings, infill panels and fittings at all stairs, ramps, and other locations to protect, assist and guide people and as required to meet all applicable codes and standards.
- B. Amenity and Comfort
  - 1. Accessibility
    - a. Provide railings that are in full compliance with barrier-free codes and standards.
  - 2. Appearance
    - a. Provide railings that are smooth in texture, with formed radius ends and bends and all joints welded and ground smooth.
    - b. Fabricate railings in maximum practical lengths to minimize field connections.
- C. Health and Safety
  - 1. Anchorages and attachments
    - a. Provide concealed fasteners, anchorages and attachments wherever feasible. Where fasteners, anchorages and attachments must be exposed, provide tamperproof systems.
- D. Structure
  - 1. Railings: Provide anchorage for railings with sufficient strength and rigidity to withstand loads prescribed by code.

**END OF SECTION C1090.10**

**SECTION C1090.20**  
**INFORMATION SPECIALTIES**

**PERFORMANCE**

A. Basic Function

1. Information Specialties consist of the following:
  - a. Visual display fixtures for non-permanent display or projection of information or work.
  - b. Identifying devices for permanent or semi-permanent display of identifying information or guidance.
2. Provide visual display fixtures and identifying devices fixed to interior construction that are necessary for complete and proper functioning of spaces required by the program.
3. Where Information Specialties are integral with elements defined within another element group, meet requirements of both element groups.
4. Brand names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.
5. Coordinate Information Specialties with all other project requirements, including the drawings and Educational Specifications.
6. Visual display fixtures: Provide at locations and sizes indicated or scheduled and as follows:
  - a. Erasable surfaces, which may be identified elsewhere as chalkboards or markerboards.
    - (1) Smooth white surface for marking with erasable markers and erasure with and without using water.
    - (2) Classrooms and other spaces: Provide lengths indicated in Educational Specifications, minimum four feet high.
    - (3) Erasable surface area must be calculated separately from other display surface types.
    - (4) Provide holders for writing materials, below and full length of each area of erasable surface.
  - b. Tackable surfaces, which are identified in the program as tackboards, for standard push pin use.
    - (1) Classrooms and other spaces: Provide lengths indicated in Educational Specifications, minimum four feet high.
    - (2) Tackable strips: Provide 1 inch wide strip above and full length of each area of erasable surface, with flag holder.
  - c. Projection Surfaces
    - (1) Provide ceiling-mounted motorized projection surfaces in Multi-Purpose Room, Gymnasium and Cafeteria and as indicated elsewhere.

- (2) Maximize size of projection surfaces consistent with projection equipment, room size and configuration.
- (3) Coordinate the surface material, finish and equipment 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.

#### 7. Identifying Devices

- a. Provide identifying devices fixed to interior construction that are necessary for direction to and identification of functions and spaces as required by the program, including the following:
  - (1) Dedication plaque in Entrance Lobby.
  - (2) Room label signs: Provide room label signs for all spaces.
  - (3) Directional signs: Provide directional signs at all building entrances.
  - (4) Building directories: Provide adequately sized directories at public building entrances and elevator lobbies on each floor.
- b. Identifying devices comprise the following elements:
  - (1) Room or function labels applied to doors or walls immediately adjacent to doorways.
  - (2) Signs that provide guidance to, or information about, building functions or spaces, including directional signs, locator maps, and logotypes.
  - (3) Building directories with replaceable information strips.
- c. Text, content and format of identifying devices: Text, content and format will be provided by the Authority.

#### B. Amenity and Comfort

##### 1. Accessibility

- a. Provide Information Specialties that comply with all applicable codes and standards.
- b. Function labels: Provide graphic and tactile signs for the following building services and functions:
  - (1) Stairways.
  - (2) Room numbers and labels.
  - (3) Elevators.
  - (4) Telephones.
  - (5) Toilets.
- c. Building directories: Accessible raised or recessed lettering in addition to listings protected by glass or plastic.

## 2. Visibility

### a. Visual Properties of Projection Surfaces

- (1) Contrast and resolution sufficient to provide accurate viewing at all normal seating locations in the room or space.
- (2) Ambient light rejection as required to provide minimum gain specified under design lighting conditions.

### b. 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 inches.
- (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.

### c. Reflectivity: Provide signs with matte surface measuring 11 to 19 GU on 60-degree glossmeter.

### d. 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. Except as otherwise indicated, required surface area of Visual Display Fixtures 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) Projection surfaces: Not less than 36 inches above floor; not more than 84 inches above floor; either permanently exposed in locations required or easily assembled or lowered without the use of tools.
  - (a) 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.

### b. Room label signs: Provide signs with feature allowing district to change information without damage or modification to other building elements.

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

## 4. Appearance

### a. Appearance of Visual Display Surfaces

- (1) Color: White surfaces are required.

(2) Tackable surfaces: Self-healing material or surface finish that minimizes visibility of ordinary thumbtack holes.

(3) Flatness: Permanently flat, without warp or bow.

b. Provide Information Specialties for entire project that are consistent in design with other interior features and coordinated with overall color scheme.

C. Health and Safety

1. Provide emergency signs and safety signs as required by applicable codes and referenced standards.

D. Durability

1. Service Life Span

a. Erasable surfaces: Minimum of 50 years, including appearance.

2. Indoor units: Materials and finish complying with code and project requirements.

3. Wear Resistance

a. Visual display surfaces: Comply with requirements of Section C 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. Protect all surfaces from accidental damage by providing covering or concealment during construction.

E. Operation and Maintenance

1. Vandalism resistance: Provide Information Specialties 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 district personnel.

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

**PRODUCTS**

A. Erasable surfaces: Provide porcelain enameled steel panel in steel frame.

B. Dedication Plaque

1. Provide one 20" x 24" cast bronze custom dedication plaque, with design and wording to be provided by the Authority.

C. Room and Function Label Signs

1. Use one of the following:
  - a. Metal or plastic panel signs with raised characters and graphics.

D. Directional Signs

1. Use one of the following:
  - a. Metal or plastic panel signs with raised characters and graphics.

**END OF SECTION C1090.20**



**SECTION C1090.25**  
**COMPARTMENTS AND CUBICLES**

**PERFORMANCE**

**A. Basic Function**

1. Provide toilet compartments that afford physical separation and privacy between toilets and urinals in multiple-person toilet rooms.
  - a. Toilet compartments comprise the following elements:
    - (1) Toilet partitions: Floor-to-ceiling units.
    - (2) Urinal privacy screens: Wall-hung units.
2. Provide cubicle curtains that afford physical separation and privacy between beds in Nurse's Suite.
3. Where elements also must function as elements defined within another element group, meet requirements of both element groups.
4. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

**B. Amenity and Comfort**

1. Accessibility: Provide code-compliant barrier-free compartments and fittings where indicated.
2. Convenience: Adjust hinges to return doors to approximately 4" open position when unlatched.
3. Appearance
  - a. Provide compartments and fittings that are smooth in texture except where provided with non-slip finishes in accordance with code.
  - b. Provide compartments and fittings that are compatible with surrounding materials, colors, and textures.

**C. Health and Safety**

1. Sanitation: Provide smooth, impervious, and water-resistant surfaces and fittings that will allow chemical cleaning and sterilization without damage or corrosion.

**D. Structure**

1. Vertical loads: Provide compartments with sufficient strength to withstand anticipated vertical loads prescribed by code for grab bars and accessories without excessive deflection or structural damage.
2. Horizontal loads: Provide compartments with sufficient strength and rigidity to withstand anticipated horizontal loading conditions without excessive deflection or structural damage.

3. Anchorage: Provide anchorage to floor, walls, and building superstructure above ceiling with sufficient strength and rigidity to withstand loads prescribed by code.
  - a. Do not use ceiling to brace compartments.

## PRODUCTS

### A. Toilet Compartments

1. Construct compartment panels, pilasters and doors using one of the following:
  - a. Solid color reinforced composite.
  - b. Solid-core phenolic.
  - c. Solid HDPE (high-density polyethylene).
2. Dimensions
  - a. Provide toilet partitions as shown on drawings, with minimum clear dimensions as required by codes and referenced standards, including requirements for barrier-free installation where indicated.
  - b. Provide toilet partition panels minimum 55" high, with bottom edge 14" above finish floor.
  - c. Provide urinal screen panels minimum 42" high x 18" wide, with bottom edge 14" above finish floor.

### B. Hardware, Anchorages and Fittings

1. Provide manufacturer's standard heavy-duty stainless steel hardware, anchorages and fittings, including:
  - a. Panel brackets: Minimum 1-1/2" stirrup-type wall brackets with minimum 2 bolts per bracket.
  - b. Adjustable pilaster anchors at top and bottom.
  - c. Pilaster shoes and caps.
  - d. Hinges: Barrel-type, self-lubricating, adjustable to bring door to rest in any position when unlatched.
  - e. Latch and keeper.
  - f. Door pull, for outswinging doors.
  - g. Door bumper.
  - h. Coat hook, which may be integral with door bumper.
  - i. Continuous channel and wing bracket, for urinal screens.
2. Provide Type 304 stainless steel with #4 satin finish throughout.
3. Provide stainless steel, tamper-proof fasteners throughout.

### C. Cubicle Curtains

1. Provide ceiling-mounted cubicle curtains, track, and hardware as complete units, including the necessary mounting brackets, hardware, fittings, and fastenings.
  - a. Provide fabrics able to withstand a temperature of not more than 160 degrees F.

- b. Provide curtains that conform to NFPA 701 Fire Tests for Flame and Resistant Textiles and Films.
  - c. Provide curtains in length from 2" below finish ceiling to 12" above finish floor, with 20" mesh at top.
2. Basis of Design: Classic by Cube Care Company.

#### **METHODS OF CONSTRUCTION**

- A. Toilet Compartments
  1. Pre-drill and pre-cut compartments for all hardware, anchorages and fittings.
  2. Provide positive attachment to floor, solid wall substrate, and above-ceiling framing.
  3. Provide maximum clearances as follows:
    - a. Panels to walls: 1 inch.
    - b. Panels to pilasters: ½ inch.
- B. Cubicle Curtains
  1. Provide solid framing for attachment of ceiling track.

**END OF SECTION C1090.25**

**SECTION C1090.40**  
**TOILET ACCESSORIES**

**PERFORMANCE**

**A. Basic Function**

1. Provide accessory fixtures as required to accomplish the design as required by code and as indicated in the project documents.
  - a. Mirrors
    - (1) One for each lavatory location, unless otherwise indicated; full width of lavatory unit(s) or 30" minimum.
    - (2) Full-length mirror on back of each single-user bathroom door.
    - (3) Full-length mirror where shown in Nurse's Suite.
  - b. Grab bars: Wherever required by code and for safety and assistance in use of toilet and bath fixtures, and at all toilets designated as barrier-free.
  - c. Waste receptacles
    - (1) One recessed waste receptacle for each 3 lavatories or less in a restroom.
    - (2) One for each toilet, partition-mounted, in faculty women's restrooms, for sanitary napkin disposal.
  - d. Electric hand dryers: One for every 3 lavatories or less in a restroom.
  - e. Holders and dispensers for toilet, sink, and bath supplies furnished by the district.
    - (1) Toilet paper: Roll, consumer-size; one double-roll dispenser per toilet.
    - (2) Toilet seat covers: Paper; one dispenser per toilet in faculty restrooms.
    - (3) Hand soap: Liquid, one dispenser for each lavatory in restrooms.
    - (4) Women's personal supplies: Vending of tampons; one for each faculty women's restroom.
  - f. Baby changing stations: One in each Pre-Kindergarten Classroom Toilet Room, plus one in the Nurse's Suite.
  - g. Holders and dispensers for cleaning supplies, utensils, and tools furnished by district.
    - (1) Mops and brooms: 6 items to be hung up in each janitor's closet, plus shelf for supplies.
2. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

**B. Accessibility**

1. Common areas in multiple-user rest rooms: Provide all toilet accessories in compliance with barrier-free codes and standards.
2. Individual-use rest rooms: Provide all toilet accessories in compliance with barrier-free codes and standards.

3. Individual stalls in multiple-user rest rooms: At stalls designated as or required to be barrier-free, provide all toilet accessories in compliance with barrier-free codes and standards.

C. Health and Safety

1. Fire resistance: Provide materials in full compliance with codes and referenced standards.
2. Slip resistance: Surfaces knurled, cross-hatched, or peened as required by codes and referenced standards.
3. Broken glass hazard: Provide only fully tempered float glass for glass in mirrors and fixtures.

D. Structure

1. Grab bars: Strength, design, anchorage, and support as required by code and 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. Operation and Maintenance

1. Frequency of servicing: Refilling and emptying will occur at the following intervals; provide capacity appropriate to servicing interval and expected use, based on project occupancy:
  - a. Toilet seat cover dispensers: Daily.
  - b. Hand soap dispensers: Daily.
  - c. Waste receptacles: Daily.
  - d. Personal supplies vendors: Daily.
2. Ease of Repair
  - a. Mirrors: Glazing replaceable without disassembly of frame.
3. Theft deterrence: Secure Toilet Accessories to substrates using tamperproof or concealed fasteners.

**PRODUCTS**

A. Mirrors

1. Angle Frame
  - a. Materials: Type 304 stainless steel angle 3/4 inch x 3/4 inch (19x19mm), with satin finish with vertical grain on exposed surfaces.
  - b. Construction: One-piece, roll-formed construction with continuous integral stiffener.
  - c. Design: Beveled design on front of angle to hold mirror tightly against frame; prevents exposure to sharp edges.
  - d. Corners: Welded, ground, and polished smooth.
2. Mirror Glass
  - a. No. 1 quality, 1/4 inch (6mm) fully tempered float/plate glass.

- b. Edges: Protected with plastic filler strips.
  - c. Back of mirror: Protected by full-size, shock-absorbing, water-resistant, non-abrasive 3/16 inch (5mm) thick polyethylene padding.
  3. Mounting: Removable, galvanized steel back with concealed hanging brackets and concealed, locking fasteners. Attachment by rivets or tabs is not acceptable.
- B. Hand Dryers
1. Performance
    - a. Motor and blower: 5/8 HP, 20,000 RPM.
    - b. Air flow rate: 19,000 linear feet per minute at air outlet.
    - c. Heater: 900 watts.
    - d. Air temperature: 135 degrees F measured at average hand position of 4 inches below air outlet.
    - e. Sound level: Operational sound level less than 80 dB.
  2. Operation: Automatic, hands-free.
  3. Cover: Brushed stainless steel.
- C. Grab Bars
1. Compliance: Dimensions, mounting locations, non-slip grip, carrying capacity and other features to comply fully with codes and referenced standards.
  2. Capacity: Designed to support minimum 900 lbs. (408 kg) in compliant installations.
  3. Materials: 18-8 S, Type 304, 18-gauge (1.2mm) stainless steel tubing with satin finish.
  4. Construction: Ends of grab bar pass through flanges and are welded to flanges to form one structural unit.
  5. Mounting flanges: Concealed, 18-8 S, Type 304, 1/8 inch (3mm) thick, stainless steel plate, with minimum two holes for attachment to substrate.
  6. Snap flange covers: 18-8 S, Type 304, 22-gauge (0.8mm) drawn stainless steel with satin finish; snap over mounting flange to conceal mounting screws.
- D. Receptacles, Holders and Dispensers
1. Cabinets: 18-8 S, Type 304, 22-gauge (0.8mm) stainless steel. All-welded construction with satin finish on exposed surfaces.
  2. Flanges: Drawn, one-piece, seamless, 18-8 S, Type 304, 22-gauge (0.8mm) stainless steel with satin finish.
  3. Doors: Drawn, one-piece, seamless, 18-8 S, Type 304, 22-gauge (0.8mm) stainless steel.
  4. Door frames: 18-gauge (1.2mm) stainless steel, with satin finish on exposed surfaces.
  5. Door hinges: Full-length stainless steel piano style, spring-loaded where appropriate.
  6. Locks: Tumbler lock with stainless steel case, all keyed alike.
  7. Dispensing mechanisms, spindles and other components: Manufacturer's standard, heavy-duty, theft- and breakage-resistant components.

8. Provide units that minimize deliberate excessive consumption or dispensing of supplies.
- E. Baby Changing Stations
1. Materials: FDA approved blow molded high-density polyethylene (HDPE) clad in 18-gauge Type 304 stainless steel, brushed finish.
  2. Operation: Concealed pneumatic cylinder to provide controlled, slow opening and closing of the changing station bed.
  3. Hinge mechanism: Reinforced full-length steel-on-steel hinge with integrated steel hook plate.
  4. Changing surface: Contoured, concave and smooth, 442 sq. in.
  5. Safety straps: Replaceable, snap-lock, nylon protective holding straps.
  6. Performance: Units exceed static load requirements called out by ASTM Standard F 2285, Standard Consumer Safety Performance Specification for Diaper Changing Stations for Commercial Use.
  7. Mounting: Surface-mounted or recessed with manufacturer-provided mounting hardware.
  8. Features: No hinge structure exposed on interior or exterior surfaces; two bag hooks; built-in liner dispenser with 25 liner capacity.
  9. Instruction graphics: Universal molded instruction graphics and safety messages in multiple languages.
- F. Mop and Broom Holders
1. Shelf and brackets: 18-8 S, Type 304, 18-gauge (1.2mm) stainless steel with satin finish; welded construction.
  2. Mop and broom holders: Replaceable, spring-loaded rubber cams to accommodate handles from 7/8 inch to 1-1/4 inch (20mm to 30mm) in diameter.
  3. Rag hooks: 18-8 S, Type 304, 16-gauge (1.6mm) stainless steel with satin finish; secured to shelf with rivets.
  4. Drying rod: 18-8 S, Type 304, 1/4 inch (6mm) diameter stainless steel with satin finish.

## **METHOD OF CONSTRUCTION**

- A. Manufacturer: Provide Toilet Accessories of one manufacturer to the maximum extent possible.
- B. Provide products that are installed in strict compliance with manufacturer's written instructions and recommendations and the following:
  1. Verify that blocking or substrate preparation has been installed properly.
  2. Verify that location does not interfere with door swings or use of fixtures.
  3. Comply with manufacturer's recommendations for backing and proper support.
  4. Provide solid framing for all attachments at walls and ceilings.
  5. Use fasteners and anchors suitable for substrate and project conditions

6. Install units rigid, straight, plumb, and level, in accordance with manufacturer's installation instructions and approved shop drawings.
7. Conceal evidence of drilling, cutting, and fitting to room finish.
8. Test for proper operation.

**END OF SECTION C1090.40**



**SECTION C1090.60**  
**SAFETY SPECIALITIES**

**PERFORMANCE**

- A. Basic Function
  - 1. Provide equipment and fixtures to facilitate non-destructive access by emergency personnel to building and site.
  - 2. Safety specialties comprise the following elements:
    - a. Wall-mounted safe and/or other device(s) as directed by local emergency authority and required by codes and project requirements.
  - 3. Provide recessed device(s) throughout except where precluded by structural or code limitations.
  - 4. Provide permanent signage for all safety specialties in accordance with code.
  - 5. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.
  - 6. Where safety specialty elements also must function as elements defined within another element group, meet the requirements of both element groups.
- B. Health and Safety
  - 1. Accident Prevention
    - a. Locate extinguishers and cabinets so that means of egress is not impeded, in accordance with code.
    - b. Provide non-breakable vision panels.
  - 2. Emergency Access
    - a. Mount safety specialties in permanent locations using mounting fixtures that will inhibit casual removal but allow ready use in case of emergency.
    - b. Mount safety specialties in locations as directed by local authority..
- C. Durability
  - 1. Provide solid embedments or blocking for attachment of safety specialties.

**PRODUCTS**

- A. Cabinets
  - 1. Provide product(s) and installation in strict compliance with requirements of local emergency authority.
  - 2. Basis of Design: Products of the Knox Company.

**END OF SECTION C1090.60**

**SECTION C1090.70**  
**STORAGE SPECIALTIES**

**PERFORMANCE**

A. Basic Function

1. Provide storage fixtures attached to interior construction as 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. Temporary Clothing Storage: Provide open or semi-concealed wardrobe units with capacity adequate for anticipated occupancy in spaces designated in the program.
  - c. Temporary Lockable Storage: Provide lockable transient storage units adequate for anticipated occupancy in spaces designated in the program.
  - d. Open Material Storage: Provide storage racks or utility shelves for material storage adequate for anticipated needs in spaces designated in the program.
  - e. Flammable Materials Storage: Provide storage units adequate for anticipated needs in spaces designated in the program.
  - f. Mail Slot Unit: Provide wall-mounted mail slot unit where designated in the program.
3. Where storage fixtures are integral with elements defined within another element group, meet requirements of both element groups.
4. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

B. Amenity and Comfort

1. Accessibility
  - a. Provide storage fixtures that comply with applicable barrier-free codes and standards and the following:
    - (1) 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.
    - (2) 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.
    - (3) 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.<sup>1</sup>

- (4) 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. Clothing Storage: Provide coat and hat racks and coat hooks 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 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 barrier-free codes and standards.
    - d. Cable Management: Provide drilled holes with complementary colored plastic grommets in all counters and countertops.
      - (1) Provide one hole for every 6 ft. of counter length.
  3. Stored Item Security
    - a. Locks: Provide locking capability at storage fixtures as follows:
      - (1) Lockers: Master-keyed combination-type 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. Mounting and Anchorage: Provide solid blocking in partitions for mounting and anchorage of all fixed storage units.
  2. Seismic Loads: Provide storage racks and shelving units that have been engineered and installed to withstand seismic forces as required by code.

## PRODUCTS

- A. Built-In Cabinetry and Casework, including Countertops
  - 1. Cabinetry and casework, unless designated otherwise
    - a. Custom-grade wood cabinets and countertops.
    - b. Plastic laminate finish.
    - c. Integral backsplash.
  - 2. Science Demonstration Lab
    - a. Custom-grade solid wood full-frame cabinets; oak, maple or birch.
    - b. Chemical-resistant clear polymer finish inside and outside.
    - c. Epoxy resin countertops; 1" thick.
  - 3. Technology Project Lab and Art Room
    - a. Custom-grade wood cabinets with plastic laminate finish
    - b. Solid laminated maple countertops; 1-3/4" thick.
- B. Wardrobe Units
  - 1. Use one of the following:
    - a. Wood and metal coat and hat racks.
- B. 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.
- C. Lockers
  - 1. Use one of the following:
    - a. Metal frame and panel lockers with baked enamel finish at corridors and locker rooms.
- D. Utility Storage Shelving and Mail Slot Unit
  - 1. Instructional and Administrative Spaces
    - a. Wood construction with plastic laminate finish.
  - 2. Storage, Utility, Mechanical and Custodial Spaces
    - a. Heavy-duty steel shelving.
    - b. Welded construction with adjustable inner shelves.
    - c. Minimum capacity 800 lbs. per shelf.
    - d. Baked enamel finish.
    - e. Full-height, six-shelf units unless noted otherwise.

E. Flammable Materials Storage

1. Use the following:
  - (1) Noncombustible construction, meeting NFPA and OSHA standards for storage of flammable materials.

**METHODS OF CONSTRUCTION**

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

1. Provide manufactured and factory-finished storage fixtures for field installation throughout the project.
2. Comply with AWI Custom Grade for all wood cabinets and casework.
3. Provide factory cutouts for all fixtures, equipment, and utilities.
4. Provide solid blocking for attachment to walls and ceilings.
5. 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. (single-tier); 36 in. (double-tier).
    - (4) Locking: Equip with master-keyed combination-type padlocks.
    - (5) Doors: Hollow construction with louvers; channel reinforced top and bottom, acoustical fill, smoothly ground and finished edges.
    - (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: Sloping top; minimum two wall hooks, coat hanger bar, and hat shelf.

**END OF SECTION C1090.70**

**SECTION C2000.00**  
**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. Applied ceiling finishes.
  - d. Stair finishes, except for integral stair surfaces.
  - e. Finishes applied to other interior surfaces.
3. Unless otherwise indicated, provide finishes consistent with the Authority's Materials and Systems Standards.
4. Where interior finishes are integral with elements defined within another element group, meet requirements of both element groups.
5. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

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 toilet rooms and custodial spaces, provide wall, ceiling, and floor surfaces that are inherently resistant to moisture and that can be cleaned by caustic agents without damage.
  - c. Provide matching cove base materials or self-cove base systems for all flooring unless otherwise indicated.

**C. Health and Safety**

**1. Slip Resistance**

- a. For spaces subject to floor wetting, including entry lobbies, provide floor finishes with inherent slip resistance under wet conditions.
  - b. At building entries, provide means for reducing or minimizing moisture and debris on shoe soles.
- 2. Tactile warning surfaces:** Provide floor surfaces that comply with ADAAG-1994 detectable warning requirements at potentially hazardous locations, including top and bottom of stairs, curbs, top and bottom of ramps, and other locations required by referenced standards.
- 3. Flammability:** Provide finishes with flame spread ratings not greater than the permitted by codes and referenced standards.

**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 corridors and other spaces vulnerable to wheeled equipment, 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.

**INTERIOR FINISH SCHEDULE**

**A. Interior Floor Finishes (Basis of Design)**

- 1. Provide interior floor finishes consistent with Table C2000.00-1.

**TABLE C2000.00-1  
 INTERIOR FLOOR FINISHES**

<b>Location</b>	<b>Key</b>	<b>Style</b>	<b>Color</b>
See drawings	VCT-1	Armstrong Standard Excelon	#51885 Granny Smith
See drawings	VCT-2	Armstrong Standard Excelon	#57513 Vicious Violet
See drawings	VCT-3	Armstrong Standard Excelon	#51867 Cantaloupe
See drawings	VCT-4	Armstrong Standard Excelon MultiColor	#52514 Jubilee White
See drawings	VCT-5	Not used.	
Electrical and IT Closets	VCT-6	Armstrong SDT Tile	#51951 Armor Gray
All VCT floors	Vinyl Base	Armstrong Vinyl Integrated Wall Base	See drawings.
Cafetorium		Robbins Pulastic Classic 60	#205 Sand Beige

Location	Key	Style	Color
Lobbies		Stonhard Stontec ERF with 1/4" chips and non-slip texture	40% #C9986 Eggshell 20% #C9994 Sand Dune 15% #C1680 Peach 10% #C2160 Orange 5% #C5910 JD Green 5% #C1790 True Blue 3% #C9902 Black Iron Oxide 2% #C1050 Black
Technology Lab Science Demo Stairways Rest Rooms Custodial Spaces		Stonhard Stonshield SLT	To be determined
Kitchen and Servery		Stonhard Stonshield HRI with light sand grit	Brick Red
Other Kitchen support spaces		Stonhard Stonshield SLT with light sand grit	Brick Red
Gymnasium		Robbins Pulastic Classic 110 (9+2)	Border and Inset: #106 Autumn Brown Accent Border: #205 Sand Beige Lines: Black

**B. Interior Wall Paint Finishes (Basis of Design)**

1. Provide one accent wall color per classroom, one accent wall color in each stair, and one accent wall color within each large group room, in colors consistent with Table C2000.00-2.

**TABLE C2000.00-2  
 INTERIOR WALL PAINT FINISHES**

Location	Key	Style	Color
1st floor Wall Accent	P-1	Benjamin Moore	#543 Woodland Hills Green
2nd floor Wall Accent	P-2	Benjamin Moore	#1398 Charmed Violet
3rd Floor Wall Accent	P-3	Benjamin Moore	#124 Orange Appeal
General Walls	P-4	Benjamin Moore	#OC-39 Timid White or #OC-67 Ice Mist

**END OF SECTION C2000.00**



# **ELEMENT D**

# **SERVICES**

**SECTION D1010.00**  
**VERTICAL 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: All components for passenger elevators, including items such as shaft rails, pit ladders, exhaust louvers, and car and hoistway
3. Comply with provisions of latest adopted version of ASME A17.1 and other applicable codes and standards.
4. Where conveying systems are integral with elements defined within another element group, meet requirements of both element groups.
5. Basis of Design: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

**B. Amenity and Comfort**

1. Accessibility: Provide accessible passenger elevators complying with code that serves every habitable level.
2. Sound levels: Maintain ambient sound levels in spaces that include or areas adjacent to operating conveying systems within levels specified in Section 01030, Project Criteria.

**C. Health and Safety**

1. Fire resistance: Provide fire ratings for the elevator and its enclosure as required by code.
2. Provide an elevator system that complies fully with all code requirements and industry standards.
3. Deliver keys and full operation of elevators upon satisfactory completion of elevator inspections.

**D. Structure**

1. Comply with all code requirements for structure of elevator equipment and hoistway.

**E. Durability**

1. Car and hoistway door finishes: Comply with requirements specified in Section C20. Coated finishes may not be used.
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.

## **PRODUCTS**

### **A. Passenger Elevators**

1. Provide pre-engineered elevators with operating characteristics as follows:
  - a. Machine-room-less traction operation.
  - b. Minimum load capacity: 3500 lb.
  - c. Minimum ultimate elevator speed: 100/150 fpm.
2. Passenger elevator operating system: Selective collective operation.
3. Operating Features
  - a. Key switch in each elevator car for independent operating service.
  - b. Card reader controlled floor buttons in all elevator cars.
  - c. Key-controlled out of service feature.
  - d. Automatic load weighing bypass.
  - e. Emergency power operation of all cars in accordance with code.
4. Construction Features and Finishes
  - a. Walls: Stainless steel.
  - b. Doors: Stainless steel.
  - c. Front panel: Brushed stainless steel.
  - d. Ceiling and lighting: Manufacturer's standard range of options.
  - e. Hands-free audio/visual communication.
  - f. Fitted wall-mounted removable utility pads.
  - g. Vandal-proof construction.

**END OF SECTION D1010.00**

**SECTION D2010.20**  
**DOMESTIC WATER EQUIPMENT**

**PERFORMANCE**

**A. Basic Function**

1. Provide equipment necessary for functioning of hot and cold domestic water system and as required by code.
2. Domestic water equipment elements may comprise the following:
  - a. Domestic water pumps.
  - b. Domestic water pressure booster pumps.
  - c. Domestic water softeners and treatment equipment.
  - d. Domestic water filtration equipment.
  - e. Domestic water heaters.
  - f. Other pumps, tanks, treatment, and miscellaneous equipment to provide a complete domestic water system in compliance with project requirements and applicable codes.
3. Where domestic water equipment elements must also function as elements defined within another element group, meet requirements of both element groups.
4. Install gas fired equipment according to NFPA 54 and the International Fuel Gas Code.
5. Brand Names: Where brand names are listed for certain items, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

**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 deliver water at a pH of approximately 7.0.
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. Provide all equipment with all labels or certifications from applicable testing agencies as required by codes and referenced standards.

2. 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. Domestic water pressure booster pumps.
    - d. Hot water recirculating pumps.
  3. Water contaminants: Provide lead filtration device on water supply to drinking fountains, classroom and faculty room sinks, and kitchen sinks.
  4. Seismic performance: Provide equipment to withstand effects of earthquake motions determined according to ASCE/SEI 7.
- D. Durability
1. Moisture: Do not locate water heaters where leakage would cause damage to surrounding building materials.
  2. Condensation: Provide insulation on cold water pipes, fittings, valves, and equipment to limit condensation.
  3. 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 equipment with a pressure classification of 125 psi.
  2. Energy Efficiency
    - a. Heat loss: Provide recirculating pumps to limit the domestic hot water temperature drop to 2 deg F within 100 feet of fixtures requiring domestic hot water.
    - b. 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) Hot water distribution piping.
  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 required by code and as specified in Plumbing Fixtures.
  - b. Equipment isolation: Provide isolation valves on both supply and discharge sides of equipment for all services.
  - c. Coordinate sizes and locations of concrete bases with actual equipment provided.

## **PRODUCTS**

- A. 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.
- B. Domestic water pressure booster pumps
  - 1. Provide dual pumps for redundancy.
  - 2. In-line mounted.
  - 3. Centrifugal type.
  - 4. Variable speed.
  - 5. Skid mounted packaged system.
  - 6. Vibration isolation.
  - 7. As required by project.
- C. Domestic hot water pumps
  - 1. Floor mounted.
  - 2. Centrifugal type.
  - 3. Spare pump.
  - 4. Housekeeping pads.
  - 5. Inertia pads and vibration isolation.

D. Domestic water heaters

1. Condensing natural gas fired with storage.
2. Low emissions.
3. Adjustable thermostat control.
4. Direct venting.
5. Safety controls to include automatic high temperature limit and low water cutoff devices or systems, electrically operated automatic gas shut off valve, gas pressure regulator.
6. Back-up water heater for 100% redundancy.
7. Housekeeping pads
8. Vibration isolation

**METHODS OF CONSTRUCTION**

A. Use the following methods:

1. Install equipment to allow for service and maintenance, provide housekeeping pads to also allow for equipment drain and/or trap assembly.
2. Maintain manufacturer's recommended clearances for all equipment.
3. Install equipment so controls and devices for service are readily accessible.
4. Anchor equipment to substrate.
5. Install piping type heat traps on inlet and outlet piping of domestic water heater storage tanks without integral or fitting type heat traps.
6. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial, gas-fired, storage, domestic-water heaters.
7. Provide inlet and outlet piping sized not smaller than sizes of equipment connections.
8. Use check valves to maintain correct domestic water flow to and from equipment.

B. Do not use:

1. Oil-fired water heaters.
2. Equipment concealed in above-ceiling locations.

**END OF SECTION D2010.20**

**SECTION D2010.60**  
**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. Water closets
  - b. Urinals
  - c. Lavatories
  - d. Sinks
  - e. Showers
  - f. Water coolers
  - g. Mop receptor
  - h. Water tempering
  - i. Utility Water Supply
    - (1) Outdoor supplies: Flush mounted, loose key lockable, maximum of 100 feet apart on building facade and one on each facade of building.
    - (2) Indoor supplies: Flush mounted, loose key, beneath counters at each multiple-fixture rest room and mechanical spaces
3. Where plumbing fixture elements must also function as elements defined within another element group, meet requirements of both element groups.
4. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

B. Amenity and Comfort

1. Convenience
  - a. Provide space between and around fixtures as required by code.
  - b. Provide water closet bowls with heights in compliance with the exceptions listed in NSPC 7.4.4, substituting “shall be” for “permitted”.
  - c. For fixtures indicated for children, install at height required by authorities having jurisdiction.
2. Appearance
  - a. Smooth, corrosion-resistant, non-absorbent, with no crevices to collect dirt.
  - b. Aesthetically pleasing, easy and comfortable to use.



- c. Color: White, except where metal fixtures are required or other colors are indicated.
  - (1) Multiple user lavatory color shall be selected from manufacturer's standard range of finish materials.

3. Provide barrier-free fixtures where required by code and in all public restroom areas.
4. Install equipment nameplates or equipment markers on plumbing equipment and equipment signs on water-tempering equipment.
5. Provide water tempering device for all equipment/fixtures; except kitchen equipment. Refer to Kitchen Equipment section for requirements.

#### C. Health and Safety

1. Burning hazard: Protect wheelchair occupants from hot water pipes and drains. Provide tempering valve as required to prevent scalding.
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: Provide 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: Barrier-free metering or self-closing manual operation with standard spout, with integral front overflow.
  - b. Water closets: Standard flush valve with manual operation.
  - c. Urinals: Standard flush valve with manual operation
  - d. Showers: With single-action hot-cold mixing valve.
  - e. Kitchen and classroom sinks: Manual operation, swivel spout, water spray nozzle.
  - f. Water coolers: Manual operation; chilled water service.



- d. Open seat.
  - e. Barrier-free.
- B. Water Closets (Children's)
- 1. Use the following:
    - a. Vitreous china.
    - b. Floor mounted fixtures.
    - c. Open seat.
- C. Urinals
- 1. Use the following:
    - a. Vitreous china.
    - b. Wall-mounted fixtures.
    - c. Extended sides for privacy.
    - d. Barrier-free.
- D. Lavatories (Single User Bowl)
- 1. Use the following:
    - a. Vitreous china.
    - b. Wall-hung fixtures.
    - c. Self-rimming.
    - d. Front overflow.
    - e. Barrier-free.
- E. Lavatories (Multiple User Bowl)
- 1. Use one or more of the following:
    - a. Molded cast polymer continuous bowl.
    - b. Multiple water sources; one for each user.
    - c. Integral soap dispenser.
    - d. Vandal-resistant construction.
    - e. Barrier-free.
- F. Pre-K and Kindergarten Classroom Sinks
- 1. Use the following:
    - a. Stainless steel.
    - b. Countertop-mounted fixtures.
    - c. Side faucet holes for easy access.
    - d. Self-rimming.

G. General Classroom Sinks, Nurse's Office, Exam and Faculty Dining

1. Use the following:
  - a. Stainless steel.
  - b. Countertop-mounted fixtures.
  - c. Self-rimming.

H. Art Classroom Sink

1. Use the following:
  - a. Stainless steel.
  - b. Integral side drainboard.
  - c. Countertop-mounted fixture.
  - d. Multiple user sink, refer to drawing.

I. Science Room Sinks

1. Use the following:
  - a. Epoxy utility sink.
  - b. Integral side drainboard.
  - c. Countertop-mounted fixture.
  - d. Beaker rack.

J. Stage Area Hand Sink

1. Use the following:
  - a. Stainless steel.
  - b. Wall mounted fixture.
  - c. Barrier-free.

K. Showers

1. Use one or more of the following:
  - a. Composite resin.
  - b. Highly durable acrylic.
  - c. Integral folding seat.
  - d. Roll-in low threshold for wheelchair access.
  - e. 10-year warranty.
  - f. Barrier-free design and construction.
2. Basis of Design: 'Sterling' Model No. 62070115.

L. Pre-K and Kindergarten Faucets and Trim

1. Use the following:
  - a. Polished chrome-plated finish.
  - b. Gooseneck or similar.
  - c. Single wrist blade handle.
  - d. Single tempered water supply line.
  - e. Bubbler, vandal-resistant construction, self-closing.

M. General Classroom Sink, Nurses Office, Exam, Faculty Dining, Art Classroom, Science Room and Stage Area Sink Faucets and Trim

1. Use the following:
  - a. Polished chrome plated finish.
  - b. Gooseneck or similar.
  - c. Extended wrist blade handles.

N. Lavatory Faucet and Trim

1. Use the following:
  - a. Polished chrome plated finish.
  - b. Manual pressure operated self-closing.
  - c. Vandal-resistant construction.

O. Flush Valves

1. Use the following:
  - a. Polished chrome plated finish.
  - b. Manual operation.
  - c. High-pressure vacuum breaker.
  - d. Vandal-resistant construction.

P. Shower Faucet and Trim

1. Use the following:
  - a. Polished chrome plated finish.
  - b. Anti-scald integral with mixing valve.
  - c. Integral volume control.
  - d. Fixed shower head.
  - e. Hand shower with glide rail, metal hose and on/off control.
  - f. Barrier-free shower seat.

Q. Water Cooler

1. Use one or more of the following:
  - a. Electric refrigerated water coolers, self-contained.
  - b. Stainless steel finished units.
  - c. Wall mounted, barrier-free.
  - d. Manual push bar with self-closing operation.
  - e. Bubbler, vandal-resistant construction.
  - f. Filters sized for peak flow rate.

R. Custodial Mop Receptor

1. Use the following:
  - a. Precast terrazzo.
  - b. Floor-mounted fixtures.

S. Custodial Mop Receptor Faucet

1. Use the following:
  - a. Extended spout with bucket hook.
  - b. Wrist blade handles
  - c. Vandal-resistant construction.
  - d. Wall mounted.

T. Water Tempering

- a. Factory fabricated thermostatic mixing valve.
- b. Set to fail open to continue cold water flow.
- c. Provide for all kitchen hand sinks, lavatories, classroom sinks, showers, water cooler.

U. Utility Water Fixtures

- a. Interior Hose Bibbs
  - (1) Non-freeze.
  - (2) Integral vacuum breaker.
  - (3) Chrome plated backer plate.
  - (4) Vandal-resistant cap.
- b. Exterior Wall Hydrants
  - (1) Box type non-freeze.
  - (2) Integral vacuum breaker.
  - (3) Flush face chrome plate finish, lockable cover.
  - (4) Concealed hose connection.

(5) Vandal-resistant construction.

## **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, install off-floor supports affixed to building substrate.
    - a. Use carrier supports without waste fitting for fixtures with tubular waste piping;
    - b. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.
  3. Install counter-mounting fixtures in and attached to casework.
  4. Install fixture level and plumb according to manufacturer's written instructions and roughing-in drawings.
  5. Install 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. Install stops in locations where they can be easily reached for operation.
  6. Install shutoff valves in water-supply piping to fixtures. Use ball valve if specific type valve is not indicated. Install valves chained or locked in open position if permitted. Install valves in locations where they can easily be reached for operation.
  7. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.
  8. Provide clay traps as required by code and in spaces as noted in Educational Specifications.
  9. Install faucet, flow-control and 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.
  10. Install traps on fixture outlets. Omit trap on fixtures with integral traps.
  11. Install 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.
  12. Set service basins in leveling bed of cement grout.
  13. Seal joints between fixtures and walls, floors, and counters using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color.
  14. Connect water supplies from water distribution piping to fixtures.
  15. Connect drain piping from fixtures to drainage piping.
  16. Install dielectric fitting in supply piping to equipment if piping and equipment connections are made of different metals.
  17. Install thermometers in supply and outlet piping connections to water-tempering equipment.

18. Install trap and waste piping on drain outlet of equipment receptors that are indicated to be directly connected to drainage system.
  19. Connect hot- and cold-water supply piping to hot- and cold-water and water-tempering equipment. Connect output from water-tempering equipment to plumbing fixtures.
  20. 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.
  21. Provide vacuum breakers at points where air or gases may develop on the interior of water distribution systems through piping or hose connections.
  22. Provide a separate, potable, circulating, tempered hot water system originating in mechanical room to supply facility, separate from kitchen hot water service.
  23. Ground equipment according to project requirements and code.
- B. Do not use:
1. Vitreous-china fixtures other than standard ASME A112.192M.
  2. Water closet flush valve tank trim other than standard ASSE 1037.
  3. Faucets other than standard ASME A112.18.1.M.

**END OF SECTION D2010.60**



## **SECTION D3000.00**

### **HEATING, VENTILATION AND AIR CONDITIONING (HVAC)**

#### **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 reduction of airborne odors, particulates, and contaminant gases.
2. The HVAC system consists of the following elements:
  - a. Facility Fuel Systems (D3010.00): Elements which provide energy used to maintain building comfort.
  - b. Heating Systems (D3020.00): Elements required to heat the building to maintain space comfort.
  - c. Cooling Systems (D3030.00): Elements necessary to generate the cooling required to maintain building comfort.
  - d. Facility Hydronic Distribution (D3050.10): Elements required to distribute chilled water, heating water, to maintain building comfort.
  - e. HVAC Air Distribution (D3050.50): Elements required to distribute air to maintain building comfort.
  - f. HVAC Design Parameters (D3050.60): Elements required to design systems to maintain building comfort.
  - g. Integrated Automation Control of HVAC Systems (D8010.50): Elements required to control equipment which maintains building comfort.
3. Where HVAC elements also must function as elements defined within another element group, meet the requirements of both element groups.
4. The Design-Build Information Package describes the basic types of HVAC components and systems that the Design-Builder shall use in the Project. Subject to compliance with codes and all project requirements, selection of particular units or models within the basic system types described may be made in the interest of greater efficiency and/or additional LEED points.
5. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.
6. Emergency/standby power: See Section D5010.10 for requirements for HVAC equipment.
7. Codes and standards: Comply with the most recent adopted versions of all codes and standards applicable to the project, which may include the following
  - a. New Jersey Uniform Construction and all subcodes, including:
    - (1) International Building Code, NJ Edition.
    - (2) International Mechanical Code, NJ Edition.
    - (3) International Energy Conservation Code, NJ Edition.

- (4) International Fuel Gas Code, NJ Edition.
  - b. NIH Design Policy and Guidelines.
  - c. NFPA 45 – Fire Protection for Laboratories using Chemicals
  - d. NFPA 70 – National Electric Code.
  - e. NFPA 90A – Installation of Air Conditioning and Ventilating Systems.
  - f. NEMA EPAct – Energy Efficient Motors.
  - g. Sheet Metal and Air Conditioning Contractors’ National Association (SMACNA/ANSI), HVAC Duct Construction Standards.
  - h. American Society of Heating Refrigerating and Air Conditioning Engineers (ASHRAE) Handbooks.
  - i. AABC National Standards for Total System Balance; Associated Air Balance Council.
  - j. NEBB (TAB) Procedural Standards for Testing Adjusting Balancing of Environmental Systems, National Environmental Balancing Bureau.
  - k. American National Standards Institute (ANSI).
  - l. Underwriters’ Laboratories (UL).
  - m. American Society for Testing and Materials (ASTM).
8. HVAC Systems Descriptions
- a. The HVAC systems descriptions for the building are as follows:
    - (1) Provide complete systems for each zone composed of rooftop air handling units, dedicated outdoor air supply (“DOAS”) energy recovery units, exhaust fans, ductwork, air devices, variable air terminal units, fan coil units, motors and controls.
      - (a) All HVAC system chilled water and hot water requirements shall be served by the centralized rooftop air cooled chillers and modular hot water boilers within the main mechanical room.
      - (b) Provide minimum 20-inch roof curbs for all rooftop equipment for snow drift and maintenance.
  - b. Cooling Source
    - (1) Chilled Water System
      - (a) Chilled water shall be produced by roof mounted air-cooled chiller(s). Provide multiple high-efficiency screw or rotary compressors. Do not use centrifugal or reciprocating compressors. Chillers shall be operated in a lead/lag alternating configuration. 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 DOAS energy recovery 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 if selected.
- (c) Do not use fiberglass insulation on exterior chilled water piping. Provide aluminum protective jacket over insulation on all exterior chilled water piping.
  - (d) Circulation pumps and valve assemblies shall be located above corridors within accessible ceilings.
  - (e) The chilled water system shall be selected to run at optimum high-efficiency and shall consist of two air cooled screw chillers each sized for approximately 50% of the total load.
  - (f) The chilled water system shall be provided with primary chilled water pumps with one spare pump. Pumps shall be located within a dedicated interior pump room located adjacent to the rooftop chillers.
  - (g) The chilled water pumps shall distribute chilled water to the fan coil units and DOAS air handling units.
  - (h) Pumps shall be provided with variable frequency drives (VFD) and shall operate in an alternating staged lead/lag configuration.
  - (i) A 30% propylene glycol solution shall be utilized for the chilled water medium.
  - (j) Chilled water system shall be capable of summer unoccupied operation.
- c. Heating Source
- (1) Hot Water Heat/Reheat System
    - (a) Hot water shall be produced by high efficiency 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. Boilers and distribution pumps shall be located within the boiler room. Heating hot water will be necessary for distribution to and use in all DOAS energy recovery units, air terminal devices such as variable-air-volume (VAV) boxes, FCU reheat coils, unit heaters, cabinet heaters, finned tube radiation, etc.
    - (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. Do not use fiberglass insulation on exterior hot water piping. Provide aluminum protective jacket over insulation on all exterior hot water piping.
    - (c) Provide electric heat trace for all piping run exterior to the building.
    - (d) Three gas-fired high efficiency condensing type boilers shall provide the necessary hot water heating source for the building's heating and ventilating systems.
    - (e) Each boiler shall be selected to run at optimum efficiency, sized for approximately 50% of the total calculated load providing redundancy in the event of equipment failure and/or periodic maintenance.

- (f) Heating/reheating water generated by the boilers shall be distributed by two variable speed pumps with one common spare pump (100% redundancy), and distributed to heating/reheating coils, unitary heaters and fan coil units.
- (g) Heating hot water pumps shall be base mounted end suction pumps located within the main mechanical room adjacent to the boilers.

(2) Natural Gas Heating

- (a) Natural gas shall be utilized for the preheat section of the packaged air handling units, air curtains and make-up air units..
- (b) Natural gas shall be utilized for the domestic water heaters and heating system boilers.
- (c) Boiler room and water heater rooms shall be provided with Gas Leak Detection alarm system and Carbon Monoxide (CO) Detection alarm system.
- (d) Each boiler shall be provided with an IRI compliant gas train valve.
- (e) Each boiler shall have separate, indirect condensate drains piped from each condensate drain pan, stack and stack Y-connection to a neutralization tank then to floor drain.
- (f) Provide prefabricated double wall metal vents suitable for use with natural gas fired hot water condensing boilers.
- (g) Each boiler shall be arranged for single fuel operation of natural gas. All boilers shall utilize linkage-less burners.

(3) Electric resistance heating

- (a) Provide electric heating elements in areas where freeze potential exists.
- (b) Provide electric heating in remote areas where heating hot water distribution is not present.

d. Airside Description

(1) HVAC System Building Zoning

- (a) Room and zone names listed below may not correspond exactly to rooms and zones in this Project, and some room and zone names listed may be for spaces not present in this Project. For rooms and zones not listed, provide HVAC systems consistent with rooms and zones with similar functions and activities.
- (b) The building HVAC system zoning shall be based upon grouping common areas with respect to occupancy, use of space and operating schedules. Ancillary spaces (corridors, closets, etc.) within each building zone shall be served by that building zone's HVAC system of similar type.
  - (i) Building zones of separate systems with similar system type shall be:
    - 1. Classrooms.
    - 2. Art/Vocal/Technology/Computer Classrooms.
  - (ii) Building zones of separate systems with similar system type shall be:

1. Administration/Student Services.
  2. Media Center.
- (iii) Building zones of separate systems with similar system type shall be:
1. Cafeterorium.
  2. Multi-Purpose Room.
  3. Gymnasium.
- (c) Provide a similar system type for all spaces within a common building zone, except where otherwise noted.
- (2) Classroom, Art/Vocal/Technology System Zones
- (a) Constant volume rooftop DOAS energy recovery units will be provided with supply and exhaust fan sections with energy recovery enthalpy wheel, discharge plenum, gas fired furnace, hot water heating and chilled water cooling coil with face and bypass dampers, and freeze protection circulation pumps for each coil, pre & final filters. Circulation pumps and valve assemblies to be located above corridors within accessible ceilings.
  - (b) Instructional classroom building system shall be split into two equal zones based upon system load and building exposure. Two DOAS units shall be provided for this building, one for each zone.
  - (c) Low-pressure outside air supply ductwork will extend to ceiling mounted fan coil units connecting to the fan coil unit return duct/ducted plenum box.
  - (d) Low-pressure supply ductwork will extend from each FCU to their associated spaces to ceiling mounted supply air devices.
  - (e) Low-pressure fully ducted exhaust/return air ductwork shall be drawn from space ceiling mounted return grilles to fan coil units.
  - (f) Four-pipe fan coil units will be provided with chilled water and hot water heating coils serving each zone.
  - (g) Space zoning: Each of the following spaces shall have their own fan coil unit:
    - (i) Classrooms.
    - (ii) Large restroom set.
    - (iii) Teacher work room.
    - (iv) Conference room.
    - (v) Perimeter office or small classroom.
    - (vi) Teaching labs.
  - (h) All fan coil units will be located in accessible ceilings within classrooms and/or corridor ceilings where physically possible. FCUs are not to be located above small restrooms and/or closet spaces. Provide hinged access panels within inaccessible ceiling for all FCUs.

- (3) Administration, Student Services and Media Center System Zones
- (a) Variable air volume rooftop handling units shall be provided for each zone with variable-frequency drives (VFDs), supply and return fan sections, discharge acoustic plenum, DX cooling coil, gas fired heating section, pre and final filters, mixing box section with return/relief and outside air connections for an economizer cycle.
  - (b) Medium pressure supply ductwork shall extend to variable air volume boxes with hot water reheat coils with temperature sensor control serving each zone.
  - (c) All boxes shall be located in accessible ceilings outside of offices/general admin spaces within corridor ceilings where physically possible.
  - (d) Low-pressure supply ductwork shall extend from each VAV box to ceiling mounted supply air diffusion devices in its associated space(s).
  - (e) Low-pressure return ductwork shall extend from shafts to ceiling mounted return air grilles.
  - (f) Administration Areas
    - (i) Perimeter offices on outside walls shall be provided with fan-powered VAV boxes and hot water perimeter finned tube radiation. Fan-powered VAV boxes with hot water reheat & perimeter radiation shall be controlled by the same room temperature sensor.
    - (ii) Space zoning: Each of the following shall be considered a single zone and be provided with a dedicated fan-powered VAV box with reheat coil or a VAV box including hot water reheat coil in interior spaces:
      1. Conference rooms.
      2. Principal's office.
      3. Vice-principals' offices.
      4. Nurse's office.
      5. Work room.
      6. Main open office area.
      7. Community parent rooms.
- (4) Cafetorium/Multi-Purpose/Assembly and Gymnasium System Zones
- (a) Variable air volume rooftop handling units shall be provided with VFDs, supply and return fan sections, discharge plenum, DX cooling coil, gas fired heating section, pre and final filters, mixing box section with return/relief & outside air connections for an economizer cycle. Provide integral enthalpy wheel as applicable for energy efficiency.
  - (b) Gymnasium with its spectator area shall be provided with two air handling units—one to serve each side of operable curtain. Low-pressure supply ductwork shall extend to multiple fan-powered VAV boxes with hot water reheat coils serving each large group high ceiling space. Provide hinged access panels within inaccessible ceiling for all coils.

- (c) VAV boxes with hot water reheat coils shall be provided for small support areas such as offices, storage, etc.
  - (d) Low-pressure supply ductwork shall extend from each VAV box to ceiling mounted supply air devices in its associated spaces.
  - (e) Low-pressure return ductwork shall extend from RTU to ceiling-mounted return air grilles. Provide low sidewall-mounted return grilles for Multi-Purpose Room or Stage Front for Cafetorium.
  - (f) Gymnasium distribution shall minimize the quantity of fan-powered VAVs located within the open ceiling area. Where possible, locate Gymnasium fan-powered VAVs within adjacent area's ceiling space and distribute air to steel sidewall supply air devices capable of appropriate throw. Locate equipment tight to structure above.
  - (g) Provide spiral duct for all exposed horizontal duct mains within occupied areas. Provide high- impact gypsum board enclosure for all vertical risers exposed below structure in occupied areas.
  - (h) Provide space carbon dioxide occupancy sensors and monitoring system for control of Gymnasium, Cafetorium and Multi-Purpose Room. All spaces with an occupancy density of 25 people per 1000 sq. ft. shall be provided with CO2 monitors located 6 feet above floor level in a protected location.
- (5) General Exhausts
- (a) Low-pressure exhaust ductwork shall extend from fully ducted exhaust registers in restrooms and utility areas.
  - (b) Toilet rooms stacked vertically shall be exhausted through a common exhaust riser to roof-mounted centrifugal exhaust fans.
  - (c) Low-pressure exhaust ductwork shall extend from kitchen hoods, kiln canopy hood and dishwashing equipment to roof-mounted centrifugal exhaust fans.
  - (d) Classroom lab exhaust hood fully ducted exhaust shall extend from exhaust hood to roof mounted centrifugal upblast exhaust fan.
  - (e) Kiln canopy and exhaust fan shall be separate from kiln manufacturer's vent exhaust.
- (7) Dedicated Split Systems
- (a) A dedicated DX split system shall provide the required cooling & heating for each of the following spaces on a 24-hour, 365-day basis:
    - (i) Emergency Control Center.
    - (ii) Custodial Office/Backup Emergency Control Center.
    - (iii) Elevator Machine Room.
    - (iv) MDF (Main Distribution Frame) Room.
    - (v) IDF (Intermediate Distribution Frame) Room.
    - (vi) Media Center Storage and Server Room.
  - (b) Provide ceiling mounted units, **not** located above the spaces being served.

- (i) Wall mounted or floor mounted indoor units may be used in IDF rooms and media storage and server room, as space and access allow.
- (c) All split-system piping shall be run outside of the space it serves.
- (d) No other building service piping shall run within or above spaces served by split systems.
- (e) Each split system shall be provided with the following components:
  - (i) Rooftop condensing unit.
    - 1. Provide rooftop dry cooler system as an option when exceeding the manufacturer's recommended vertical pipe lengths.
  - (ii) DX cooling coil.
  - (iii) Electric resistance heating.
  - (iv) Fully monitored space temperature and humidity sensors.
  - (v) Supply fan.
  - (vi) Filtration
  - (vii) Low ambient control.
- (8) Electrical Distribution Room, Mechanical and Boiler Rooms
  - (a) Continuously running constant volume heating and ventilation units shall provide the required heating and ventilation for each room. Provide motor operated damper as required for ventilation air and combustion air. Provide conditioning of electrical spaces to maintain 95 degree F indoor temperature to ensure space does not exceed 104 degree F maximum per NEC. Each unit shall be provided with the following components:
    - (i) Automatic shut-off damper.
    - (ii) Disposable 30% filter.
    - (iii) Hot water-heating coil (electric heating within electrical rooms).
    - (iv) Supply fan.
    - (v) Remote wall mounted thermostat.
    - (vi) DX Cooling coil (electrical distribution room)
- (9) Pump Rooms, Exterior Storage Rooms and Incoming Water Service Room
  - (a) Ceiling hung independent unitary heaters shall provide the required heating for each space. Provide multiple heaters to ensure proper space conditioning and coverage. Provide ventilation fan and motor operated louvers as required for air circulation.
  - (b) Each unit heater shall be provided with the following components:
    - (i) Electric resistance heating.
    - (ii) Wall mounted remote thermostat.
    - (iii) Supply fan.



(10) Stairwells

- (a) Unitary cabinet unit heaters shall provide the required heating for each stairwell, vestibule and entry area. Hot water cabinet unit heaters shall be provided at each exterior door and intermittent stair landings. Provide recessed equipment where construction allows. Provide cooling as required for adequate conditioning.
- (b) Each unit shall be provided with the following components:
  - (i) Hot water heating coil.
  - (ii) Wall mounted remote thermostat.
  - (iii) Supply fan.
  - (iv) Disposable 30% filter.
  - (v) Chilled water cooling coil, or DX cooling.

(11) Kitchen

- (a) Design Requirements
  - (i) A dedicated packaged DX cooling gas fired heating air handling unit shall serve the kitchen and dishwash areas for general HVAC.
  - (ii) Provide ceiling-mounted terminal units for the general kitchen and dishwash space heating and space cooling loads.
  - (iii) The kitchen air handling unit shall operate in three modes: Unoccupied, Occupied—Cooking, and Occupied—Non-Cooking.
  - (iv) For intermittent kitchen space conditioning, transfer air grilles drawing air from the cafeteria space to the kitchen and dishwash areas may be provided for periods when the kitchen RTU is not operating.
  - (v) The kitchen hood shall have a dedicated gas-fired DX cooling makeup air handling unit supplying tempered air to the kitchen space and/or hood. Air supply shall be within 10 degrees of space temperature and as required by code.
  - (vi) Note that the kitchen hood exhaust air, dishwasher exhaust and general kitchen exhaust air shall not be returned to the kitchen air handling unit.
- (b) Description of design approach: Air is exhausted from the kitchen via various dedicated exhaust fans.
  - (i) Size dishwash area exhaust for 10 ACH minimum.
  - (ii) The kitchen staff toilet is served by a constant-speed exhaust fan which operates intermittently from a DDC schedule (ON during occupied hours and OFF during unoccupied hours).
  - (iii) The kitchen is served by the kitchen general exhaust fan which operates from the same DDC schedule controlling the operation of the kitchen RTU.
  - (iv) The hood exhaust fan is manually operated through a local switch mounted in the kitchen. Whenever the kitchen is performing cooking-

related activities, the hood exhaust fan must be activated. When the hood exhaust fan is activated, the electrically-interlocked gas valves are opened to allow cooking, and the relief/exhaust damper of the kitchen make up air unit is partially closed. With the hood exhaust fan switch in the OFF position, the gas solenoids of the kitchen equipment burners shall be de-energized (via hard wired interlock between the solenoids and the hood exhaust fan) and the relief/exhaust damper of the kitchen make up air unit are returned to automatic control being sequenced with the outside air damper.

- (v) Kitchen hood exhaust capacity shall be listed and labeled in accordance with UL 710. Design and install the kitchen exhaust hood, ductwork, exhaust fan, make-up air system, and fire protection system in accordance with all applicable codes and manufacturers' printed recommendations.
  - (vi) Supplementary hot water perimeter heating shall be provided under the windows and shall be controlled via local DDC temperature sensors.
  - (vii) Diffusers shall be selected and located to achieve a maximum terminal velocity of 50 fpm around the hood. Standard diffusers shall not be used in the immediate area of the hood in order to maximize the capture and containment of cooking grease laden vapors/odors and minimize effluent spillage.
  - (viii) Floor-mounted exposed cabinet heaters, unit heaters and fan coil units shall not be installed inside the kitchen area.
  - (ix) Kitchen grilles, diffusers and any other devices and apparatus used for air distribution must be flush, aluminum and compatible with the panel ceiling.
- (12) Kitchen Walk-In Refrigerator/Freezer Unit Compressors
- (a) Condensing units shall be roof-mounted on roof curbs in secured, weatherproof enclosures.
- (13) Loading Dock/Receiving areas
- (a) Provide an air curtain to aid in conditioning and prevent debris and insects from infiltrating the building areas.
    - (i) Gas fired or hot water heating
    - (ii) Supply fan
    - (iii) Air dispersion full width of open doorway
    - (iv) When located outdoors provide gas fired heating.
- (14) Entry Areas Without Vestibules
- (a) Provide an air curtain to aid in conditioning and prevent debris and insects from infiltrating the building areas without vestibule.
    - (i) Hot water heating
    - (ii) Supply fan
    - (iii) Air dispersion full width of open doorway

(15) Entry Areas With Vestibules

- (a) Unitary cabinet unit heaters shall provide the required heating for each vestibule entry area. Hot water cabinet heaters shall be provided at each vestibule. Provide recessed equipment where construction allows. For vestibules adjacent to continuously occupied staff area, such as security desk, provide base building system ceiling supply air device in order to pressurize vestibule.
- (b) Each unit shall be provided with the following components:
  - (i) Hot water heating coil.
  - (ii) Wall mounted remote thermostat.
  - (iii) Supply Fan.
  - (iv) Filters

B. Amenity and Comfort

- 1. Space temperature setpoint: In accordance with all project requirements and ASHRAE and DOE standards.
- 2. Relative humidity range: In accordance with all project requirements and ASHRAE standards.
- 3. Perform measurement of temperature and humidity in spaces with unacceptable temperature and humidity fluctuations. Rebalance and adjust system to provide conditions to meet design criteria and comfort levels.

C. Health and Safety

- 1. Emergency Power
  - a. Provide emergency power in accordance with code.
- 2. Electrical Shock Prevention
  - a. Provide a means of disconnecting power at each piece of equipment.
- 3. Refrigerants
  - a. Comply with the requirements of ASHRAE 15.
  - b. Prevent release of refrigerant to atmosphere.
  - c. Prevent exposure of occupants to hazardous refrigerants.
  - d. Do not locate refrigerant equipment within space containing gas fired equipment.
- 4. Indoor Air Quality
  - a. Provide sufficient ventilation to comply with code and to obtain acceptable indoor quality, determined using either the Ventilation Rate Procedure or the Indoor Air Quality Procedure of ANSI/ASHRAE 62.1-2007.
  - b. Locate outside air intakes away from any air contaminants in accordance with ANSI/ASHRAE Standard 62.1 and applicable codes.

## D. Durability

### 1. General Freeze Protection

- a. Provide equipment with low ambient controls. Avoid conditions that create the potential for freezing. Hydronic chilled water lines that are located on the exterior of the building or which serve units that take in outside air shall be a mixture of 30% propylene glycol and water. In addition, the hot water and chilled water pumps shall be energized automatically any time the ambient temperature is less than or equal to 35°F.
- b. Where possible, hydronic hot water and chilled water lines that are not located on the exterior of the building and which do not serve units that take in outside air shall be pure water without glycol in order to minimize the energy efficiency losses experienced with the usage of glycol/water mixtures.
- c. Provide a glycol fill system to automatically fill glycol piping loop whenever system pressure falls below 3 psig of maximum pressure. Provide audible alarm at computer work station.

## E. Operation and Maintenance

### 1. Maintenance Access

- (1) All equipment shall be located to maintain ease of access.
- (2) Equipment utilities shall be routed to allow for access to equipment and replacement without removal of utilities.
- (3) Equipment shall be located in area which will allow for complete removal and replacement without demolition to building infrastructure.
- (4) Provide access doors for access to all enclosed equipment.

#### a. Safety and Convenience

- (1) Provide all motor operated rooftop equipment with the following factory installed items.
  - (a) Disconnect.
  - (b) Dual 120-volt receptacle.
  - (c) Work light with switch.

### 2. HVAC Reliability

#### a. Boilers

- (1) Provide multiple boilers to deliver design load capacity.
- (2) Provide a minimum of three boilers, each sized at 50% of design load capacity.

#### b. Chillers

- (1) Provide two chillers sized at 50% of total chilled water cooling load capacity.
- (2) Provide surge tank to prevent short cycling or documentation demonstrating compliance with manufacturer's requirements for proper system operation.

#### c. Pumps

- (1) Provide multiple pumps to deliver design flow requirements.

- (2) Provide a minimum of two pumps for each system, each sized at 100% of design flow.
  - (a) Provide one pump for chilled water system and one additional standby pump.
  - (b) Provide one main pump for the boiler hot water and one additional standby pump.
  - (c) Provide each boiler with its own circulation pump.
3. Substantiation
  - (1) Design Documents
    - (a) Identification of equipment that requires redundancy.
  - (2) Equipment Testing
    - (a) Provide functional test and report for all equipment to verify operating conditions conform to design parameters.
    - (b) Provide testing, adjusting and balancing of all air systems, hydronic systems, equipment, hoods and their distribution components.
    - (c) Provide testing, adjusting and balancing of all air hood systems and their distribution components as required by ASHRAE 110 and all applicable codes.
    - (d) Complete and submit the air and hydronic systems testing and balancing report. Provide in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB which affect control system setup and operation.
    - (e) Provide prefunction and functional test reports as required for commissioning.
    - (f) Hydronic system testing: Prior to testing all pipe systems must be flushed and strainers cleaned. Adjust water systems to provide required pressure and quantity within 10% of design capacity.
    - (g) Provide sound level testing and report of all spaces to meet requirements of the standard. Sound pressure deviation shall be no more than 3 decibels, with consideration for background noise.
    - (h) Provide training of emergency workers and custodial personnel in accordance with Section 01820, Operation and Maintenance Data and Training.

## PRODUCTS

### A. Condensing Hot Water Boiler

1. Basis of Design
  - a. Buderus.
  - b. Burnham.
  - c. Aerco.
  - d. Fulton.

- e. Lochinvar.
  2. 92% Efficiency.
  3. Heat exchanger: Non-ferrous corrosion resistant.
  4. Direct venting.
  5. Provide controls capable of sequencing multiple boilers compatible with building automation systems as described in Section D8010.50. Capable of local control of setpoints with display/keypad.
  6. Safety controls: High limit aquastat, low water cut off, air safety switch, high condensate cut off probe, flame proof switch.
  7. Boiler condensate cooler and neutralization tank as recommended by boiler manufacturer.
  8. Boiler system shutdown switch at exit to boiler room.
  9. Housekeeping pads and vibration isolation.
- B. DOAS Energy Recovery Units
1. Basis of Design
    - a. McQuay
    - b. AAON, Inc.
    - c. York
    - d. Gouvernaire
  2. Cabinet construction: Weatherproof insulated double wall enclosure, minimum 18-gauge; access doors with piano hinges and locking handle minimum 20-gauge.
  3. Unit configuration
    - a. Supply side
      - (1) Perforated insulated discharge plenum
      - (2) Outdoor air intake
      - (3) Pre and final filters
      - (4) Supply fan with premium efficiency motor, VFD and 10% harmonic distortion filter.
      - (5) Enthalpy wheel
      - (6) Chilled water coil
      - (7) Hot water coil
      - (8) Circulation pumps both coils
      - (9) Freezestat both coils
      - (10) By-pass dampers.
      - (11) Stainless steel drain pans.
      - (12) Pipe access sections within curb.

- b. Exhaust side
    - (1) Filters.
    - (2) Enthalpy wheel.
    - (3) Exhaust/return fan with premium efficiency motor, VFD and 10% harmonic distortion filter.
  - c. Access doors for all sections.
  - d. Manufacturer's controls shall be compatible with building automation systems as described in Section D8010.50 and capable of local control of setpoints with display/keypad.
- C. Rooftop Air Conditioning Unit
- 1. Basis of Design
    - a. McQuay.
    - b. AAON, Inc.
    - c. Carrier.
    - d. Trane.
  - 2. Cabinet construction: Weatherproof insulated enclosure minimum of 18-gauge, access doors with piano hinges and locking handle.
    - a. Supply side
      - (1) Perforated insulated discharge plenum.
      - (2) Outdoor air intake.
      - (3) Pre and final filters.
      - (4) Supply fan with premium efficiency motor, VFD and 10% harmonic distortion filter.
    - b. DX coil.
    - c. Compressor/Condenser
      - (1) Crankcase heater, high and low pressure safety controls, low pressure control, motor overload protection, suction and discharge service valves and filter drier.
      - (2) Direct drive axial fan resiliently mounted, galvanized fan guard.
    - d. Economizer dampers
    - e. Enthalpy wheel.
    - f. Gas Fired Furnace
      - (1) Induced draft type burner with adjustable combustion air supply, modulating gas control, pressure regulator, gas valves, manual shut-off, intermittent spark ignition, flame sensing device and automatic 100% shutoff pilot. Turn down ratio to match minimum load.
      - (2) Gas burner safety controls.

- g. Exhaust/Return side
  - (1) Enthalpy wheel (as noted for system) shall be removable and replaceable media.
  - (2) Filters.
  - (3) Return/exhaust fan with premium efficiency motor, VFD and 10% harmonic distortion filter.
  - (4) Provide back draft damper for RTU with enthalpy wheel.
- h. Premium efficiency motors with thermal overload.
- i. Access doors to all sections.
- j. Factory mounted disconnect switch.
- k. Low ambient operation.
- l. Manufacturer's controls shall be compatible with building automation systems as described in Section D8010.50 and capable of local control of setpoints with display/keypad.

D. Makeup Air Unit

- 1. Basis of Design
  - a. Greenheck
  - b. Reznor
  - c. Penn Barry
- 2. Cabinet construction: double wall
- 3. Unit configuration
  - a. Outside air intake
  - b. Merv 14 air filters
  - c. Outdoor air damper with end switch
  - d. Supply fan
  - e. DX coil
  - f. Compressor/Condenser
    - (1) Crankcase heater, high and low pressure safety controls, low pressure control, motor overload protection, suction and discharge service valves and filter drier.
    - (2) Direct drive axial fan resiliently mounted, galvanized fan guard.
  - g. Indirect fired gas furnace
    - (1) Motorized shut down valve.
    - (2) Stainless steel heat exchanger.
    - (3) Modulating gas valve.
  - h. Integral exhaust fan (space permitting).
  - i. High efficiency ECM motors with thermal overload.



E. Exhaust Fans

1. Basis of Design
  - a. Greenheck.
  - b. Penn Barry.
  - c. Loren Cook.
2. Utility /Restroom Exhaust Fans
  - a. Centrifugal roof exhaust.
    - (1) Vibration isolation.
    - (2) Back draft damper.
    - (3) VFD and 10% harmonic distortion filter for kiln hood.
3. Kitchen Hood Exhaust Fan
  - a. Upblast utility set.
    - (1) Integrated weather cover.
    - (2) Motor located out of air stream.
    - (3) Vibration isolation.
    - (4) Labeled UL-762, complying with NFPA 96.

F. Fan Coil Units

1. Basis of design
  - a. IEC (International Environmental Corp.).
  - b. Temspec Inc.
  - c. Trane.
  - d. Carrier.
  - e. McQuay.
2. Provide ultra-low noise units capable of meeting NC requirements for classrooms.
3. Unit configuration
  - a. Fully enclosed acoustically insulated cabinet.
  - b. Fan.
  - c. Filters.
  - d. Secondary drain pan with leak detection.
  - e. Hot water heating coil.
  - f. Chilled water cooling coil.
  - g. Supply & Return duct collars.
  - h. Ducted return plenum box.
  - i. Pet cock for both coils for system drainage.

- j. High-efficiency ECM motors.
- k. Spring hanging vibration isolators.
- l. Factory mounted switch for multiple speed operation and remote thermostat connection.
- m. Wall mounted thermostat.
- n. Manufacturer's controls shall be compatible with building automation systems as described in Section D8010.50 and capable of local control of setpoints with display/keypad.
- o. Fan coil units shall be sized to meet space acoustical requirements.

#### G. VAV Terminal Air Units

- 1. Basis of Design
  - a. Titus
  - b. Nailor
  - c. Metal-Aire
  - d. Price
- 2. Provide ultra-low noise units capable of meeting code requirements.
- 3. Provide reheat, fan-powered, series configuration for all perimeter areas.
  - a. Manufacturer's controls shall be compatible with building automation systems as described in Section D8010.50 and capable of local control of setpoints with display/keypad.
- 4. Built in actuator with integral velocity sensor.
- 5. High efficiency motors for fan-powered VAV boxes.
- 6. Spring hanging vibration isolators.

#### H. Motors

- 1. Construction
  - a. Electric Service
    - (1) Motors 1/2HP and smaller: 277V single-phase, 60Hz.
    - (2) Motors larger than 1/2HP: 480V three-phase, 60Hz.
  - b. Open drip-proof, designed for continuous operation at 40 degree C environment.
  - c. Design temperature rise in accordance with NEMA MG1 limits for insulation class, service factor and motor enclosure type.
  - d. Motors with frame sizes 254T and larger: energy efficient type.
  - e. Motors shall be sized so driven load will not exceed service factor range above 1.0.
- 2. Explosion-proof motors shall be UL listed and labeled for hazard classification with over temperature protection.
- 3. Provide nameplate in visible location.

4. Motors with variable frequency drives shall be inverter duty type and shall comply with NEMA MG-1, Part 3.1., Insulation Class F or better. Temperature rise at full load with sine wave power shall not exceed Class B temperature limit. Thermal cut-out switch shall be 'Klixon' type. Motor service factor shall be 1.0 when operating from variable frequency drive. Nameplate shall have markings as 'inverter duty'.
  5. Provide sliding bases for belt-driven motors.
  6. Provide totally enclosed motors for exterior locations.
- I. Single-Phase Power—Split-Phase Motors
1. Capacity and torque characteristics: Sufficient to start accelerate and operate connected loads at designated speeds, at installed altitude and environment with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.
  2. Breakdown torque: Approximately 200% of full load torque.
  3. Drip-proof enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve or ball bearings.
  4. Enclosed motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service factor, prelubricated ball bearings.
- J. Three-Phase Power—Squirrel-Cage Motors
1. Capacity and torque characteristics: Sufficient to start accelerate and operate connected loads at designated speeds, at installed altitude and environment with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.
  2. Power output, locked rotor torque, breakdown or pull-out torque: NEMA Design B characteristics.
  3. Design, construction, testing and performance: Conform to NEMA MG-1 for design B motors.
  4. Insulation system: NEMA Class B or better.
  5. Testing procedure: In accordance with IEEE 112.
  6. Motor frames: NEMA standard T-frames of steel, aluminum or cast iron with end brackets of cast iron or aluminum with steel inserts.
  7. Thermistor system (motor frame sizes 254T and larger): Three PTC thermistors imbedded in motor windings and epoxy encapsulated solid state control relay for wiring into motor starter.
  8. Bearings: Grease lubricated anti-friction ball bearings with housing equipped with plugged provision for relubrication, rated for minimum ABMA STD 9, L-10 life of 20,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.
  9. Sound power level: NEMA MG-1.
  10. Part winding start: Use part of winding to reduce locked rotor starting current to approximately 60% of full winding locked rotor current while providing approximately 50% of full winding locked rotor torque.
  11. Nominal efficiency: As scheduled at full load and rated voltage when tested in accordance with IEEE 112.

12. Nominal power factor: As scheduled at full load and rated voltage when tested in accordance with IEEE 112.
13. Stator: Copper windings.
14. Testing: Testing agency shall perform field tests, inspection, and test reports in accordance with NETA ATS on factory and field installed motors.
15. Efficiency: All permanently wired electric motors shall comply with the requirements of EPAct.

**K. Identification**

1. Provide nameplates, tags, stencils, duct and pipe markers to identify all equipment, valves and hydronic system piping distribution and components. Follow the color codes as per ASME A13.1 Colors and Designs.
  - a. Tags shall have corrosion-resistant chains.
  - b. Identify thermostats relating to terminal boxes or fan coil units with nameplates.
  - c. Identify ductwork with plastic nameplates with permanent adhesive or stenciled painting, located at each side of penetration of structure or enclosure.
  - d. Provide non-fading weatherproof nameplate on all mechanical equipment exposed to outdoors.
  - e. Identify piping with service type and direction of flow.
2. Provide valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
3. Provide ceiling tags to locate VAV terminals, fan coil units, reheat coils, valves and dampers above T-bar ceiling panels.

**METHODS OF CONSTRUCTION**

**A. Equipment**

1. Provide all rooftop equipment with 20" high minimum roof curbs for maintenance and protection against snow accumulation.
  - a. Provide solid bottom plenum roof curbs with galvanized channel frame with gaskets, nailer strips.
2. Provide all exterior equipment with secured, weatherproof enclosures.
3. Provide fan guards for all centrifugal fans.
4. Cover and protect all HVAC equipment and motors from damage and moisture during transportation and onsite storage.
5. All equipment and components shall be fully drainable for off-season shutdown. Provide isolation valves to enable shutdown and/or replacement of equipment.
6. Provide secondary drain pans for all ceiling mounted air conditioners, fan coil units, reheat coils to extend 3 inches beyond equipment perimeter, 2 inches deep, of aluminum or stainless steel construction.

**END OF SECTION D3000.00**

**SECTION D3010.00**  
**FACILITY FUEL SYSTEMS**

**PERFORMANCE**

A. Basic Function

1. Provide natural gas for use by HVAC, plumbing, food service, and emergency power equipment.
2. Comply with the most recently adopted New Jersey version of the ICC International Fuel Gas Code.
3. Comply with the most recently adopted New Jersey version of the ICC International Mechanical Code.
4. Where energy supply elements also must function as elements defined within another element group, meet the requirements of both element groups.
5. Provide detection and alarm systems for notification in the event or leak or failure of fuel gas systems and equipment.

B. Amenity and Comfort

1. Heating
  - a. Provide fuel to all fuel burning equipment that is used to maintain space comfort.
2. Plumbing
  - a. Provide fuel to all fuel burning equipment that is used to produce domestic hot water.
3. Food Service
  - a. Provide fuel to all fuel burning equipment that is used in food service operation.
4. Emergency Generator
  - a. 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
  - a. Sufficient to satisfy pressure requirements of the greatest supply pressure equipment demand.
2. Natural Gas System Working Pressure
  - a. Sufficient to satisfy pressure requirements of each individual piece of equipment.
3. Natural Gas Entrance into Facility
  - a. Locate the service meter at least 3 feet from ignition sources and as required by the natural gas utility requirements.
  - b. Facility gas service and emergency generator gas service arrangement shall comply with NFPA 110 Standard for Emergency and Standby Power Systems Chapter 7, Installation and Environmental Considerations.

4. Seismic Protection
    - a. Provide fuel distribution system with the ability to flex where differential movement is anticipated.
  5. Gas Leak Detection
    - a. Provide gas leak detection for incoming gas meter room and all mechanical spaces and other spaces with gas service and where required by code.
  6. Carbon Monoxide Detection
    - a. Provide carbon monoxide detection for all mechanical spaces and other spaces with permanent gas fired equipment.
- D. Durability
1. Expected Service Life Span
    - a. Provide a system which will be viable for the life of building.
  2. Vandalism
    - a. Protect the service meter from unauthorized access and the public.
  3. Accidental Damage
    - a. Protect service meter from accidental damage by installing bollards to stop vehicles.
- E. Operation and Maintenance
1. Ease of Service
    - a. Provide shut-off valves as required by code and at each branch connection.
    - b. Provide emergency gas shut-off valve interlocked with fire alarm detection system located at the entrance to the Boiler Room.
  2. Emergency Generator
    - a. Provide emergency generator gas shut-off valve interlocked with fire alarm detection system.
- F. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

## **PRODUCTS**

- A. Pipe
1. Use one or more of the following:
    - a. Materials permitted by code.
    - b. Black 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 welded fittings and compression type fittings.
  - 2. Do not use:
    - a. Copper.
    - b. Aluminum-alloy.
    - c. Ductile iron.
    - d. Plastic.
    - e. Stainless steel.
- C. Manual gas shutoff valves
- 1. CWP rating: 125 psig
  - 2. Threaded ends 2" and smaller, flanged ends 2-1/2" and larger
  - 3. Two-piece, full-port, bronze ball valves with bronze trim
  - 4. Cast-Iron lubricated plug valves
  - 5. Suitable for natural gas with "WOG" indicated on valve body
- D. Pressure Regulators
- 1. Single stage suitable for natural gas
  - 2. Threaded ends 2" and smaller, flanged ends 2-1/2" and larger
  - 3. Comply with ANSI Z21.80
  - 4. Interchangeable springs and orifice
- E. Carbon Monoxide (CO) Detection and Alarm Systems
- 1. Provide for boiler rooms, domestic water heater rooms, emergency generator rooms, all other spaces with permanent gas fired equipment service.
    - a. Installation in Unoccupied Spaces
      - (1) CO detection and alarm system shall be installed with detectors provided in unoccupied spaces as follows, where and when applicable:
        - (a) CO detectors shall be provided for gas fired emergency generator, gas fired heating equipment and gas fired domestic water equipment.
      - (2) CO detector shall be provided within the gas meter room and gas booster room, if separate rooms are provided.
      - (3) CO detectors shall be located per manufacturer's recommendations considering proximity to fuel burning equipment that may cause false alarms.

F. Operation of Carbon Monoxide Detection and Alarm System

1. Upon detection of CO, the individual CO detector shall signal the gas leak detection alarm control panel. The alarm control panel shall then institute the following:
  - a. Start the associated ventilation exhaust fan in the emergency generator room, gas meter room, and boiler rooms.
  - b. Activate the visual alarms in the boiler room (or gas-fired hot water heater room for projects without boilers), emergency control room, back-up emergency control room, and custodian's office.
  - c. Activate visual alarm in the Fire Alarm panel. (no audible alarms required)
2. The emergency generator, in the event of a loss of utility power, shall power the CO detection system devices and alarm system, including associated exhaust fans.
3. The CO detection and gas leak detection alarm control panel shall contain power supplies to feed the CO detectors and the visual alarms.
4. The CO detection and gas leak detection alarm system control panel shall be located in the boiler room, with remote panels in the emergency control room, back-up emergency control room, and custodian's office

G. Gas Leak Detection and Alarm Systems

1. Boiler rooms, mechanical rooms, emergency generator rooms, all other spaces with gas service and as required by code
  - a. Installation in Unoccupied Spaces
    - (1) Natural gas leak detection and alarm system shall be installed with detectors provided in unoccupied spaces as follows, where and when applicable:
      - (a) Natural gas detectors adjacent to emergency generator and hot water heater (18" below ceiling, above the vent of the gas fired water heater in the vicinity of the barometric damper).
      - (b) Natural gas detectors between the boilers (18" below ceiling above the breeching of the boilers).
    - (2) Natural gas detector in gas meter room, and gas booster room, if separate room is provided (18" below ceiling).

H. Operation of Leak Detection and Alarm System

1. Upon detection of combustible gas, the individual leak detector shall signal the alarm control panel. The alarm control panel shall then institute the following:
  - a. Close the main gas valve on the gas service.
  - b. Electrically shut down all equipment including (but not limited to) the boilers, gas-fired generator, hot water heaters, and gas-fired rooftop equipment.
  - c. Start the explosion proof exhaust fan in emergency generator room, gas meter room, and boiler rooms.
  - d. Activate the audio/visual alarms in the boiler room (or gas-fired hot water heater room for projects without boilers), emergency control room, back-up emergency control room, and custodian's office.



- e. Notify local authorities in accordance with emergency procedures.
  2. The emergency generator, in the event of a loss of utility power, shall power the natural gas leak detection and alarm system, including leak detection exhaust fans.
  3. The natural gas leak detection and alarm control panel shall contain power supplies to feed the gas leak detectors and the audio/visual alarms.
  4. The natural gas leak detection and alarm system control panel shall be located in the boiler room, with remote panels in the emergency control room, back-up emergency control room, and custodian's office.
- I. General
1. Gas meter room, if any, shall have an explosion proof fan, explosion proof lights and sealed penetrations. It shall also be provided with an outside air intake wall louver if above grade. If new gas meter room is below grade, provide an 8-inch diameter outside air intake pipe terminating in a reverse bend two feet above grade level with maximum length as permitted by code.

## **METHODS OF CONSTRUCTION**

- A. Construct the system using the following methods:
1. Install all gas piping and accessories in accordance with IFGC, the local gas company's rules and regulations, and fuel-burning equipment manufacturer's recommendations.
  2. Notify the local 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, bollards, and vehicle protection, as required by the gas company.
  5. Provide lockup type regulators as required by the gas company.
  6. Provide electronic ignitions for gas fired water heaters, boilers, furnaces and air handling units.
  7. 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 applicable codes and the gas company's rules and regulations.
  8. Provide minimum UL-FM approved gas trains; IRI gas trains preferred.
  9. Test, inspect and purge gas piping according to the IFGC and requirements of Authorities having Jurisdiction. Repair leaks and defects with new materials and retest system until satisfactory results are obtained.
  10. Provide seismic restraints for gas piping as per code.
  11. Provide UL listed fire-stop system for all pipe penetrations through fire-rated constructions.
  12. Provide pipe sleeves for pipes passing through concrete walls, masonry walls, concrete floor slabs, and concrete roof slabs.
  13. Provide welding certificates. Welding shall comply with ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications".

14. Prime and paint gas piping (including gas train and vents) yellow as recommended by ANSI A13.1.
15. No natural gas storage is permitted on premises.

**END OF SECTION D3010.00**

## **SECTION D3020.00**

### **HEATING SYSTEMS**

#### **PERFORMANCE**

- A. Basic Function
  - 1. Provide the necessary equipment and infrastructure to deliver heat to the occupied spaces, areas containing life safety systems and areas with freeze potential.
  - 2. Where HVAC elements also must function as elements defined within another element group, meet the requirements of both element groups.
- B. Health and Safety
  - 1. Hazards:
    - a. Provide boilers which safeguard people, property and equipment from the following potential hazards:
      - (1) Exposure to fuel.
      - (2) Exposure to open flames.
      - (3) Exposure to hot surfaces.
      - (4) Explosion.
- C. Durability
  - 1. Temperature Endurance
    - a. 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
    - a. Provide flues and chimneys designed for flue gas temperature compatible with boiler(s), domestic water heaters and other fuel burning equipment.
  - 3. Boiler Design
    - a. Design boilers to conform to the construction standards of the latest version of ASME Boiler and Pressure Vessel Code, Section IV, Rules for Construction of Heating Boilers.
    - b. Design the heat generating plant with more than one boiler. Use three boilers, each with an IBR rating of about 50% of the load. Heating hot water shall be provided at 140 degree F supply with a 30 degree temperature differential.
    - c. Choose the boilers based upon load calculations, efficiency requirements, and the dimensional constraints of the boiler room.
    - d. Coordinate with the local utility to determine gas service connection fee by first submitting a standard gas load letter.
    - e. Design the boiler controls, piping and valves, and its fuel train per NFPA 85 requirements. Specify high turn-down ratio for applications with widely fluctuating loads.

- f. Estimate the boiler's induced draft requirements for sizing the exhaust duct, induced draft fan (if required), forced draft system (if required), and chimney.
- g. Design larger HP induced and forced draft fans with variable frequency drives (VFDs).
- h. If necessary, soften or chemically treat boiler water to about 7.0 pH before introduction or return into the boiler feed system.
- i. Whenever a liquid (glycol) solution is used as a heat transfer fluid, provide fluid(s) that are environmentally acceptable and approved by the authority having jurisdiction.
- j. For hot water boiler systems, the expansion tank and water circulating pump(s) shall be placed up-stream of the boiler.
- k. The hot water GPM/velocity through the boiler shall be within the manufacturer's acceptable limits. Provide boiler circulating pump for boiler systems.
- l. Design all hot water boiler with circulating pumps, and secondary main pump with one stand-by pumps and VFD.
- m. Specify company field advisor to do operational and performance tests as required for boiler acceptance and in compliance with code and commissioning requirements.

D. Operation and Maintenance

1. Boiler Operating Water Pressure and Temperature
    - a. 40 to 160 psig dependent on boiler type, at 250 degrees F minimum.
  2. Ease of Use
    - a. Locate equipment to provide access to and working clearances around heating equipment as required by code and as recommended by the manufacturer.
    - b. Provide clearances to allow for maintenance access and replacement of boilers without removal of other unrelated utilities.
    - c. Provide boiler rooms that provide adequate direct access to the outdoors for servicing and replacement of components.
- E. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

**PRODUCTS**

A. Boilers

1. Use the following:
  - a. Hot water heating equipment.
  - b. Equipment fueled by natural gas.
  - c. Modular condensing boilers.
    - (1) 92% efficiency
    - (2) Direct vent
    - (3) spring isolation

- (4) Boiler circulation pumps: to maintain proper flow rate through the boilers.
- (5) Condensate drain kit
- (6) Muffler as necessary for sound level requirements.
- (7) Housekeeping pad

B. Chimneys and Flues

- 1. Use one or more of the following approved by the fuel burning equipment manufacturer:  
Each boiler to be individually vented to outdoors.
  - 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. Pumps

- 1. Centrifugal Pumps:
  - a. Base mounted with housekeeping pads.
  - b. Split casing
  - c. 175 psi working pressure
  - d. Suction and discharge gauge ports
  - e. Seal flush connection, drain plug
  - f. Flanged suction and discharge
  - g. Mechanical seal, 225 degree F maximum operating temperature
  - h. Alloy steel shaft with copper, bronze or stainless steel shaft sleeve
  - i. VFD with high efficiency motors
  - j. Inertia pads and vibration isolation

D. Auxiliary Equipment

- 1. Use one or more of the following:
  - a. Air separators.
  - b. Expansion tanks
  - c. Chemical water treatment.

E. Piping

- 1. Hot water (<2-1/2 inch): Type L, seamless copper.
- 2. Hot water (>3 inch): Schedule 40, black steel
- 3. Note: Black steel piping will be seamless.

F. Insulation

- 1. Hot water: 1 inch molded fiberglass.
- 2. Exterior piping: Provide ultraviolet-resistant PVC/aluminum jacket with heat trace.

## **METHODS OF CONSTRUCTION**

- A. Construct the heating system using the following methods:
  - 1. Provide breeching sizing calculations certified by the breeching manufacturer.
  - 2. Install support and restrain breeching per seismic restraint requirements per code.
  - 3. Boiler breeching shall be independent of other breeching and venting systems.
- 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 not connect breeching from domestic water heater into boiler breeching. Provide separate systems for domestic water and heating hot water systems.

**END OF SECTION D3020.00**

**SECTION D3030.00**  
**COOLING SYSTEMS**

**PERFORMANCE**

- A. Basic Function
  - 1. Provide a complete cooling system as required to maintain temperature and relative humidity as required by code and project requirements,
  - 2. Where refrigeration elements also must function as elements defined within another element group, meet the requirements of both element groups.
- B. Health and Safety
  - 1. Provide condensing units that comply with ASHRAE 15, Safety Code for Mechanical Refrigeration.
  - 2. Provide pressure vessels that comply with ASME Boiler and Pressure Vessel Code, Section VIII, Pressure Vessels, including both coolers and condensers.
- C. Durability
  - 1. Temperature Endurance
    - a. Provide equipment designed for ambient temperatures ranging from 0 degrees F to 122 degrees F.
  - 2. Chiller Design
    - a. The chilled water system shall consist of two air cooled chillers each sized for 50% of the total chilled water cooling load.
    - b. Chilled water shall be provided at 14 degree temperature differential.
    - c. Each chiller shall be provided with a dedicated chilled water pump with one common spare pump for all chillers.
    - d. Design, fabricate and install chillers to conform to the performance requirements and construction standards of the latest version of all applicable codes and AHRI standards.
- D. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.
- E. Operation and Maintenance
  - 1. Ease of Use
    - a. Locate equipment to provide access to and working clearances around refrigeration equipment as required by code and as recommended by the manufacturer.
    - b. Provide clearances to allow for maintenance access and replacement of refrigeration equipment without removal of other unrelated utilities.
    - c. Provide equipment locations that provide adequate direct access for servicing and replacement of components.

## PRODUCTS

### A. Refrigeration Units

1. Basis of Design
  - a. Liebert
  - b. Mitsubishi
  - c. Compu-Aire Inc.
2. Use one or more of the following:
  - a. Split system air conditioner units.
  - b. Remote air cooled condensing units.
3. Do not use:
  - a. Packaged terminal air-conditioners.
4. Split AC Systems
  - a. Unit Configuration: Self-contained air cooled, factory assembled, pre-wired and pre-piped unit with manufacturer's controls and the following:
    - (1) DX cooling coil.
    - (2) Electric heating coil.
    - (3) Atomizing humidifier with stainless steel pan and solenoid valve.
    - (4) Space temperature and humidity sensors.
    - (5) Supply fan.
    - (6) 30% disposable glass fiber filtration.
    - (7) Low ambient control.
    - (8) Condensate pump.
  - b. Ceiling mounted units shall also include the following:
    - (1) Fully enclosed acoustically insulated cabinet.
    - (2) Supply fan.
    - (3) Secondary drain pan.
    - (4) Inlet and outlet duct collar.
    - (5) Return air plenum.
    - (6) Spring hanging vibration isolators.
  - c. Wall mounted control panel with start/stop switch, adjustable humidity and adjustable temperature setpoints.
  - d. Rooftop dry cooler system as required for design, mounted on 20" roof rails.
  - e. Roof top condensing unit with fan driven by double shafted evaporator fan motor. Mounted on 20" roof rails.



- f. Compressor/Condenser
    - (a) Provide controls compatible with BAS as noted in section D8010.50 high pressure switch, low pressure control, motor overload protection, service valves, oil strainer and drier and safety controls.
  - g. Factory mounted disconnect switch
- B. Air Cooled Chillers
- 1. Basis of Design
    - a. McQuay
    - b. York
    - c. Trane
    - d. Carrier
  - 2. Use one or more of the following:
    - a. Rotary chillers.
    - b. Screw chillers.
    - c. Scroll chillers.
    - d. Provide high-efficiency units.
    - e. For chiller capacities equal to or greater than 140 tons, use rotary or screw chillers.
    - f. For chiller capacities less than 140 tons where rotary or screw chillers are not available, use scroll chillers.
    - g. For constant-speed chillers provide solid-state starters with soft start feature.
    - h. Provide variable-frequency drives (VFD's) for variable-speed rotary and screw chillers.
    - i. Provide minimum 1000-gallon surge tank to prevent short cycling in accordance with manufacturer's recommendation.
    - j. Provide manufacturer's packaged air cooled chillers with manufacturer's microprocessor controls compatible with BMS system and the following:
      - (1) Ability to read and write data for monitoring, control and alarm notification at the BMS head end.
      - (2) Lead/lag staged operating configuration.
      - (3) Chiller controls with weather proof enclosure with lockable hinged access.
      - (4) Lead/lag remote panel for manual or automatic switching.
      - (5) Operating controls to prevent compressor short cycling, load limit thermostat, low ambient control, periodic pump down, hot gas bypass, chilled water setpoints, chilled water reset temperature, start-up and shutdown time schedule and trending capabilities.
    - k. Provide sound reduction package to reduce sound levels. Provide sound attenuation as required to meet the sound level design criteria.

- l. Provide removable louvered panels for protection of coils and lower portion of unit.
  - m. Provide spring vibration isolation, neoprene base pad, and dunnage.
  - n. Provide flexible pipe connections and shut off valves.
  - o. Safety controls including loss of chilled water flow, high or low oil pressure switch, high oil temperature, loss of refrigerant charge, high motor winding temperature, low temperature thermostat operation, control device failure, external emergency stop.
3. Do not use:
- a. Centrifugal chillers.
  - b. Reciprocating compressors.
  - c. Across-the-line starters.

#### C. Pumps

##### 1. Centrifugal Pumps

- a. Base mounted with housekeeping pads.
- b. Split casing, cast iron or bronze.
- c. 175 psi working pressure.
- d. Suction and discharge gauge ports.
- e. Seal flush connection, drain plug.
- f. Flanged suction and discharge.
- g. Mechanical seal, 225 degree F maximum operating temperature.
- h. Alloy steel shaft with copper, bronze or stainless steel shaft sleeve.
- i. Premium efficiency motors with VFD & 10% harmonic distortion filter.
- j. Inertia pads and vibration isolation.

#### D. Auxiliary Equipment

1. Provide a complete system with all accessories and components necessary for performance consistent with all project requirements, including the following:
  - a. Pot feeders.
  - b. Air separators.
  - c. Expansion tanks.
  - d. Chemical water treatment.

#### E. Piping

1. Above-ground refrigerant piping, within the building:
  - a. Type ACR drawn-copper tubing or Type L, H58 hard drawn-copper tubing.
2. Refrigerant piping for 2" and smaller:
  - a. Type L or Type K annealed-copper tubing.
  - b. Install below ground refrigerant piping in protective conduit. Vent conduit outdoors.

3. Flexible connectors: Corrugated stainless steel hose with single layer of stainless steel exterior braiding with copper tube ends.
  4. Refrigerant Pipe Hangers and Supports:
    - a. Comply with the requirements and recommendations of MSS, Manufacturers Standard Society for the Valve and Fittings Industry, Inc.
  5. Chilled Water (<2-1/2 inch): Type L, seamless copper.
  6. Chilled Water (>3inch): Schedule 40, black steel, seamless.
- F. Insulation
1. Chilled Water & glycol: 1" molded fiberglass.
  2. Cooling Coil condensate drains: 1" fiberglass
  3. Exterior piping: Provide ultraviolet-resistant PVC/aluminum jacket with heat trace.
  4. Refrigerant Suction: 1/2" flexible elastomeric cellular rubber insulation ASTM C 534 Grade 3, ultraviolet-resistant PVC jacketing, molded tubular material.

## **METHODS OF CONSTRUCTION**

- A. Construct in accordance with the following:
1. Non-HCFC's refrigerants are acceptable such as R-134a (HFC) or R-410A.
  2. Provide vibration isolation and seismic restraints for refrigeration equipment and refrigerant piping, per code.
  3. Provide UL Listed fire-stop system for all refrigerant pipe penetrations through fire-rated constructions.
  4. Provide pipe sleeves for refrigerant pipes passing through concrete walls, masonry walls, concrete floor slabs, and concrete roof slabs.
  5. Install refrigerant piping according to ASHRAE 15.
  6. Install refrigerant piping in rigid or flexible conduit in locations where tubing will be exposed to mechanical injury.
  7. Test and inspect refrigerant piping according to ASME B31.5, Chapter VI.
  8. Provide refrigerant monitoring and oxygen depletion monitoring system in compliance with ASHRAE 15 and the International Mechanical Code for all mechanical rooms with indoor mechanical equipment containing refrigerants.
  9. Provide protective aluminum jacket or protective weather-resistant finish for insulated refrigerant piping located outdoors or subject to abuse.
  10. Split DX Systems
    - a. Ensure that the relative installed height and distance between the condensing unit and evaporator unit meet the manufacturer's requirements. If possible, place the condensing unit at a lower level than the evaporator.
    - b. Consider using hot gas by-pass for capacity control, especially with 100% outdoor air.
    - c. For larger systems, choose multistage compressors with solid-state starters.

- d. For rooms conditioned with split systems, provide supplemental air via branch duct, supply air grille and volume damper, by connecting to a base building air conditioning system's supply air duct.
11. Specify company field advisor services in sufficient quantity to address start-up, commissioning tests, and personnel training on major equipment.
- B. Chillers
1. For systems utilizing variable-flow chillers with VFDs, select chillers to optimize partial load efficiencies..
  2. Size the chilled pumps so the water velocities in the evaporator tubes are within the chillers' acceptable limits.
  3. Evaluate need for chemical treatment of the chilled water system.

**END OF SECTION D3030.00**

**SECTION D3050.10**  
**FACILITY HYDRONIC DISTRIBUTION**

**PERFORMANCE**

- A. Basic Function
  - 1. Distribute heating water and cooling water to maintain the required space conditions.
  - 2. Systems required include chilled water system and heating hot 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.
- B. Health and Safety
  - 1. Accidental Explosion
    - a. Provide pressure relief valves to prevent over-pressurizing the systems.
  - 2. Fire Source
    - a. Provide distribution elements constructed of incombustible materials.
- C. Durability
  - 1. Expected Service Life Span
    - a. Provide a hydronic distribution system which will be viable for the life of building.
  - 2. Pressure Ratings
    - a. 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
    - a. Provide a means of removing air from hydronic distribution systems to prevent erosion. Design systems in a manner that will prevent cavitation.
  - 4. Corrosion Control
    - a. Drain condensate from cooling coils to prevent corrosion of associated equipment.
    - b. Provide condensate drain pans with piped condensate drain and p-trap for cooling equipment.
  - 5. Pipe Stress and Strain Control
    - a. Provide pipe loops, bends, expansion joints, and flexible pipe connectors to reduce stress and strain due to expansion and contraction.
- D. 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
  - (1) Match pump pressure and flow characteristics with the pressure and flow characteristics of the distribution system.
- E. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

## 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
          - (i) Welded Standard Class wrought steel fittings.
          - (ii) Flanged Class 150 wrought steel fittings.
          - (iii) Flanged Class 125 cast iron fittings.
          - (iv) Flanged Class 250 cast iron fittings.
          - (v) Grooved ductile iron fittings.
    - c. Valves
      - (1) General-duty valves for HVAC piping
        - (a) Gate, globe, check, ball and butterfly.
        - (b) Two-piece, full-port, bronze ball valves with bronze trim.
        - (c) Iron, single-flange butterfly valves.
        - (d) Bronze swing check valves.
        - (e) Iron swing check valves.
      - (2) Calibrated-orifice balancing valves.
        - (a) Bronze, cast iron, steel
      - (3) Control valves
        - (a) 2" and smaller
          - (i) Pressure independent valves or characterized control valves
          - (ii) Control valves shall be part of a factory assembled coil connection package supplied by the valve manufacturer.

- (iii) Supply side coil connection shall include a strainer/shut-off ball valve/drain, an integrated isolation ball valve/manual air vent with P/T port
- (iv) Return side coil connection shall include a union fitting with P/T port, a pressure independent or characterized control valve, an integrated manual balancing valve/union/isolation ball valve/manual air vent with P/T port.
- (v) Provide 24" flexible hose set for coil connection
- (b) 2-1/2" and larger
  - (i) Butterfly valves
  - (ii) Class 150 flanges
  - (iii) 316 stainless steel disc
- d. Dielectric Nipple, Coupling, and Waterways
  - (1) Separate ferrous and copper alloy connections with nonconductive insulating material
- e. Condensate Drain Piping
  - (1) Type M or DWV, with wrought copper fittings and soldered joints

## B. Pumps

- 1. Basis of Design
  - a. Paco
  - b. Aurora Pumps
  - c. ITT B&G
- 2. Types
  - a. Base-mount end-suction
  - b. Base mounted split case
  - c. Vertical in-line
- 3. Cast iron or bronze casing with flanged pump connections
- 4. Pumps shall be non-overloading at any point on the pump curve
- 5. Premium efficiency motors with VFD and 10% harmonic distortion filter.

## 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 as required by code.

5. Provide UL listed firestop systems for all pipe penetrations through fire-rated construction.
6. Provide pipe sleeves for pipes passing through concrete walls, masonry walls, concrete floor slabs, and concrete roof slabs, fire-rated where required.
7. Provide dielectric fittings for combining systems or components made of dissimilar 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 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, and water coil.
14. All hydronic equipment shall be designed with shut-off isolation valves to facilitate maintenance and replacement.
15. Pipe Identification
  - a. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.
16. Valve tags
  - a. Install tags on valves and control devices in piping systems except the following:
    - (1) Check valves.
    - (2) Valves within factory-fabricated equipment units.
    - (3) Plumbing fixture supply stops.
    - (4) Shutoff valves.
    - (5) Faucets.
    - (6) Convenience and lawn-watering hose connections.
    - (7) HVAC terminal devices and similar roughing-in connections of end-use fixtures and units.
  - b. List tagged valves in a valve schedule.
17. Piping System
  - a. Generally, design the system using a constant pressure drop of maximum 3 feet per 100 feet of piping, providing the fluid velocity is within acceptable limits (about 10 FPS maximum).
  - b. Use calibrated orifice balancing valves and automatic flow-control valves, or pressure independent control valves.



- c. Incorporate isolation valves so that all equipment and instruments attached to the system may be easily serviced or replaced.
  - d. Evaluate the piping system's expansion and show all provisions for anchoring, guiding, and compensation on the drawings.
  - e. Provide air vents with all piping systems.
  - f. Include an approved backflow preventer with any hydronic system connected to a potable water system.
  - g. Insulate, support, and pitch the piping system.
  - h. Design the water treatment system as required by the application.
  - i. Provide valved and capped connections on branches to facilitate future system modifications and expansion. Provide within mechanical spaces for additional equipment such as pumps, boilers, chillers etc. Provide minimum of 2 within each HVAC system zone for additional future terminal unit equipment.
18. Pumps
- a. Consider any extra fouling that may be present after years of operation of the hydronic piping and equipment when estimating the system's total pressure head.
  - b. Choose the type of pump (in-line, base mounted, split case, etc.) that best suits the application.
  - c. Pipe the pump installation to include isolation valves, suction "Y" strainer, suction and discharge pressure gauges, check valve, and adequate suction piping length or suction diffuser.
  - d. Include VFD, vibration isolators, and flexible piping connections as required by each application.
19. Hydronic Heat Exchangers/Convectors
- a. Choose the type of exchanger (shell-and-tube, plate-and-frame, etc.) that best fits the application.
  - b. Size the unit according to the manufacturer's recommendations.
  - c. Pipe the exchanger with isolation valves, temperature and pressure gauges, two- or three-way valve and controls that best fit the hydronic system and application.
20. Terminal Units (Variable Air Volume Boxes, Unit Heaters, Finned Tube Radiation, etc.)
- a. Design, pipe, and install the terminal unit based on the space load, application, and manufacturer's instructions.
21. Do not use any the following methods or procedures:
- a. PVC or CPVC piping.

**END OF SECTION D3050.10**

**SECTION D3050.50**  
**HVAC AIR DISTRIBUTION**

**PERFORMANCE**

- A. Basic Function
  - 1. Distribute air to maintain the required space conditions.
  - 2. Where air distribution elements also must function as elements defined within another element group, meet the requirements of both element groups.
- B. Codes and Standards: Comply with the most recent adopted versions of all codes and standards applicable to the project, which may include the following
  - 1. New Jersey Uniform Construction and all subcodes, including:
  - 2. NIH Design Policy and Guidelines.
  - 3. NFPA 90A – Installation of Air Conditioning and Ventilating Systems.
  - 4. NFPA 96 – Ventilation Control & Fire Protection of Commercial Cooking Operations
  - 5. Sheet Metal and Air Conditioning Contractors’ National Association (SMACNA/ANSI), HVAC Duct Construction Standards.
- C. Amenity and Comfort
  - 1. Space Temperature Control
    - a. Coordinate air distribution system's design and installation with zoning and space temperature requirements specified in project requirements and other Performance Specifications sections.
  - 2. Humidity Control
    - a. Provide humidification modulation and control for all spaces served by split systems.
    - b. Maintain relative humidity between 30 and 50 percent in all spaces served by split systems.
  - 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
      - (1) Provide an air distribution system which allows relocation of supply diffusers, adjustment of direction of airflow from supply diffusers, and adjustment of dampers.
      - (2) Provide volume dampers throughout air distribution system as required for air balancing and adjustment. At a minimum provide volume dampers at each air device, each floor duct main take-off of riser, and each duct main split.
    - c. Provide the services of a testing, adjusting, and balancing firm certified by either AABC (Associated Air Balance Council) or NEBB (National Environmental Balancing Bureau).

- (1) Measure air movement in accordance with ANSI/ASHRAE Standard 55 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
      - (1) Provide systems which comply with the acoustical requirements of code, project requirements and RC Levels as defined in ASHRAE HVAC Applications Handbook. Do not exceed the sound pressure level for any octave band at the specified RC.
      - (2) Verify compliance as required by code and project requirements and the following:
        - (a) Construction: Measurement, record, and report of sound pressure levels in each octave frequency band.
        - (b) 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 area.
        - (c) Measurement of room sound levels with ANSI S1.4-1983(R06), Type 1 or 2 sound level meters.
          - (i) Calibration of meters and then measure room sound levels.
          - (ii) Result Interpretation
            1. Acceptable RC levels: Measured sound pressure levels are below the specified dB levels for the given octave band.
            2. Remedial action: Reduction of sound pressure levels which exceed specified dB levels for a given octave band.
        - (d) Provide equipment with sound ratings which comply with testing and rating requirements of ARI 880.
      - b. Equipment: Provide low noise, sound attenuated equipment. Provide sound attenuators and/or insulated equipment/ductwork as required to obtain acceptable levels.
        - (1) Construction: Provide tested and rated air terminals.
        - (2) Provide sound power levels for all fan powered equipment.
        - (3) Provide vibration isolation for all motorized equipment.
        - (4) Provide air handling unit duct supply and return main sound attenuators as required to meet space acoustical requirements.
  5. Cleanliness:
    - a. Provide filtration of all air distributed to the occupied spaces.
    - b. Provide filtration of outside air at outside air intake openings.
    - c. Provide insect screens at outside air intake openings.
  6. Odor: Provide exhaust to remove odors in accordance with code requirements and the following:

- a. Janitors' closet exhaust: 2 cfm per sq. ft. minimum.
- b. Locker room exhaust: 2 cfm per sq. ft. minimum.
- 7. Appearance
  - a. Air Device Color
    - (1) Provide air devices within same space with matching color.
    - (2) Match surrounding finish colors.
    - (3) Provide factory-applied finish colors.
- D. Health and Safety
  - 1. Bacterial Growth
    - a. Provide humidifiers which do not promote the growth of microorganisms.
    - b. All ductwork lining installed shall not promote the growth of microorganisms.
  - 2. Fire Sources
    - a. Provide air distribution elements constructed from incombustible materials.
  - 3. Fire Spread
    - a. Provide interlocks to prevent operation or start-up of air distribution elements when fire or smoke detection systems are in alarm condition.
    - b. Provide fire and/or smoke dampers at penetrations through rated assemblies.
  - 4. Accidental Explosion
    - a. Provide ventilation to prevent build-up of explosive gases.
- E. Durability
  - 1. Expected Service Life Span
    - a. Provide a system which will be viable for the life of building.
  - 2. Aesthetic Life Span
    - a. Provide units exposed within the occupied space which will not fade, chip, or peel for a minimum of 10 years.
  - 3. Accidental Damage
    - a. Provide housekeeping pads, roof curbs, raised dunnage, weatherproof enclosures, fan guards, access panels, bollards, and other elements necessary to protect air distribution system and equipment from accidental damage.
- F. Operation and Maintenance
  - 1. Operating Parameters
    - a. Duct Construction
      - (1) In accordance with SMACNA HVAC Duct Construction Standards.
      - (2) Duct seal class A for duct pressure classes above 2 inches w.g. and above.
      - (3) Duct seal class B for duct pressure classes 2 inches w.g. and less.

- b. Penetrations through fire rated partitions shall be fire stopped. Penetrations through non-rated partitions shall be sealed with acoustic caulk and backer rod.
- c. Fans
  - (1) Match fan pressure characteristics to the air distribution system pressure characteristics including the system effect factors; pressure characteristics based on ANSI/AMCA Standard 210 fan ratings and system characteristics based on engineering calculations.
- d. Substantiation
  - (1) Preliminary Design
    - (a) Identification of the type of fan to be used.
  - (2) Design
    - (a) Calculations showing the air distribution pressure characteristics and data supporting the selection of the fan.
  - (3) Construction
    - (a) Calculations showing the air distribution systems pressure characteristics.
    - (b) AMCA seal and ratings on each fan used.
    - (c) Complete and submit Air and Hydronic Systems testing and balancing report.
    - (d) Provide prefunction and functional test reports as required for commissioning.
- 2. Ease of Use
  - a. Provide units with individual controls coordinated with controls specified in Integrated Automation Control of HVAC Systems, Section D8010.50.
  - b. Locate access panels and access doors at service side of all components and ceiling mounted equipment.
- 3. Access
  - a. Provide units with removable access panels or hinged access doors to allow cleaning and replacement of filters, coils, humidifiers, enthalpy wheels and fans.
  - b. Locate units and other building elements to provide easy access for maintenance and replacement without relocation of other elements.
- G. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

## **PRODUCTS**

### **A. Ductwork**

- 1. Use one or more of the following:
  - a. Galvanized sheet metal duct: ASTM A 653A 653M FS Type B
    - (1) Supply: Hot dipped, G-90 galvanized coated, steel sheet.
    - (2) General exhaust: Hot dipped, G-90 galvanized coated, steel sheet.
    - (3) Exposed exterior ductwork: Double wall insulated ductwork.

- b. Stainless steel metal duct: ASTM A666, Type 304 and Type 316
  - c. Aluminum sheet metal duct: ASTM B 209 (ASTM B 209M)
    - (1) Provide aluminum connectors and bar stock
    - (2) Provide mill finish for concealed ducts.
    - (3) Provide exposed side bright finish for exposed ducts.
  - d. Flexible Duct
    - (1) Insulated flexible ducts.
    - (2) Black polymer or two-ply vinyl film supported by helically wound spring steel wire.
    - (3) Fiberglass insulation with polyethylene or aluminized vapor barrier film.
    - (4) Limit use to 4 feet extended length in supply applications.
2. Do not use:
- a. Fibrous glass duct.

**B. Insulation**

- 1. Supply ductwork (interior exposed mechanical rooms): 1½-inch rigid fiberglass board.
- 2. Supply ductwork (interior concealed): 1½-inch blanket fiberglass.
- 3. Supply and return (vertical shaft risers): 2-inch rigid board
- 4. Exposed exterior ductwork: Double wall insulated ductwork.
- 5. Outside air intake ducts and plenum: 3-inch rigid board
- 6. Exhaust duct insulation 10 feet up to exterior penetration: 1½-inch blanket fiberglass.
- 7. Flexible Glass Fiber Insulation
  - a. Non-combustible blanket
  - b. Vapor barrier
    - (1) Kraft paper with glass fiber yarn and bonded to aluminized film
- 8. Rigid Glass Fiber
  - a. Non-combustible
  - b. Vapor barrier jacket
    - (1) Kraft paper with glass fiber yarn and bonded to aluminized film
- 9. Duct liner
  - a. 1" thickness
  - b. Acrylic polymer coating (no free fibers in airstream)
  - c. Anti-microbial coating
- 10. Kitchen Hood Grease Exhaust Duct Insulation
  - a. 2 hour rated UL listed, providing zero clearance to combustibles.

- b. Ceramic fiber duct wrap in multiple layers with staggered joints and continuous vapor barrier seal.
      - c. Basis of Design: 3M Fire Barrier Duct Wrap 15A.
- C. Air Devices, including Diffusers, Registers, and Grilles
  - 1. Basis of Design
    - a. Titus
    - b. Anemostat
    - c. Price
  - 2. Use one or more of the following:
    - a. Factory-finished steel air devices.
    - b. Aluminum air devices.
    - c. Stainless steel air devices.
  - 3. Provide aluminum air devices in moist areas, restrooms, kitchen and dishwash areas.
  - 4. Air devices shall be adjustable from the face, provided with volume dampers within neck.
  - 5. Provide dual opposed blade dampers where line of sight is prevalent into interior of duct.
  - 6. Air devices to have adjustable blow pattern.
- D. 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.
- E. Manual volume dampers
  - 1. Steel.
  - 2. Parallel or opposed blade design.
  - 3. Multiple blade.
  - 4. Single blade fabricate for up to 6x30 inch dimension.
  - 5. Standard leakage rating.
  - 6. Provide extended shaft.
- F. Combination Fire and Smoke Dampers
  - 1. Type: Dynamic; rated and labeled according to UL 555.

2. Fire rating: 1½ hours and as indicated or required by code.
  3. Two-position damper.
  4. Mounting sleeve and collar.
  5. Concealed linkage.
  6. Blades out of airstream.
  7. Integral smoke detector.
  8. Close-off rating 4 in. w.g.
  9. End switch to indicate damper position.
- G. Fire Dampers
1. Type: Dynamic; rated and labeled according to UL 555.
  2. Fire rating: 1½ hours and as indicated or required by code.
  3. Two-position damper.
  4. Mounting sleeve and collar.
  5. Blades out of airstream.
  6. Close-off rating 4 in. w.g.
  7. End switch to indicate damper position.
- H. Duct Smoke Detectors
1. Provide as required by code.
- I. Commercial Kitchen Hood Exhaust Ducts
1. Comply with International Mechanical Code and other code requirements.
  2. Concealed: Carbon-steel sheet (minimum 0.060 inch or No. 16 U.S. Standard Gauge) commercial quality, with oiled matte finish for exposed ducts.
  3. 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.
  4. Continuous liquid tight welds of flange, seams and joints.
  5. Minimum duct velocity shall be 1500 feet per minute.
- J. Dishwasher Hood Exhaust Ducts
1. Provide type 304, stainless steel with finish to match kitchen equipment and range hood. Weld and flange seams and joints.
  2. Aluminum, with seams and laps arranged on top of duct.
  3. Pitch ductwork towards equipment being served.
  4. Provide duct condensate drain with P-trap at all low points in exhaust system. Extend condensate pipe to nearest floor drain or utility sink.
- K. Laboratory Hood Exhaust Ducts
1. Comply with International Mechanical Code and other code requirements.
  2. Concealed: Carbon-steel sheet (minimum 0.060 inch or No. 16 U.S. Standard Gauge).



3. Exposed: Type 316, stainless steel (minimum 0.050 inch or No. 18 U.S. Standard Gauge).
  4. Continuous liquid tight welds of flange, seams and joints.
  5. Minimum duct velocity shall be 1500 feet per minute to 2000 feet per minute maximum.
- L. Kiln Exhaust Ducts
1. Comply with manufacturer's recommendations, International Mechanical Code and other code requirements.
  2. Exposed: Type 304, stainless steel (minimum 0.050 inch or No. 18 U.S. Standard Gauge), or aluminum.
  3. Provide hard duct throughout Kiln exhaust system, with flexible connection to equipment.
  4. Kiln canopy hood duct velocity shall be 1500 feet per minute minimum.

## **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."
  2. Fire-Rated Partition Penetrations
    - a. Where ducts pass through interior partitions and exterior walls, install appropriately rated fire dampers, fire/smoke dampers, sleeves, and fire stopping systems. 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 "Duct Cleanliness for New Construction."
  4. Install ducts with hangers and braces designed to withstand, without damage, seismic force required by applicable codes.
  5. Provide duct accessories of materials similar to ductwork materials installed in: use galvanized-steel accessories in galvanized-steel ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
  6. 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 three duct widths from branch takeoff.
  7. Install backdraft dampers or motorized dampers on exhaust fans or exhaust ducts nearest to outside, except where prohibited by code.
  8. Install flexible connectors in ductwork connections to equipment associated with fans and motorized equipment supported by vibration isolators.
  9. Provide clean outs as required by code at base of vertical risers and transitions.
  10. 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 and outlet side of duct mounted coils.
    - b. Adjacent to fire or smoke dampers, providing access to reset or reinstall fusible links.

- c. Adjacent to duct smoke detectors.
  - d. Duct access doors shall have one dimension minimum of 12 inches.
11. Fabricate all ducts and components in compliance with all applicable codes and the following:
- a. 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.
  - b. 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.
  - c. Commercial kitchen grease exhaust duct insulation shall have a minimum 2-hour fire rating.
12. Install new filters prior to testing adjusting and balancing.
13. Install new filters immediately before issuance of Certificate of Occupancy.
14. Provide one complete set of extra filters for each piece of equipment that is provided with filters. Where equipment serves outside air with pre-filters and final filter, provide two sets of both types.
15. Do not use any the following methods or procedures:
- a. Duct tape as a sealant on any ducts.
16. Electrical Equipment Spaces
- a. Do not route ducts through or above transformer vaults, electrical equipment spaces and enclosures.
    - (1) Exception: Branch ductwork serving the electrical space, not to be run above equipment or equipment panels.

**END OF SECTION D3050.50**

**SECTION D3050.60**  
**HVAC DESIGN PARAMETERS**

**PERFORMANCE**

A. Description/Design Approach

1. Heating Ventilating and Air Conditioning Systems shall be designed in accordance with the International Mechanical Code, heating and cooling load calculations and ASHRAE Standard 62.1 Ventilation for Acceptable Indoor Air Quality using the following criteria:
  - a. Comply with LEED requirements for design and construction as stipulated in the Owners Project Requirements.
2. Adherence to design parameters defined herein is required to the extent that such parameters exceed or are more stringent than applicable codes and standards.
3. Perform HVAC calculations for system designs according to ASHRAE recommendations and other project requirements wherever applicable. Preserve all calculations as part of the record of design.
4. Coordinate all HVAC equipment locations with all architectural and engineering disciplines and the work of all trades.
5. Coordinate with the plumbing engineer to identify the quantity and/or location of the floor drains to satisfy code, equipment drainage, and maintenance and good housekeeping.
6. Housekeeping Pads
  - a. All floor-mounted or supported equipment shall be on concrete housekeeping pads that are minimum 4" longer and wider than the equipment base and a minimum height of 4".
  - b. Each pad shall be lagged to the floor with a minimum of 4 steel anchoring devices. Steel rods shall form a 12 inch grid to provide reinforcement of concrete. Provide spring vibration isolation for motorized equipment.
  - c. All edges and corners shall be chamfered 1".
  - d. All tripping hazards shall be eliminated.
  - e. Heights and reinforcement requirements may vary depending on the weight and dynamic forces produced by the equipment.
  - f. Adequate space shall be provided around pads to allow for servicing of equipment and manufacturers recommended clearances.
  - g. Clearances shall be maintained around boilers, generators, tanks and related equipment and appliances so as to permit inspection, servicing, repair, replacement and visibility of all gauges.
7. The final sizing and layout of mechanical equipment rooms shall consider possible future expansion of the facility's requirements.

- B. Indoor design conditions: Design criteria for all spaces shall be in compliance with code and the following:
1. General Spaces
    - a. Classrooms and Offices
      - (1) Dry Bulb Temperature
        - (a) 75 deg F summer, 50% RH.
        - (b) 72 deg F winter.
        - (c) 80 deg F DB/66 deg F WB unoccupied summer.
        - (d) 55 deg F unoccupied winter.
      - (2) Spaces Served by Split Systems, Dry Bulb Temperature
        - (a) 75 deg F summer, 55% RH max.
        - (b) 24 hour/7 days per week year-round operation, independent of other building systems.
- C. Outdoor Conditions
1. All equipment will be sized and systems designed to meet the indoor design conditions under all outdoor conditions as required by code and within the limits outlined below.
    - a. Winter
      - (1) Dry bulb temperature: 0 deg F.
      - (2) Wind velocity: 19.4 miles per hour.
    - b. Summer
      - (1) Dry bulb temperature: 94 deg F.
      - (2) Wet bulb temperature: 74.9 deg F.
      - (3) Wind velocity: 7.5 miles per hour.
- D. Internal Load Criteria
1. Internal heat gain from lighting, heat generating equipment and people occupying the spaces for design (peak load) calculations and sizing of the HVAC and mechanical systems shall comply with code and all project requirements. General space load criteria are listed below.
  2. People
    - a. General: 250 Btu sensible, 155 Btu latent.
    - b. Gymnasium participant: 710 Btu sensible, 1090 Btu latent.
    - c. Gymnasium spectator: 250 Btu sensible, 275 Btu latent.
    - d. Kitchen areas: 275 Btu sensible, 475 Btu latent.
  3. Lighting
    - a. Classrooms: 1.5 watts/sf.
    - b. Offices: 1.5 watts/sf.

- c. Gymnasium: 1.5 w/sf.
  - d. Cafeteria: 1.5 w/sf.
  - e. Corridors and general areas: 1.0 watts/sf.
4. Equipment
- a. Classrooms: 2 watts/sf.
  - b. Offices: 4 watts/sf.
  - c. Corridors and general areas: 1 watt/sf.
  - d. Kitchen areas: per manufacturer equipment data.
- E. Building Envelope Criteria
1. Heating
- a. Heating load shall include:
    - (1) Maximum transmission losses through exterior envelope:
      - (a) Exterior wall overall U-value 0.064 Btu/hr/sf/F.
      - (b) Slab on grade floor (unheated slabs) F value 0.73 Btu/hr/lf/F; overall U-values 0.25 Btu/hr/sf/F.
      - (c) Roof/ceiling overall U-values 0.048 Btu/hr/sf/F.
    - (2) Ventilation outside air intake load plus building pressurization.
    - (3) Miscellaneous transmission losses through slabs on grade and foundations.
2. Cooling
- a. Cooling load shall include:
    - (1) Transmission and solar heat gain through exterior envelope:
      - (a) Exterior wall overall U-value 0.064 Btu/hr/sf/F.
      - (b) Slab on grade floor (unheated slabs) F value 0.73 Btu/hr/lf/F; overall U-values 0.25 Btu/hr/sf/F.
      - (c) Roof/ceiling overall U-values 0.048 Btu/hr/sf/F.
      - (d) Solar heat gain coefficient 0.40.
      - (e) Building envelope criteria as prescribed by code and project requirements.
    - (2) Ventilation outside air intake load plus building pressurization.
    - (3) Sensible and latent heat gain per space based on program occupancy per net floor area of occupied space as determined above and by code.
    - (4) Interior heat gains from lighting, equipment, fixtures, computers, and other sources of heat generation.
    - (5) Infiltration losses with 15 mph wind. Include the effects of positive pressurization.

F. Ventilation Criteria

1. Comply with outdoor air requirements per occupant for all spaces compliant with ventilation standards and by code.
2. Elevator venting.
  - a. Elevator machine rooms and hoistways shall be provided with vents to prevent the accumulation of smoke and hot gases in case of fire in accordance with code.
    - (1) Vents shall open either directly or through non-combustible ducts to the outdoor air.

G. Insulation and Acoustical Performance

- a. Equipment
  - (1) Fan coil and heat pump units shall have interior anti-microbial acoustic lining downstream of the supply fan.
  - (2) Air handling units, supply and return ductwork shall have anti-microbial acoustic lining for a10 feet length beyond unit connection.
  - (3) Packaged rooftop equipment, supply and return ductwork shall have anti-microbial acoustic lining for a10-foot length beyond unit connection.
  - (4) All equipment with motors shall have vibration isolation.
  - (5) Provide sound attenuating units and/or other measures as necessary to comply with specified sound level criteria.
  - (6) Provide sound attenuating units within supply and return duct mains for each air handling unit, DOAS and packaged rooftop unit system.

H. Air Filtration Criteria

- a. Equipment
  - (1) Packaged roof top units and air handling units: 30% prefilters, 85% final filters
  - (2) Terminal equipment (FCUs, VAV boxes, cabinet unit heaters): 30% filters
  - (3) Independent air conditioning systems: 30% filters.

I. Pressurization Criteria

- a. Design all systems to attain desirable pressure levels within the rooms relative to all adjacent areas per code. In general, the following guidelines will apply:
  - (1) Kitchen Areas and Restrooms: Negative to corridor and/or surrounding spaces.
  - (2) Perimeter zones: Positive to the outside.
  - (3) If the air system designs permit a reduction in airflow during “unoccupied” periods, the relative direction of airflow between spaces shall remain consistent with “occupied” operation.

J. Exhaust Air Criteria

- a. Restroom/Utility Area Exhausts
  - (1) Exhaust air quantities for restrooms and utility areas shall be established in conformance with latest edition of IMC.

b. Kitchen Exhaust Hood

- (1) Exhaust air quantities for make-up air type hoods shall be established in conformance with IMC Chapter 5 “Exhaust Systems” and manufacturer’s recommendations.

c. Classroom Exhaust Hoods

- (1) Exhaust air quantities for classroom exhaust hoods shall be selected in conformance with manufacturer’s recommendation and code requirements.
- (2) Classroom lab hoods with integral solvent cabinets and stand-alone solvent cabinets must provide continuous constant volume exhaust operation.
- (3) Classroom lab hoods, independent of other equipment requiring exhaust, shall have 2-speed operation to allow for night setback and/or unoccupied reduced exhaust rates. Exhaust fans shall have variable frequency drives (VFD) for balancing.
- (4) Canopy hood with individual exhaust fan shall be provided for all classroom heat and odor producing equipment such as cooking equipment, kilns, etc.

K. Airside Sizing Criteria

a. Supply, Return, and Exhaust Systems

- (1) VAV/CV ductwork up-stream of terminal units, in mechanical rooms and shafts:
  - (a) Supply: 0.08”/100 ft.
  - (b) Return: 0.10/100 ft.
  - (c) Discharge air velocity maximum: 2,200 FPM
  - (d) Branch duct to diffusers, grilles and registers. maximum: 600 FPM.

(2) Louvers

- (a) Sized and selected to eliminate moisture entrainment.

b. Airside equipment (maximum velocities)

- (1) Preheat coils: 500 feet per minute.
- (2) Cooling coils: 450 feet per minute.
- (3) Filters: 500 feet per minute.

c. Coil Criteria

- (1) Cooling Leaving Air Temperature
  - (a) 52 deg F to 55 deg F (12.8 degree C).
- (2) Heating Leaving Air Temperature
  - (a) 95 deg F to 105 deg F (40 degree C).

d. Air Handling Units, Rooftop Gas Fired Packaged DX Units and Split Systems

- (1) Equipment efficiency: ASHRAE Standard 90.1 or better.
- (2) The heating load for air handling units or roof top gas-fired units shall be increased by 10% to account for duct losses (duct insulation losses, duct air

leakage) and general building pick-up. The 10% factor shall be applied to transmission and infiltration.

- (3) The cooling capacity for air handling units or roof top gas-fired units shall be increased by 5% to account for duct losses (duct insulation losses, duct air leakage) and general building pull-down. The 5% factor shall be applied to all terms (transmission, infiltration, lighting loads, equipment loads, people loads, and solar loads) and to the ventilation load. Cooling loads shall include the sensible loads and the latent dehumidification loads.
- (4) DOAS energy recovery units shall be provide a supply air temperature of 65 deg F when outdoor temperature falls below 55 deg F and supply 55 deg F when outdoor temperature is above 60 deg F.

#### L. Water Side Sizing Criteria

##### 1. Heat-Producing Equipment Criteria

- (1) Equipment efficiency: ASHRAE Standard 90.1 or better.
- (2) All boilers (conventional or condensing) shall be provided with a reserve capacity of minimum 10% to account for piping losses and pickup. Boiler capacity shall be based on total connected capacity.
- (3) Refer to Section D3020.00, Heating Systems for further criteria.

##### 2. Cooling Equipment Criteria

- a. Equipment efficiency: ASHRAE Standard 90.1 or better.

##### 3. Pipe Sizing Criteria

###### a. Water Systems

- (1) Chilled Water and Hot Water Distribution
  - (a) Maximum pressure drop: 2.5 feet head per 100 equivalent feet of pipe.
  - (b) Maximum velocity: 12 feet per second (MER and Shafts).
- (2) Chilled Water and Hot Water Distribution (<2 inch)
  - (a) Maximum pressure drop: 2.5 feet head per 100 equivalent feet of pipe.
  - (b) Maximum velocity: 6 feet per second.

###### b. Refrigerant Piping

- (1) Size per manufacturer's recommendations.
- (2) Length of run and vertical distance to be considered.

**END OF SECTION D3050.60**



**SECTION D4010.10**  
**WATER-BASED FIRE SUPPRESSION**

**PERFORMANCE**

A. Basic Function

1. Provide fire sprinkler or fire extinguishing systems throughout building and associated structures as required by code and all referenced standards that pertain to the installation.
2. Provide wet pipe sprinkler or dry pipe systems unless otherwise indicated or required by code.
3. Provide automatic wet-type standpipe system with open water supply valve, capable of supplying water demand and maintaining water pressure.
4. Provide hydraulic calculations and fire hydrant flow test report, signed and sealed by professional engineer.
5. Engineered system design shall be approved by authority having jurisdiction.
6. Spaces, areas and systems with Fire Extinguishing Systems
  - a. Kitchen exhaust hood(s).
  - b. Other locations as required by code.
7. Spaces with Pre-Action Sprinkler Systems
  - a. Electrical rooms.
  - b. MDF and IDF rooms.
  - c. Emergency control center rooms.
8. Do not install wet type sprinklers in areas subject to freezing.
9. Provide code-required coverage if the coverage specified above is less than required by code.
10. Fire system design: Design and construction in accordance with code and NFPA 13.
11. Standpipes and hoses: Design and construction in accordance with code and NFPA 14.
  - a. Provide fire department connections, valve cabinets, and signage as required by code.
    - (1) Coordinate locations and installation with local authority.
    - (2) Verify that equipment hose threads are the same as local fire department equipment.
  - b. Support vertical piping and tubing at base and at each floor.
12. Fire pump and all accessories: Design and construction in accordance with code and NFPA 20. Provide fire pump system as deemed applicable for project requirements and code compliance.
13. Electrical components, devices and accessories: Listed and labeled as defined by NFPA 70 by qualified testing agency as marked for intended location and application.

14. Where fire sprinkler and extinguishing elements also must function as elements defined within another element group, meet the requirements of both element groups.
  15. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.
- B. Amenity and Comfort
1. Accessibility
    - a. Provide fire department valve cabinets at each intermediate stair landing or at locations approved by the local authority.
  2. Appearance
    - a. All spaces with ceiling unless indicated otherwise: Concealed sprinklers.
    - b. Provide upright pendant sprinklers with guards at rooms without ceilings, including Gymnasium and mechanical spaces.
    - c. Install sprinklers in suspended ceilings in center of acoustical ceiling panels.
    - d. Fire department valve cabinets: Bright-chrome finish with hinged solid metal door panel.
    - e. Valves: Brass finish.
    - f. Fire department connections: Brass finish.
    - g. Identification: Install labeling and pipe markers on equipment and piping according to requirements in NFPA 14.
- C. Health and Safety
1. Sprinkler head performance: As required by code and NFPA 13.
  2. Water Demand Requirements
    - a. Determine minimum water supply requirements for each sprinkler system using the hydraulic calculation method defined by NFPA 13.
  3. Water Source
    - a. Provide fire pump(s), if required, that are designed and installed in accordance with NFPA 20 and all applicable codes and standards.
    - b. Provide water from a public service main.
    - c. If necessary, obtain new or updated hydrant flow test within time frame required by NFPA 13, NFPA 291 and local authorities.
    - d. Devices supervising the operation of valves controlling the water supply to the sprinkler system shall be provided. A signal shall be transmitted to the fire alarm system from these components.

D. Structure

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 and ASCE/SEI 7.
- b. Provide sprinkler system components, bracing and clearance 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.

F. Operation and Maintenance

1. Provide sprinkler system and fire pump maintenance in accordance with NFPA 25.
2. Ease of Service
  - a. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - b. Spare sprinkler heads: Provide spare sprinkler heads of each type installed in quantities as required by code, with covers and guards, plus a minimum of 2 sprinkler wrenches.
  - c. Sprinkler cabinet: with space for spare sprinkler heads in accordance with NFPA 13.
3. Demonstration: Engage a factory authorized service representative to train maintenance personnel to adjust, operate and maintain specialty valves and equipment.

**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.

B. Fittings

1. Use the following:
  - a. Steel.

C. Fire Pumps

1. Use one or more of the following:
  - a. Electric fire pump.
  - b. Provide emergency power for all components of fire protection system.
  - c. Electric jockey pump.
  - d. Concentric increaser and check valve in discharge, OS&Y or butterfly on system side.

- e. Fire pump bypass line with OS&Y and check valve.
  - f. Suction and discharge pressure gauges.
  - g. Casing relief valve.
  - h. Provide extra set of gaskets, screens and seals.
  - i. Horizontal base-mounted or vertical in-line.
  - j. Vibration isolation
  - k. Housekeeping pad.
  - l. Flow metering system for closed loop testing.
2. Do not use:
    - a. Diesel engine driven fire pump.
- D. Fire Protection Valves
1. Valves shall be UL listed or FM approved.
  2. Minimum pressure rating for standard pressure piping: 175 psi.
  3. Minimum pressure rating for high pressure piping: 250 psi.
  4. General requirements: Install in vertical position for proper direction of flow, in main supply to system.
- E. Sprinkler Heads
1. UL or FM Global Listing.
  2. Chrome plated finish.
  3. Other Components
    - a. Escutcheons: Chrome plated steel, one piece flat.
    - b. Cover Plates: Factory-painted steel to match ceiling color.
    - c. Guards: Wire cage with fastening device for attaching to sprinkler.

**END OF SECTION D4010.10**

**SECTION D4030.00**  
**FIRE PROTECTION SPECIALITIES**

**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. Cabinets for fire extinguishers and fire hose stations.
  - c. Mounting brackets.
  - d. Signage for fire protection specialties.
3. Provide portable fire extinguishers and other specialties throughout the facility, of the type and size and in the locations required by NFPA and the code.
4. Provide all fire extinguishers and fire hose stations in code-compliant cabinets except in mechanical and storage rooms.
5. Provide recessed cabinets throughout except where precluded by structural or code limitations.
6. Provide permanent signage for all fire protection specialties in accordance with code.
7. Where fire protection specialty elements also must function as elements defined within another element group, meet the requirements of both element groups.
8. Substantiation
  - a. Design: Types, locations, and calculations of travel distances.

**B. Amenity and Comfort**

1. 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.

**C. Health and Safety**

1. Accident Prevention
  - a. Locate extinguishers and cabinets so that means of egress is not impeded, in accordance with code.
  - b. Provide non-breakable vision panels.
2. Fire Safety
  - a. Mount extinguishers and cabinets in permanent locations using mounting fixtures that will inhibit casual removal but allow ready use in case of fire.
  - b. Mount extinguishers and cabinets in locations that are unlikely to be blocked or hidden by furnishings or temporary impediments.

D. Durability

1. Provide solid embedments or blocking for attachment of cabinets and brackets.
2. 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.

**PRODUCTS**

A. Cabinets

1. Provide one of the following:
  - a. Steel cabinets with factory-applied organic coating finish.
  - b. Aluminum cabinets.
  - c. Stainless steel cabinets.
2. Do not use:
  - a. Wood cabinets.
  - b. Plastic cabinets.
  - c. Cabinets without vision panels.

**END OF SECTION D4030.00**

## **SECTION D5000.00**

### **ELECTRICAL**

#### **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: Utility power sources, engine-generator systems, uninterruptible power supply.
  - b. Service and distribution: Service entrance equipment, distribution equipment, transformers, motor control equipment, service and feeder wiring (conductors and raceways), transient voltage surge suppressors, control equipment, and other elements required for a complete functional system.
  - c. Branch circuits: Branch circuit wiring.
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. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.
6. Substantiation
  - a. Construction
    - (1) 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 1-2006.
    - (2) Provide testing in accordance with International Electrical Testing Association Acceptance Testing Specifications for Electric Power Distribution Equipment and Systems NETA ATS-2009.
      - (a) 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.
      - (b) Perform each visual and mechanical inspection and electrical test listed.
    - (3) Test generator for full load bank test in accordance with NFPA 110 and meet all NJDEP air permit requirements before final acceptance.
  - b. Before an application for final acceptance of the work will be considered, all tests deemed necessary to show proper execution of the work shall be performed,

witnessed, approved, and completed. Scheduling of all testing procedures shall be submitted for approval.

- c. 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.
- d. Testing to show the proper functioning of all lighting fixtures and lamps, including those supplied by others, shall be included in the electrical work.
- e. 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. 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.
  - c. Interior lighting as required by code.
  - d. Other systems and areas in accordance with project requirements.
3. Hazardous locations: Comply with requirements of NFPA 70 chapter on Hazardous (Classified) Locations as required by code and in the following areas:
  - a. Flammable liquid storage.
  - b. Chemical storage.
4. Grounding: Provide solidly grounded electrical distribution systems in accordance with NFPA 70 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 insulated 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 metal piping. .
- g. Ground the flag pole.
- h. Provide isolated grounding system as required to meet technology requirements.
- i. Indicate sizes of grounding electrode conductors, equipment grounding conductors, isolated grounding conductors and bonding jumpers.
- j. Use 3/4-inch diameter by 10'-0" copper clad steel ground rod with exothermic welded connections
- k. Use all copper or bronze grounding materials

**C. Operation and Maintenance**

- 1. Service 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.
  - b. Comply with requirements of ASHRAE 90.1.
- 3. Protection against disturbances
  - a. Surge protection: Voltage excursion limit of 2 times design voltage.
    - (1) Voltage excursion limit of 1000 volts for 480Y/277 volt systems and 400 volts for 208Y/120 volt systems.
    - (2) Comply with U.L. 1449 latest edition.
    - (3) Provide protection at service entrance switchboard.
    - (4) Provide protection of all 120/208 volt computer panelboards supplying 120 volt computer power and office equipment 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 to protect branch circuits supplying power to the following:
    - (a) Fire alarm panel
    - (b) Communications systems including those listed in Section D6000.00..
    - (c) Building Management System (BMS).
    - (d) MDF and IDF equipment.
  - (8) Do not provide integrally mounted TVSS devices for switchboards and panelboards
  - (9) General system voltage: 480 GndY/277 volts/3-phase, 4-wire /60 Hz.
    - (a) All 3-phase motors ½ horsepower and greater (rated at 460 volts): 480 volts/3-phase.
    - (b) All other loads 3 kW or greater: 480 volts/3-phase.
    - (c) Lighting voltage: 277 volts for fluorescent and LED lighting.
    - (d) Accent and specialty lighting voltage: 120 volts.
    - (e) Receptacle and small appliances voltage: 120 volts.
  - (10) Locate lighting and appliance panelboards near the center of the load to be served.
4. Locate lighting and appliance panelboards near the center of the load to be served.

## **METHODS OF CONSTRUCTION**

- A. Construct using the following methods:
1. All electro-mechanical installations required by this Section shall be performed as outlined in the American Electricians Handbook, latest edition.
  2. Comply with all applicable federal, state and local electrical and safety codes.
  3. Comply with all utility company requirements.
  4. 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.
  5. 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.
    - a. 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.
    - b. 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.

- c. 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.
  6. Provide FSK through-wall fittings at all penetrations in foundation walls and floors 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.
  7. Install all raceway, wiring and cable concealed in finished spaces. Provide pullboxes, size and type as required.
  8. 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.
  9. Provide flexible connections to motors and other rotating/vibrating equipment.
  10. Make taps and splices for branch circuits and feeders larger than #10 AWG with mechanical or compression connectors, insulated.
  11. 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.
  12. Taps shall be full circuit size up to their overcurrent protection device.
  13. Make connections to fixture and motor leads #10 AWG and smaller with screw-on pre-insulated spring pressure connectors.
  14. Connect stranded wire connectors to screw terminals with locking fork crimp terminals with nylon insulated grips.
  15. Route raceways through roof using dedicated roof jacks or pitch pockets. Install raceway on roof on dedicated roof supports eight inches high minimum.
  16. Provide seismic restraints and anchors for equipment, fixtures, raceway, etc. in accordance with all applicable codes and seismic design requirements.
  17. Provide solid copper conductors for #10 AWG and smaller and stranded copper conductors for #8 AWG and larger.
- B. Do not use:
1. Exposed wiring or cable not U.L. listed for the purpose.
  2. Wood supports or anchorages.
  3. Nonmetallic conduit, boxes or fittings.
  4. Vinyl, plastic, nylon, or other combustible or smoke-producing identification or construction materials in any space used as a plenum above a hung ceiling for the return of environmental air.

**END OF SECTION D5000.00**

## SECTION D5010.10

### FACILITIES POWER GENERATION

#### PERFORMANCE

A. Basic Function:

1. Provide power generation for emergency and standby power systems.
  - a. Provide emergency and standby power as required by code.
  - b. Generator loads shall be divided into two classifications: life safety and non-life safety. These loads shall be connected to the emergency generator distribution system utilizing two automatic transfer switches (ATS).
  - c. The life safety ATS shall serve as required by code and for the duration of the outage, and for the following loads (subject to code compliance):
    - (1) Emergency lighting in corridors, exit and emergency egress lighting, security night lighting, stairs and places of public assembly and exit signs for duration of outage.
    - (2) Exterior lighting adjacent to exit discharge doors.
    - (3) Lighting for emergency control centers, main office, nurse's office, security desk and custodial office.
    - (4) Elevators: One elevator at a time.
    - (5) Elevator cab lighting.
    - (6) Electric fire pumps.
    - (7) Fire and smoke detection and alarm system.
  - d. The non- life safety ATS shall serve for the duration of the outage for the following loads:
    - (1) Any systems listed above which are excluded by code from the life safety ATS.
    - (2) HVAC equipment: Sufficient to keep the building and systems from freeze-up maintain HVAC and electrical services to the following spaces during loss of power:
      - a. Electric Room.
      - b. MDF and IDF Rooms.
      - c. Emergency Control Center and Backup Emergency Control Center.
      - d. Server Room(s).
    - (3) Freeze protection: Maintain service to electric unit heaters in the following spaces during loss of power:
      - a. Water Service Rooms.
      - b. Pump Rooms.
      - c. Boiler Rooms.

- (4) Public address and clock system.
  - (5) Electrical lights.
  - (6) Elevator pit sump pump and pit lights.
  - (7) Telecommunications system.
  - (8) Sewage removal system (if any).
  - (9) Walk-in refrigerator(s) and freezer(s).
  - (10) Surveillance and Intrusion Security System.
  - (11) BMS System.
  - (12) Gas leak detection and exhaust system.
  - (13) Central station reporting system.
  - (14) Main and Remote Emergency Control Centers.
2. Electrical Generation Capacity
    - a. Provide 20 percent spare capacity in addition to the connected load.
    - b. Provide 2.5 volt-amperes per square foot for the entire building.
  3. Configuration: 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. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.
- B. Amenity and Comfort
1. Sound and Noise
    - a. Provide generator sound attenuated enclosure with critical exhaust silencer type rated at 25-35 dB(A).
  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.

D. Structural

1. Seismic Design

- a. Provide 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 20 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 run time: Minimum time delay of 15 minutes, to prevent re-transfer back to normal in case of a 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 electric efficiency: 30 percent @ 0.80PF, without fan.
- e. Power quality: Compatible voltage, wave shape, and frequency with the primary power source; coordinate power requirements with local utility company.

**PRODUCTS**

A. Generator Sets

1. Engine Type

- a. Use the following:
  - (1) Four-stroke, spark ignited.

2. Controls

- a. Isochronous governor with speed sensing.

3. Starting and Control Batteries

- a. Use the following:
  - (1) Nickel cadmium valve regulated pocket plate (flooded cell).
- b. Do not use:
  - (1) Valve-regulated lead-calcium.

- (2) Lead-antimony (flooded cell).
- (3) Lead-calcium (flooded cell).

#### 4. Engine Cooling

Use the following:

- (1) Liquid-cooled engine mounted radiator.

#### A. Automatic Transfer Switches

- 1. Electrical characteristics: 480V, 4-pole, with three-cycle short circuit rating without series current limiting protection devices.
- 2. Systems: Provide separate transfer switch and electrical distribution systems for life safety loads and non-life-safety loads, to enable isolation of non-life-safety loads from emergency generator.
- 3. Utility coordination: Coordinate automatic transfer switches with the local utility.

### **METHODS OF CONSTRUCTION**

#### A. Use the following:

- 1. Generator enclosure: Provide manufacturer's heavy-duty, sound-attenuated, weatherproof, vandal-proof, secure and code-compliant enclosure as follows:
  - a. Minimum 14-gauge galvanized steel.
  - b. Baked enamel finish.
  - c. Stainless steel fasteners.
  - d. Top-mounted critical exhaust silencing system.
  - e. Full access through lockable doors with standard keying system.
  - f. Interior lighting system.
  - g. Control panel viewing window.

**END OF SECTION D5010.10**

## **SECTION D5020.00**

### **ELECTRICAL 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 closets on each floor near equipment and receptacles being served. Do not locate panelboards exposed in public corridors, hallways or stairwells.
5. Provide separate panelboards for lighting, receptacles, computers and HVAC equipment.
6. Where service and distribution elements must also function as elements defined within another elements group, meet requirements of both groups.
7. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

##### **B. Amenity and Comfort**

###### **1. Sound and Noise**

- a. Do not locate transformers near sound sensitive areas.
- b. Provide transformers with noise generation equal to 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.

##### **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: 220 deg C.

F. Operation and Maintenance

1. Capacity

- a. Main switchboards: In accordance with code plus 15% spare capacity.
- b. Interior distribution transformers: As required to serve building circuits and equipment plus 15% spare capacity.
- c. Branch circuit panelboards: In accordance with code plus 15% 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%.

2. Transformer Applications

- a. Distribution transformers for ordinary loads: Provide general purpose, dry-type, energy-saving transformers with 115-deg C rise copper windings.
- b. Distribution transformers for loads sensitive to noise and harmonics: Shielded isolation, K-factor 13 rated 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
2. Do not use:
  - a. Oil type.
  - b. Less-flammable liquid type.
  - c. Liquid filled.
  - d. Gas type.
  - e. Aluminum windings.

## B. Secondary Service and Distribution Feeders

### 1. Conduits

#### a. Provide one of the following:

- (1) Below grade, single-run or grouped: RNMC.
- (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: RNMC 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.

#### c. Fittings: Compatible with raceway and suitable for use and location. Use compression type up to 1-1/4 inch EMT, set screw type 1-1/2 inch EMT and larger. Cast compression fittings are not acceptable.

### 2. Conductors for use in conduits

#### a. Use the following:

##### (1) Copper

- (a) Service entrance conductors in underground conduit: Type THHN-THWN, 90 deg C.
- (b) Feeders in underground conduit: Type THHN-THWN, 90 deg C interior.
- (c) Feeders in conduit: Type THHN-THWN, 90 deg C.
- (d) Elevator feeders in conduit: Type THHN-THWN, 90 deg C.
- (e) Fire pump feeder: Type MI, copper cable, 2-hour fire rated.

C. Main Service Equipment

1. Types of Equipment

- a. Use the following:
  - (1) Switchboards: Type 1, front accessible only.
  - (2) Basis of Design: Cutler–Hammer Eaton.

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) Molded 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. Basis of Design: Cutler–Hammer Eaton.

2. Busbars

- a. Use the following:
  - (1) Copper.
- b. Do not use:
  - (1) Plated aluminum.

3. Circuit Breakers

- a. Use the following:
  - (1) Molded case circuit breakers.
- b. Do not use:
  - (1) Series-rated equipment.

E. Motor Control Centers

1. Basis of Design: Cutler–Hammer Eaton.

2. Busbars
    - a. Use the following:
      - (1) Copper.
    - b. Do not use:
      - (1) Plated aluminum.
  3. Overcurrent Protectors
    - a. Use one of the following:
      - (1) Circuit breakers.
      - (2) Motor circuit protector (MCP).
    - b. Do not use:
      - (1) Series-rated equipment.
- F. Hardware
1. Use the following:
    - a. Nameplates screwed or riveted to panel trim.
    - b. Distribution panels: door-in-door construction.
    - c. Locks: Tumbler type, keyed alike.
    - d. Directories: Typed and installed in metal frame with transparent protective cover.

## **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 D5020.00**

**SECTION D5030.10**  
**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. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

B. Amenity and Comfort

1. Accessibility: Comply with barrier-free code requirements and the following:
  - a. ICC-ANSI A117.1 and N.J.A.C. 5:23.

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.

**PRODUCTS**

A. Conduits

1. Provide one of the following:
  - a. Below grade, single-run or grouped: RNMC.
  - 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: RNMC with separate insulated equipment grounding conductor. Provide RMC 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.
  - l. Minimum raceway size: 3/4 inch.
  - m. Fittings: Compatible with raceway and suitable for use and location. Use compression type up to 1-1/4 inch EMT, set screw type 1-1/2 inch EMT and larger. Cast compression fittings are not acceptable.
- 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: THHN-THWN, 90 deg C.
      - (2) Interior branch circuits in conduit: Type THHN, 90 deg C.
      - (3) Interior branch circuit homeruns: Type THHN, 90 deg 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: Wiring #10 AWG and smaller in ceiling spaces and for connections from boxes to lighting fixtures and equipment may be Type MC metal-clad cable. Use of MC cable is limited to 30-amp single-phase circuits.
  - 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, .035 inch thick cover plates. Cover plates for emergency devices shall be red in color.

## METHODS OF CONSTRUCTION

- A. Use the following practices and procedures:
1. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
  2. Install cables concealed in ceiling spaces, in hollow spaces of interior masonry walls in dry locations.
  3. Install cables above accessible tile ceilings so that cables do not rest on ceiling tiles.
  4. Securely fastened cables to the building structure at intervals prescribed by NFPA 70 and not pulled through rings or wiring harnesses.
  5. 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.
  6. Use pulling means including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.
  7. Lighting circuits: Install no more than one 3-phase circuit or three consecutive 1-phase circuits with common neutral in the same conduit.
  8. Receptacle and computer circuits: Install no more than one 3-phase circuit or three consecutive 1-phase circuits with separate neutrals in same conduit.
  9. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
  10. 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.
  11. Firestop cables penetrating fire rated walls.
  12. Identify and color-code conductors and cables.
  13. Provide full circuit size branch circuit taps up to their overcurrent protection device unless otherwise indicated
  14. Taps and splice branch circuits larger than #10 AWG with insulation piercing connectors or compression splices.
  15. Taps and splice branch circuits #10 AWG and smaller with crimp connectors-with insulated caps, connectors or compression splices.
  16. Connections to fixture and motor leads #10 AWG and smaller: Provide with pre-insulated spring pressure connectors.
  17. Stranded wiring conductors: Use screw terminals with locking fork crimp terminals with nylon insulated grips.
  18. 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.
  19. Provide splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.



20. Wiring at outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack and pigtail connections
  21. 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 D5030.10**

**SECTION 5040.00**  
**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: General room lighting, emergency lighting, and accent lighting.
  - b. Exterior area lighting: General lighting of exterior spaces including roadways, driveways, walkways, parking areas, and recreation areas.
  - c. Athletic lighting: Lighting for interior athletic activities.
3. Provide lighting designed in accordance with recommendations of 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. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

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 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. Color rendering index (CRI): 80 or better, unless noted otherwise.
  - e. 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.
- F. Power Consumption and Efficiency
- a. Comply with requirements for energy efficiency of lighting in ASHRAE 90.1 and all applicable requirements in Facilities Section.

**END OF SECTION D5040.00**

**SECTION D5040.10**  
**LIGHTING CONTROL**

**PERFORMANCE**

**A. Basic Function**

1. Provide a Digital Lighting Management System for control of all interior lighting except emergency lighting.
2. Provide lighting control devices necessary for digital lighting management as required by code to automatically shut-off lighting within 30 minutes of occupants leaving interior spaces.
3. Lighting control elements shall include the following:
  - a. Lighting control devices, room controllers and control panels
  - b. Automatic configurations of control devices with plug and learn capability.
  - c. Components plug together in any configuration with preassembled RJ45 connectors/ category 5e cables.
  - d. Wireless handheld remote control configuration tool for device setting modifications.
  - e. Network lighting control for scheduled control and remote system management.
  - f. Other devices, software and miscellaneous equipment to provide a complete digital lighting management system in compliance with project requirements and applicable codes.
4. Where lighting control elements must also function as elements defined within another element group, meet requirements of both element groups.
5. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

**B. Amenity and Comfort**

1. Accessibility: Comply with all applicable codes and standards, including for barrier-free access.
2. Appearance
  - a. Install control panels in electric closets adjacent to lighting panels.
  - b. Conceal all wiring in ceilings and walls.

**C. Health and Safety**

1. Provide equipment with labels or certifications from applicable testing agencies as required by codes and referenced standards.
2. Seismic Performance: Provide equipment to withstand effects of earthquake motions determined according to ASCE/SEI 7.

**D. Durability**

1. Provide a system which will last a minimum of 10 years in service without major repairs.

2. Moisture resistance: Regardless of whether exposure to moisture is likely, provide control equipment that is resistant to moisture.
- E. Operation and Maintenance
1. Operational training: Minimum of (8) hours, 2 persons.
  2. Maintenance training: Minimum of (8) hours, 2 persons.

## **PRODUCTS**

- A. Basis of Design: Use products similar to Wattstopper.
- B. Network & Control
1. Provide one of the following:
    - a. Microprocessor-based hardware
    - b. BACnet compatibility
  2. Provide an interface device for connection to a USB port on any computer running on the school's network.
  3. Provide secure, restricted-access software using intuitive graphics, providing identification of system settings and permitting users to identify, modify and store settings and reconfigurations of lighting devices.
  4. Do not use
    - a. Network cables longer than 1000feet
    - b. Local cables longer than 150 feet

**END OF SECTION D5040.10**

**SECTION 5040.30**  
**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. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

**B. Amenity and Comfort**

1. Accessibility: Comply with barrier-free requirements including ICC/ANSI A117.1 and N.J.A.C 5:23-7.2.
2. Light levels: In compliance with NJAC. 6A:26 and the latest edition of the IESNA Handbook.
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) LED lamps: 3500 Degrees K; CRI 80 minimum

**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 5040.00 Artificial Lighting and the following:
    - a. Lighting controls: Provide digital lighting management control system.
    - b. Occupancy controls: Provide lighting circuits throughout the project that are controlled by devices that do not require action by occupants.
      - (1) Controls: Local switches, occupancy sensors, daylight sensors and programmable lighting control panels throughout project.
    - c. Light sources: Provide lamps with average lamp efficacy rating not less than the following:
      - (1) Incandescent lamps: 15 lumens/watt.
      - (2) Tungsten-halogen lamps: 25 lumens/watt.
      - (3) Reflector halogen lamps: 25 lumens/watt.
      - (4) Compact fluorescent lamps: 69 lumens/watt.
      - (5) Linear fluorescent lamps: 90 lumens/watt.
      - (6) Exception: Accent, display and specialty lighting lamps.
    - d. Ballasts: Provide electronic ballasts, high power factor greater than 0.98, ballast factor of not less than 0.88 and class A sound rating 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. Luminaires
1. For general use in all interior finished spaces with suspended ceilings not described below: Recessed 2 foot by 4 foot parabolic units with 18 cells, 3" louver; similar to Columbia P2 series.
  2. Gymnasium: Pendant, direct linear fluorescent lighting units with specular reflector, low and high bay areas; similar to Columbia LHR series.
  3. Main electrical rooms, mechanical room, telecommunications rooms and similar areas: Semi-direct lighting units pendant mounted; similar to Columbia Industrial CSR series.
  4. Electric closets, elevator machine rooms, storage rooms and similar areas: Direct fluorescent bare lamp strip with wire cage; similar to Columbia CS series.
  5. Classrooms and similar instructional spaces, Media Center, small group instruction rooms, labs, conference rooms, etc.: Direct-indirect (30/70%) linear fluorescent lighting units; similar to Finelite series 16.

6. Classroom whiteboard: Pendent fluorescent wallwasher; similar to Finelite X2 series.
  7. Corridors: Parabolic 2 by 4 foot 3-lamp; similar to Columbia.
  8. Kitchen Areas, Storerooms and Served Areas: Recessed 2 by 4 foot fluorescent luminaire with prismatic K12 lens, gasket for wet location, vermin proof, with silicone sealant on all seams; similar to Columbia WT series.
  9. Multi-Purpose Room, Auditorium: Similar to Finelite series X1.
  10. Stage Lighting
    - a. Spot lights: Two sets of spot lights to the left and right of stage center line. Each set shall consist of four 6 inch zoom type ellipsoidal reflector spotlights with 575 watt tungsten lamps, rated for 2000 hours. All spots shall be dimmer controlled.
    - b. Border lights: Two rows of track lights above platform. Each track shall consist of lamp sockets 6" on center with permanent glass color filters and 100watt lamps. Each track shall be wired for four colors (clear, red, amber, blue) on four alternating circuits (every fourth lamp). Minimum of two circuits per color.
    - c. Work lights: Provide industrial fluorescents above the platform, switched separately from the dimming system.
    - d. Control: Provide a microprocessor-based 24-channel, two scene preset dimming control system with one dimmer per circuit, one control channel per color. System will be controlled by a portable control console and stage control panel.
  11. Stair landings: Round 16" surface mounted fluorescent with vandal resistant lens.
  12. Under stairs: Surface 6 inch by 4 foot fluorescent with vandal-resistant lens under each stair.
  13. Toilet/Locker Rooms: Recessed 2 by 4 foot fluorescent luminaires with prismatic K12 lens; similar to Columbia series 4PS.
- B. Lamps
1. Linear fluorescent "high lumen" T-8 lamps for general interior lighting.
  2. Compact fluorescent lamps, for accent lighting only.
  3. Reflector halogen lamps for accent only.
  4. LEDs for exit signs; similar to McPhilben Edge-Lite.
  5. Bi-axial fluorescent lamps, for 2 by 2 foot lighting units, and special applications.
  6. LED for exterior use.
- C. Do not use the following:
1. Indirect lighting units.
  2. High pressure sodium lamps.
  3. Metal halide lamps.

**END OF SECTION D5040.30**



**SECTION D5040.40**  
**EXTERIOR AREA LIGHTING**

**PERFORMANCE**

**A. Basic Function**

1. Provide exterior artificial lighting for safe passage of students and staff to deter theft and vandalism 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 components that are IDA-approved as Dark Sky Friendly products for exterior lighting fixtures.
5. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

**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: 5.0 fc, maximum uniformity ratio (average to minimum) of 4:1.
  - c. Building perimeter (20 ft depth from building): 1.0fc, maximum uniformity ratio (average to minimum) of 4:1.
  - d. Playgrounds and yards: 0.6fc, maximum uniformity ratio (average to minimum) of 4:1
  - e. 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
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 80.

3. Appearance
  - 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.
- 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.
- E. Operation and Maintenance
  1. Minimum outdoor operating temperature: Provide lighting systems that operate at temperatures as low as -10 deg F.
  2. Power consumption and efficiency: Comply with requirements of Section D5040.00 Artificial Lighting.
    - a. Lighting controls: Provide programmable timing in accordance with ASHRAE 90.1-2007.

3. Maintenance efficiency: Provide luminaires that do not collect dirt rapidly and are readily cleanable.
  - a. Luminaire categories: Provide luminaires of IESNA Category I, for minimum dirt accumulation and LDD factors.
  - b. 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 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.
  - d. Low-pressure sodium units.
  - e. Compact fluorescent units.
3. Basis of Design
  - a. Wall-mounted area luminaires: Lithonia WST-LED2, Type II.
  - b. Wall-mounted accent luminaires: Sistemalux Mini Lift LED, S.5087-120
  - c. Pole-mounted luminaires: Lithonia DSX1 Series LED, Size 1.
  - d. Canopy luminaires: BetaLED CAN-304, 4300K.
  - e. Recessed step lights: McPhilben SDO.
  - f. Building signage lights: CALI ALS450, 3500K.

### **B. Lamps**

1. Use one of the following types:
  - a. LED lamps.

### **C. Lighting Standards or Poles**

1. Use the following:
  - a. Galvanized steel with factory-applied fluoropolymer or powder-coated finish.

**END OF SECTION D5040.40**

**SECTION D5080.10**  
**SPECIAL GROUNDING SYSTEMS**

**PERFORMANCE**

- A. Basic Function
  - 1. Provide grounding systems that:
    - a. Provide a lightning prevention Early Streamer Emission system (ESE) to protect from lightning strikes.
      - (1) No lightning risk assessment is required.
    - b. Provide protection from shock due to overhead power transmission lines accidentally contacting metal fences.
- B. Amenity and Comfort
  - 1. Appearance: Concealed grounding conductors and ground terminals wherever possible.
- C. Health and Safety
  - 1. Lightning Protection System Resistance
    - a. Maximum ground resistance: 10 ohms, between any individual down conductor and ground.
    - b. Substantiation: As specified in Section 1030, Project Criteria.
  - 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: Life of the building without requiring any more maintenance than annual inspection and minor repairs not more frequently than annually.
  - 2. Lightning protection elements quality shall be demonstrated and certified by Applied Research Laboratories.
  - 3. Lightning protection air terminal (lightning rod): Copper 3/4" diameter x 12" long.

**PRODUCTS**

- A. Lightning Protection Conductors
  - 1. Use one or more of the following:
    - a. Stranded copper cable.
    - b. Structural steel superstructure, electrically continuous.

- c. Concrete reinforcing steel, 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 Electrodes
  - 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 Terminal (Lightning Rod)
  - 1. Use the following:
    - a. Solid copper.
  - 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. Lightning Mast
  - 1. Use the following:
    - a. Hollow tubular tapered aluminum.
  - 2. Do not use any of the following:
    - a. Any metal part of building.
    - b. Solid aluminum.
- E. 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. Provide installation in accordance with the ESE manufacturer's standard and all codes.
- B. Do not expose down conductors attached to building exterior.

**END OF SECTION D5080.10**

**SECTION D6000.00**  
**COMMUNICATIONS**

**PERFORMANCE**

A. Basic Function

1. Provide the following Communication and Information Technology (IT) system components in accordance with code, referenced standards, and all project requirements:
  - a. Main Distribution Frame (MDF) and Intermediate Distribution Frame (IDF) construction, layout, cooling, ventilation, power, UPS, and ready-to-use delivery and installation.
  - b. Vertical and horizontal cable plant; cable management; labeling schema and application; cable plant testing and certification.
  - c. Data outlets and electrical receptacles.
  - d. Two-way communication systems.
  - e. Security system.
  - f. Large-format display systems.
  - g. Speech enhancement speakers and system.
  - h. Music playback system and speakers.
  - i. General paging, clock, bell schedule and announcement system.
  - j. Television and video distribution system.
  - k. Support for UHF-based analog/digital radio communications.
2. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

B. Operation and Maintenance

1. Provide operations and maintenance data and training as required by Section 08120, Operation and Maintenance Data and Training, and as follows:
  - a. Operational training: Minimum of (8) hours, 2 persons.
  - b. Maintenance training: Minimum of (8) hours, 2 persons.

C. General Requirements

1. See Table D6000.00-1, Communications Responsibilities, for description of Design-Builder's Communications responsibilities under this section.
2. Two-Way Communication Systems
  - a. Provide two-way communication systems between elevators, areas of refuge, and other required areas and the emergency control center as required by code.

3. Security System

- a. Provide an integrated digital security system consisting of the following:
  - (1) Exterior door monitoring and control
  - (2) Exterior operable window contactors at first-floor windows.
  - (3) Glass break detectors.
  - (4) Motion detectors.
  - (5) Video surveillance system covering the interior and exterior of the building.
- b. Homeland Security requirements for redundancy in entrance/access alarm systems shall be met as follows:
  - (1) Every exterior door shall have a lock and contacts, plus an interior motion detector on a separate circuit.
  - (2) Every at-grade room with operable windows shall have locks and contacts on all operable units, plus a motion detector on a separate circuit.
  - (3) Every at-grade room with fixed windows ONLY shall have a motion detector, plus a glass break detector on a separate circuit.
- c. Security system components and function shall meet all code and project requirements and the requirements of “Best Practices for Schools under Construction or Being Planned for Construction.”

4. Large-Format Display Systems

- a. Where indicated, provide a large-format ceiling-mounted digital projector sufficient for viewing from entire room.
  - (1) Provide sound output integrated with room sound system.
  - (2) Provide scissor lift to lower projector to within five feet of floor for servicing.
    - (a) Basis of Design: Model SLX by Draper, Inc., Spiceland IN.
- b. At each location where a digital projector or interactive white board is indicated, provide the following:
  - (1) Customizable control interface with RS232 and IR interface.
    - (a) Basis of Design: Pixie+ by SP Controls, South San Francisco CA.
  - (2) Two wall-mounted input panels for interactive white board, with inputs for all supported formats including HDMI, USB, VGA/DVI input and output, 3.5mm audio input and output, 4-pin mini-DIN S-video and audio input, and RCA/stereo audio input and output.
    - (a) For digital white boards, locate panels as directed.
    - (b) At each interactive white board location, locate panels within 4 feet of interactive white board and within 6 feet of instructor furniture.



5. Speech Enhancement System
  - a. Where indicated, provide speech enhancement system to enhance the instructor's audibility throughout the space.
    - (1) Basis of Design: Orator Infrared Voice Enhancement System manufactured by Bogen Communications, Inc., Ramsey, NJ.
6. Music Playback System
  - a. Provide a two-channel music system and speakers with the following features:
    - (1) Playback capability in CD, MP3, WMA and other common audio formats.
    - (2) FM radio reception.
    - (3) Minimum 20-20K hz response.
    - (4) Minimum continuous output as noted.
    - (5) Operation independent of any other audio devices.
7. General Page
  - a. The general paging system shall provide audio paging capability throughout the facility.
  - b. Announcements must be audible from all indoor and outdoor spaces that will be occupied by students or staff.
  - c. The paging system shall provide the ability to distribute a page to multiple zones as well as to the entire facility.
8. Clock Systems
  - a. Automatic daylight savings time adjustments shall be made automatically based on Network Time Protocol (NTP).
  - b. All clocks shall display current time within one minute of accuracy to the Network Time Protocol Server.
  - c. Clocks shall be analog unless otherwise indicated and equipped to display hour, minute and seconds.
  - d. Double-faced clocks shall be used in corridors and other common areas where the clock is viewable from opposite sides.
  - e. All clocks shall be powered through IEEE 802.3af standard Power over Ethernet (PoE) utilizing CAT5/6 cabling.
9. Bell Scheduling
  - a. A bell generation system shall utilize the general paging system to distribute tones to the facility. The tones will be utilized primarily to signal class change.
  - b. The bell scheduling system shall accommodate for multiple schedules based on date/day.
  - c. The system shall allow for manual tone generation.
  - d. The scheduling system must be programmable from a standard desktop or laptop computer.

10. Wide Area Network (WAN) Connectivity

- a. A private fiber-based WAN is in use throughout the district.
- b. Coordinate with school district officials to connect to the WAN.
- c. Connectivity shall be through direct fiber hand-off.
- d. Utilize the building MPOE and carrier conduits.
- e. Interconnections shall be made at the building MDF.

D. Detailed Technology Requirements and Data Outlet Placement

1. Instructional Component

a. Pre-K and Kindergarten Classroom

- (1) Speech enhancement speakers and system
- (2) Two data outlets within 4 feet of interactive white board.
- (3) Six data outlets within 10 feet of student workstations as depicted on furniture plan (enlarged room layouts) and centered to furniture placement.
- (4) Two data outlets within 6 feet of instructor furniture.
- (5) One data outlet above door or at specified location for wall-mounted clock.
- (6) One data outlet within 3 feet from the main door for wall-mounted telephone.

b. General Classroom, Grades 1-3

- (1) Speech enhancement speakers and system
- (2) Two data outlets within 4 feet of interactive white board.
- (3) Six data outlets within 10 feet of student workstations as depicted on furniture plan (enlarged room layouts) and centered to furniture placement.
- (4) Two data outlets within 6 feet of instructor furniture.
- (5) One data outlet above door or at specified location for wall-mounted clock.
- (6) One data outlet within 3 feet from the main door for wall-mounted telephone.

c. General Classroom, Grades 4-8

- (1) Speech enhancement speakers and system
- (2) Two data outlets within 4 feet of interactive white board.
- (3) Six data outlets within 10 feet of student workstations as depicted on furniture plan (enlarged room layouts) and centered to furniture placement.
- (4) Two data outlets within 6 feet of instructor furniture.
- (5) One data outlet above door or at specified location for wall-mounted clock.
- (6) One data outlet within 3 feet from the main door for wall-mounted telephone.

d. Self-Contained Special Education Classroom

- (1) Speech enhancement speakers and system
- (2) Two data outlets within 4 feet of interactive white board.

- (3) Six data outlets within 10 feet of student workstations as depicted on furniture plan (enlarged room layouts) and centered to furniture placement.
  - (4) Two data outlets within 6 feet of instructor furniture.
  - (5) One data outlet above door or at specified location for wall-mounted clock.
  - (6) One data outlet within 3 feet from the main door for wall-mounted telephone.
- e. Science Demonstration Room
- (1) Speech enhancement speakers and system
  - (2) Two data outlets within 4 feet of interactive white board.
  - (3) Two data outlets within 6 feet of instructor furniture.
  - (4) One data outlet above door or at specified location for wall-mounted clock.
  - (5) One data outlet within 3 feet from the main door for wall-mounted telephone.
- f. Small Group Instruction, Speech, Reading, Resource, OT/PT Rooms
- (1) Four data outlets within 10 feet of student workstations as depicted on furniture plan (enlarged room layouts) and centered to furniture placement.
  - (2) Two data outlets within 6 feet of instructor furniture.
  - (3) One data outlet above door or at specified location for wall-mounted clock.
  - (4) One data outlet within 3 feet from the main door for wall-mounted telephone.
- g. Small Group Instruction/Itinerant Staff Office
- (1) Four data outlets within 10 feet of student workstations as depicted on furniture plan (enlarged room layouts) and centered to furniture placement.
  - (2) Two data outlets within 6 feet of instructor furniture.
  - (3) One data outlet above door or at specified location for wall-mounted clock.
  - (4) One data outlet within 3 feet from the main door for wall-mounted telephone.
- h. Basic Skills/ESL Classroom
- (1) Speech enhancement speakers and system
  - (2) Two data outlets within 4 feet of interactive white board.
  - (3) Six data outlets within 10 feet of student workstations as depicted on furniture plan (enlarged room layouts) and centered to furniture placement.
  - (4) Two data outlets within 6 feet of instructor furniture.
  - (5) One data outlet above door or at specified location for wall-mounted clock.
  - (6) One data outlet within 3 feet from the main door for wall-mounted telephone.
- i. Teacher Workroom
- (1) Four data outlets mounted above desk level on work surface.
  - (2) One data outlet at copier location.
  - (3) One data outlet above door or at specified location for wall-mounted clock.

- j. Remote Administrative Office
  - (1) Two data outlets within 10 feet of Remote Admin Office furniture.
  - (2) Two data outlets within 10 feet of Remote Admin Reception furniture.
  - (3) One data outlet above main door or at specified location for wall-mounted clock.
  - (4) Two wall-mounted data outlets along wall with 6' Marker Board at or above 3 feet from floor of Teacher Planning Conference room.
- 2. Large-Group Component
  - a. Multi-Purpose Room
    - (1) Three data outlets at or above door level on each wall for clock placement.
    - (2) Music sound system and speakers, minimum 250-watt continuous output.
    - (3) Support for wired and wireless microphone system.
    - (4) Large-format ceiling-mounted digital projector.
    - (5) Two data outlets within 4 feet of ceiling-mounted digital projector.
    - (6) One large format motorized projection screen as depicted on furniture plan (enlarged room layouts).
    - (7) Sound and video inputs accessible from center and both sides of the stage.
    - (8) One data outlet within 6 feet of stairs leading to the stage for wall-mounted telephone.
  - b. Stage/Instrumental Music Room
    - (1) Speech enhancement speakers and system.
    - (2) Two data outlets within 4 feet of interactive white board.
    - (3) Music sound system and speakers, minimum 100-watt continuous output.
    - (4) Two data outlets within 6 feet of instructor furniture.
    - (5) One data outlet above door or at specified location for wall-mounted clock.
    - (6) One data outlet within 3 feet from the main door for wall-mounted telephone.
  - c. Cafeteria and Food Service
    - (1) Speech enhancement speakers and system.
    - (2) Three data outlet at or above door level on each wall for clock placement.
    - (3) Four data outlets supplied in food service office within 6 feet of furniture.
    - (4) Two data outlets within 4 feet of each point of sale (PoS) terminal as depicted on furniture plan (Enlarged Room Layout).
    - (5) Large-format ceiling-mounted digital projector.
    - (6) Two data outlets within 4 feet of ceiling-mounted digital projector.
    - (7) Music sound system and speakers, minimum 250-watt continuous output.

- (8) Support for wired and wireless microphone systems.
  - (9) One large format motorized projection screen as depicted on furniture plan (Enlarged Room Layout).
  - (10) One data outlet within 6 feet door leading to main corridor for wall-mounted telephone.
  - (11) Two data outlets within 6 feet of Kitchen office desk.
- d. Faculty Conference/Dining Room
- (1) Two data outlets within 4 feet of interactive white board.
  - (2) Two data outlets within 5 feet of vending machines; not behind machines.
  - (3) One data outlet within 3 feet from the main door for wall-mounted telephone.
  - (4) One data outlet above main door or at specified location for wall-mounted clock.
- e. Gymnasium
- (1) Two data outlets in each PE Office within 6 feet of instructor furniture.
  - (2) Four data outlets at or above door level on each wall for clock placement.
  - (3) One data outlet on right wall centered between the two PE offices or at specified location for wall-mounted clock.
  - (4) Two data outlets in each PE Office within 6 feet of instructor furniture.
  - (5) One multi-sport score board placed opposite bleachers with controls wired to a central location near bleachers.
  - (6) Music sound system and speakers, minimum 250-watt continuous output.
  - (7) Support for wired and wireless microphone system.
  - (8) One data outlet in each corner along wall with bleachers for wall-mounted telephone.
- f. Vocal Music Room
- (1) Speech enhancement speakers and system
  - (2) Two data outlets within 4 feet of interactive white board.
  - (3) Music sound system and speakers, minimum 100-watt continuous output.
  - (4) Large-format ceiling-mounted digital projector.
  - (5) Two data outlets within 4 feet of ceiling-mounted digital projector.
  - (6) Six data outlets within 10 feet of student workstations as depicted on furniture plan (Enlarged Room Layout) and centered to furniture placement.
  - (7) Two data outlets within 6 feet of instructor furniture.
  - (8) One data outlet above door or at specified location for wall-mounted clock.
  - (9) One data outlet within 3 feet from the main door for wall-mounted telephone.

- g. Instrumental Music Office/Lesson Room
    - (1) Four data outlets within 10 feet of student workstations as depicted on furniture plan (enlarged room layouts) and centered to furniture placement.
    - (2) Two data outlets within 6 feet of instructor furniture.
    - (3) One data outlet above door or at specified location for wall-mounted clock.
    - (4) One data outlet within 3 feet from the main door for wall-mounted telephone.
  - h. Custodial Office/Back-Up Emergency Control Center
    - (1) Supply connectivity as required to support ECC Requirements.
    - (2) All connectivity must be redundant.
    - (3) Supply stand-alone POTS based telephone service.
    - (4) Independent access to general paging system.
    - (5) Independent access to public announcement PA system.
    - (6) One data outlet above door or at specified location for wall-mounted clock.
  - i. Staff Locker/Break Room
    - (1) One data outlet above door or at specified location for wall-mounted clock.
    - (2) Two data outlets within 6 feet of work table.
    - (3) One data outlet within 3 feet from the main door for wall-mounted telephone.
3. Core Component
- a. Media Center
    - (1) Data outlets for desks and work tables, copiers/printers, student computers and other devices within the media center.
    - (2) Speech enhancement speakers and system
    - (3) Six data outlets at circulation desk.
    - (4) One data outlet above door or at specified location for wall-mounted clock.
    - (5) One data outlet within 3 feet from the main door for wall-mounted telephone.
  - b. Media Center Office/Work Room
    - (1) Six data outlets at desks and work tables.
    - (2) One data outlet above door or at specified location for wall-mounted clock.
    - (3) One data outlet within 3 feet from the main door for wall-mounted telephone.
  - c. Media Center Server/Storage Room
    - (1) Fiber based connectivity from Media Center Server room to closest IDF.
    - (2) All copper based network connectivity for Media Center shall be wired to the Media Center Server room.
    - (3) One data outlet above door or at specified location for wall-mounted clock.
    - (4) One data outlet within 3 feet from the main door for wall-mounted telephone.

d. Technology/Project Lab

- (1) Speech enhancement speakers and system
- (2) Two data outlets within 4 feet of interactive white board.
- (3) Two data outlets within 6 feet of instructor furniture.
- (4) One data outlet above door or at specified location for wall-mounted clock.
- (5) One data outlet within 3 feet from the main door for wall-mounted telephone.
- (6) Six data outlets at each project work station as depicted on furniture plan (Enlarged Room Layout) and centered to furniture placement.
- (7) Three duplex 20-amp, 120-volt, specification grade outlets above counter space as depicted on furniture plan (Enlarged Room Layout).
- (8) One overhead pull-down style duplex power outlet above each project table.
- (9) One moveable interactive whiteboard.

e. Art Room

- (1) Speech enhancement speakers and system
- (2) Two data outlets within 4 feet of interactive white board.
- (3) Two data outlets within 6 feet of instructor furniture.
- (4) One data outlet above door or at specified location for wall-mounted clock.
- (5) One moveable interactive whiteboard.

f. Nurse's Office

- (1) Four data outlets within 6 feet of Nurse's desk.
- (2) Two data outlets within 4 feet of table in Nurse's Office.
- (3) One data outlet above door or at specified location for wall-mounted clock.
- (4) One data outlet within 3 feet from the main door for wall-mounted telephone.
- (5) One data outlet above door or at specified location for wall-mounted clock within the Exam Room.

g. Main Office

- (1) One data outlet above door or at specified location for wall-mounted clock at the reception waiting area. Two data outlets within 6 feet of each desk within the main office.
- (2) Two data outlets within 6 feet of copier in workroom.
- (3) One data outlet above door or at specified location for wall-mounted clock within the workroom.
- (4) Two data outlets within 6 feet of credenza in conference room.
- (5) One data outlet above door or at specified location for wall-mounted clock within the conference room.

- (6) One data outlet above door leading to corridor or at specified location for wall-mounted clock within the principal's office.
  - (7) Two data outlets within 6 feet of desk in principal's office.
  - (8) One data outlet above door or at specified location for wall-mounted clock within vice-principal's office.
  - (9) Two data outlets within 6 feet of desk in vice-principal's office.
- h. Emergency Control Center
- (1) Supply connectivity as required to support ECC Requirements.
  - (2) All connectivity must be redundant.
  - (3) Supply stand-alone POTS-based telephone service.
  - (4) Independent access to general paging system.
  - (5) Independent access to public announcement PA system.
  - (6) One data outlet above door or at specified location for wall-mounted clock.
- i. Student Services
- (1) Two data outlets within 6 feet of Receptionist desk.
  - (2) One data outlet above door or at specified location for wall-mounted clock.
  - (3) Two data outlets within 4 feet of each printer or copier.
  - (4) Two data outlets within 6 feet of desk within office or work station.
  - (5) One data outlet above door or at specified location for wall-mounted clock within each office.
- j. Parent/Community Room
- (1) Speech enhancement speakers and system
  - (2) Two data outlets within 4 feet of interactive white board.
  - (3) Two data outlets within 6 feet of instructor furniture.
  - (4) One data outlet above door or at specified location for wall-mounted clock.
  - (5) One data outlet within 3 feet from the main door for wall-mounted telephone.
- k. Child Study Team
- (1) Two data outlets within 6 feet of receptionist furniture.
  - (2) One data outlet above door or at specified location for wall-mounted clock in the reception area.
  - (3) Two data outlets within 6 feet of desk within each CST office.
  - (4) One data outlet above door or at specified location for wall-mounted clock in each CST Office.
  - (5) Two data outlets within 4 feet of table in Conference room.
  - (6) One data outlet above door or at specified location for wall-mounted clock in the conference room.



## **PRODUCTS**

- A. Proprietary Specifications
  - 1. The following products or manufacturers have been approved by the Authority for proprietary specification and use in this Project:
    - a. Intrusion alarm system: Bosch Radionics.
    - b. Entry control system: HID Global.
    - c. Security cameras: Panasonic.
  - 2. Subject to compliance with codes and all project requirements, the Design-Builder is required to use the indicated products or manufacturers and to verify compatibility with the school district's existing systems.
- B. Floor-mounted boxes for data connectivity.
  - 1. Avoid floor-mounted boxes where possible.
  - 2. Where no alternative to the use of floor-mounted boxes exists, the Basis of Design shall be the Evolution Series Floor Box from Legrand/Wiremold.

## **METHODS OF CONSTRUCTION**

- A. Safety and Security
  - 1. Safety and security systems shall be designed to provide survivability in the event of primary path failure.
  - 2. Each IDF and ECC/B-ECC shall have physical fiber optic path to the MDF and to one other IDF. The intent is to provide a "loop" and to mitigate outages from single path failures.
  - 3. Primary (MDF to IDF) and secondary (IDF to IDF) fiber connectivity shall not share paths of travel.

**Table D6000.00-1 Communications Responsibilities**

<i>Item</i>	<i>By Design-Builder</i>	<i>By Others</i>	<i>Comments</i>
<b>Infrastructure</b>			
MDF and IDFs	●		
Racks and Cabinets	●		
UPS for MDF and IDFs	●		
Entrance Conduits	●		
Grounding System	●		
Service Entrance Conduits	●		
Cable Management	●		
Vertical and Horizontal Cabling	●		
Data Outlets	●		
Routers		●	
Switches		●	
WiFi Routers		●	
<b>Telephone System</b>			
Wall Outlets	●		
Dedicated Lines	●		
Loud Bells	●		
Switching and Routing Equipment		●	
Handsets		●	
Elevator Communication System	●		

<i>Item</i>	<i>By Design-Builder</i>	<i>By Others</i>	<i>Comments</i>
<b>Other Systems and Equipment</b>			
Interactive White Boards		●	
Ceiling-Mounted Projectors	●		
Security System	●		
General Paging System	●		
Speech enhancement System	●		
Music Playback System	●		
Clock and Bell System	●		
Emergency Responder Radio Coverage	●		
Internet Service Connection		●	
Cable Television Service Connection		●	
<b>Other Requirements</b>			
Cable Terminations	●		
Equipment and Cable Labeling	●		
Testing and Certifications	●		
System Warranty	●		

**END OF SECTION D6000.00**

**SECTION D7050.00**  
**DETECTION AND ALARM**

**PERFORMANCE**

A. Basic Function

1. Provide automatic fire detection and automatic and manual alarm systems as required by code.
2. In addition to protected premises system(s), provide a new on-premises supervising station located at security 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 to remote central station supervising station and approved by Keansburg 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. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

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 and other applicable codes.
2. Evacuation plan: Provide general evacuation of entire premises upon initiation of automatic or manual alarm condition.
3. Detection
  - a. Comply with all code requirements.
  - b. Air handling units over 2,000 cfm: Minimum of one detector in the return.
  - c. Upon detection of fire or smoke condition, provide 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.

- 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) Alarm-activated door controls.
      - (4) Locks restricting exit through doors constituting means of egress.
  - 6. Audible and visual trouble notification of operations staff for the following:
    - a. Alarm zone failures
    - b. Annunciator zone failures
    - c. Ground faults
    - d. Backup power failure
    - e. Water supply equipment failures.
  - 7. Error and failure prevention: Provide the following:
    - a. Addressable system
    - b. Tamper sensors at sensitive points
    - c. Products of only one manufacturer or certified by manufacturer as compatible.
    - d. 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 Supply
      - (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. School district personnel training: As required by code and commissioning requirements, and as follows.
  - a. Operational: Minimum of 8 hours, for 2 persons, for each separate system.
  - b. Maintenance: Minimum of 8 hours, for 2 persons, for each separate system.

## **PRODUCTS**

### **A. Proprietary Specifications**

1. The following products or manufacturers have been approved by the Authority for proprietary specification and use in this Project:
  - a. Fire alarm system: United Technologies Corp/Edwards, Vigilant system.
2. Subject to compliance with codes and all project requirements, the Design-Builder is required to use the indicated products or manufacturers and to verify compatibility with the school district's existing systems.

### **B. Control Systems for All Applications**

1. Use one of the following:
  - a. Microprocessor-based hardware.
  - b. Point addressable fire alarm devices.
2. Do not use:
  - a. Hardwired relay base controls
  - b. Zoned alarm devices.

### **C. 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.

### **D. Warning Devices**

1. Use one of the following:
  - a. Speakers.
  - b. ADA-compliant strobes.
  - c. Combination speaker /strobes.
2. Do not use:
  - a. Horns.
  - b. Combination horn/strobes.

E. Communication Cabling

1. Use one of the following:
  - a. Copper cable complying with manufacturer's requirements.

**METHODS OF CONSTRUCTION**

- A. Basis of Design: Use products selected for district-wide compatibility.
- B. Provide fire alarm cable installed in conduit.
  1. Do not use:
    - a. Loose fire alarm cable without raceway.

**END OF SECTION D7050.00**

## SECTION D8010.50

### INTEGRATED AUTOMATION CONTROL OF HVAC SYSTEMS

#### PERFORMANCE

##### A. Basic Function

1. Provide the elements necessary to control the building's indoor environment.
2. 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.
3. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

##### B. General

1. The Building Management System (BMS) will be classified as a stand-alone computer-based, networked, distributed digital control system, BACnet-compatible interface, and as follows:
  - a. The control system shall include the complete stand-alone distributed digital controllers (DiDC), networked together to provide automated control and monitoring functions of various mechanical and electrical equipment. The system can be monitored or controlled through an operator's remote workstation via the network or from the supervisory station.
  - b. Each DiDC shall include all hardware, software, signal conditioning and termination devices to provide full monitoring and control of its data environment. Power conditioning (isolation transformers) shall be used. All controllers shall be furnished with battery backup.
  - c. The system shall include all sensors, indicators, actuators, final control elements, interface equipment, other apparatus, accessories, and software connected to distributed controllers operating in multiuser, multitasking environment on token-passing network and programmed to control mechanical systems.
  - d. Secure access from the supervisory station or an operator's remote workstation shall permit interface with the network via dynamic color graphics with each mechanical system, building floor plan, and control device depicted by point-and-click graphics..
  - e. Each DiDC shall be capable of peer-to-peer communication for sharing of point status and value information. Communication from one DiDC to another shall not depend on the central host computer or other DiDC panels.
  - f. Provide secure off-site real-time backup of all BMS programming, functions, setpoints, and other building information to enable remote operation in the event of local failure of the host computer.
  - g. Provide complete turnkey service by the controls subcontractor for the BMS and all functions.



## 2. System Requirements

- a. The application of electronic distributed digital control for the main HVAC systems and associated areas are as follows:
  - (1) Each air handling unit (AHU) and associated exhaust fan(s) shall be controlled by a dedicated DiDC. Typical parameters are to be controlled and monitored include temperature, humidity, air flow and air pressurization, fan start-stop, fan status, safety shutdown (low temperature, high static pressure and fire alarm interface), and filter monitoring.
  - (2) General Zone Control
    - (a) Terminal air devices serving classrooms, offices, and support areas shall be controlled by direct digital controllers.
    - (b) AHU/DOAS ERU/RTU duct pressure/airflow control shall be performed and integrated with the BMS. All components for this control (airflow stations and probes, electronic differential pressure transmitters, electronic flow transmitters, etc.) shall be of commercial quality.
  - (3) Supervisory Station
    - (a) Provide central monitoring and control through a supervisory station at a location to be designated by the Authority.
    - (b) Provide a central host computer with keyboard, mouse, minimum 32" LED screen, printer, and all accessories necessary for complete monitoring and control of the BMS as well as network access.
  - (4) The BMS shall control and monitor the following equipment:
    - (a) Chillers.
    - (b) Boilers.
    - (c) Pumps.
    - (d) Air handling units.
    - (e) Rooftop package air conditioning units.
    - (f) DOAS energy recovery units.
    - (g) Duct airflow/pressurization control.
    - (h) Air terminal units.
    - (i) Fan coil units.
    - (j) Fans.
    - (k) Miscellaneous equipment necessary for a complete system.
- b. All air handling units/rooftop packaged units and exhaust fans shall be hardware interlocked.
  - (1) Automated system startup shall be performed by the BMS.
  - (2) Provide hardwire control interlocks for safety devices (freeze-thermostat, smoke detection, high static pressure, damper and switches.)

- (3) Provide sequential startup of systems by the BMS for demand control upon return of utility power after a power failure.

3. Control Devices

- a. All temperature sensing for the HVAC systems shall be accomplished using electronic RTD sensors.
- b. Cooling, reheat and preheat coil (2-way) valves shall be commercial quality. Use two-way valve circuit around chiller/chilled water and hot water pump systems. Two-way control valves shall be used throughout except for “end of pipe run” equipment where a 3-way valve arrangement may be applied to maintain minimum pump flow rate.
- c. Low leakage dampers shall be specified for all AHU outside air intake dampers. Dampers shall be same material as duct system served.
- d. Temperature Control Zones
  - (1) The following spaces shall receive individual room temperature control:
    - (a) All pre-kindergarten and instructional component spaces.
    - (b) All large group component spaces.
    - (c) All core component spaces.
    - (d) Offices, in groups of no more than 4.
    - (e) Conference rooms.
    - (f) Emergency control rooms, backup emergency control & IDF rooms.
    - (g) Mechanical equipment rooms.
    - (h) Elevator machine rooms.
    - (i) Electrical rooms.
    - (j) Any other spaces with continuous, periodic or occasional equipment load equivalent of 5 watts per square foot or greater.
- e. Temperature/Air Quantity Setback/Setup (2009 IECC 503.2.4.3.1)
  - (1) Temperature will be set back from 72°F to 55°F (Winter) and setup from 75°F to 85°F (summer) and airflow shall cycle on/off to maintain setback/setup set-point.
- f. Provide a thermostat or a temperature sensor for each zone to maintain the required space conditions.
- g. Provide monitoring and control of major pieces of HVAC equipment.
- h. Monitor all general alarms for all equipment.
- i. Monitor the following equipment:
  - (1) Air terminals
    - (a) Supply airflow.
    - (b) Space temperature.
    - (c) Supply air temperature.

- (d) Filter status.
- (2) Fan powered air terminals
  - (a) Primary airflow quantity.
  - (b) Space temperature.
  - (c) Supply air temperature.
  - (d) Fan on-off status.
  - (e) Heating valve % open.
  - (f) Filter status.
- (3) Air handlers and DOAS energy recovery units
  - (a) Supply fan on-off status.
  - (b) Return fan on-off status.
  - (c) Entering air temperature degree F.
  - (d) Discharge air temperature degree F.
  - (e) Outside air temperature degree F.
  - (f) Outside air temperature after enthalpy wheel
  - (g) Mixed air temperature
  - (h) Entering chilled water temperature
  - (i) Leaving chilled water temperature.
  - (j) Entering heating water temperature
  - (k) Leaving heating water temperature.
  - (l) Supply fan airflow quantity.
  - (m) Return/exhaust fan airflow quantity.
  - (n) Outside airflow quantity.
  - (o) Supply air relative humidity.
  - (p) Return air relative humidity.
  - (q) Wheel start/stop.
  - (r) Enthalpy wheel on-off status.
  - (s) Return air CO2 PPM monitoring and alarm.
  - (t) Pre and final air filter static pressures and alarm.
  - (u) Freeze stat status and alarm.
  - (v) Smoke detector status.
- (4) Packaged rooftop air handlers and DOAS energy recovery units
  - (a) Supply fan on-off status.
  - (b) Return fan on-off status.

- (c) Entering air temperature degree F.
  - (d) Discharge air temperature degree F.
  - (e) Outside air temperature degree F.
  - (f) Outside air temperature after enthalpy wheel degree F.
  - (g) Mixed air temperature degree F.
  - (h) Supply fan airflow quantity.
  - (i) Return fan airflow quantity.
  - (j) Exhaust fan airflow quantity.
  - (k) Outside airflow quantity.
  - (l) Supply air relative humidity.
  - (m) Return air relative humidity.
  - (n) Exhaust air relative humidity.
  - (o) Enthalpy wheel start/stop.
  - (p) Enthalpy wheel on-off status.
  - (q) Return air CO2 PPM monitoring and alarm.
  - (r) Pre and final air filter static pressures and alarm.
  - (s) Smoke detector status.
- (5) Chillers
- (a) On-off status.
  - (b) Supply water temperature set point
  - (c) Entering chilled water temperature.
  - (d) Leaving chilled water temperature.
  - (e) Percent of full load.
  - (f) Chilled water flow quantity.
  - (g) Low water flow alarm
  - (h) Lead/lag status
  - (i) Run time
  - (j) Percent of full load
  - (k) Safety controls.
- (6) Boilers
- (a) On-off status.
  - (b) Entering water temperature.
  - (c) Leaving water temperature.
  - (d) Percent of full load.

- (e) Lead/lag.
- (f) Safety controls.
- (7) Exhaust fans.
  - (a) On-off status.
  - (b) Exhaust damper open-closed.
- (8) Pumps
  - (a) On-off status.
  - (b) Start/stop.
  - (c) Pump speed.
- (9) Gas detection and CO detection systems
  - (a) Alarm status.
- (10) Duct static pressure sensors.
- (11) Heating and ventilating units.
- (12) Kitchen make-up air unit.
- (13) Independent split systems
  - (a) On-off status.
  - (b) Space temperature.
  - (c) Percent humidity.
  - (d) Alarm Status.
- (14) Variable frequency drives.
- j. Control the following equipment:
  - (a) Air terminals.
  - (b) Fan powered air terminal units.
  - (c) Air handlers.
  - (d) DOAS energy recovery units.
  - (e) Rooftop packaged air conditioning units.
  - (f) Chillers.
  - (g) Boilers.
  - (h) Fan coil units.
  - (i) Exhaust fans.
  - (j) Circulating pumps.
  - (k) Heating ventilating units.
  - (l) Kitchen make-up air unit.
  - (m) Independent split systems.

- (n) Variable frequency drives.
  - k. Where control and instrumentation elements also must function as elements defined within another element group, meet the requirements of both element groups.
- C. Amenity and Comfort
  - 1. Zoning and Space Temperature Control
    - a. Dedicated terminal unit and temperature sensor for each separated space.
    - b. Dedicated terminal unit and temperature sensor for each corner space.
  - 2. Humidity Control
    - a. Provide monitoring and control of humidification for all air handling unit systems.
    - b. Provide monitoring and control of humidification equipment in split systems.
- D. Health and Safety
  - 1. Life Safety
    - a. Provide interconnection and coordination of HVAC controls with other life safety systems.
  - 2. Fire Sources
    - a. Provide products which are rated for the specific locations where they are installed.
- E. Durability
  - 1. Expected Service Life Span
    - a. Provide a system which will last a minimum of 10 years in service without major repairs or operating expense.
  - 2. Vandalism
    - a. Protect the system from unauthorized access.
  - 3. Accidental Damage
    - a. Protect thermostats, temperature sensors, control wiring, field panels, and computer, keyboard, and monitor from accidental damage.
- F. Operation and Maintenance
  - 1. Provide full ownership and administrative control of all building automatic control components, head end system, control panels and points of control, alarm, and system design adjustments to owner at completion of project.
    - a. Include all required access to programming interface, login password and identification settings for all future maintenance and monitoring of controls system.
    - b. All software shall be licensed to the owner with full password capability and access. Under no circumstances shall any part of the system or software be licensed or controlled by the controls contractor.
    - c. The entire system including original software discs shall be turned over to the owner.
  - 2. System Capacity
    - a. Provide a building control system with sensors and points to perform as specified, with the capacity for 15% additional points.

3. Ease of Use
  - a. Locate field panels in mechanical rooms.
  - b. Locate the supervisory station as directed by the Authority.
  - c. Provide a system with the following features:
    - (1) User programmability.
    - (2) Graphic user interface.
    - (3) Internet-based access and control from remote locations.
    - (4) Multiple layers of secured access to data and program information.
  - d. Provide field panels which are independent and are not dependent on the host computer to continue functioning.
4. Ease of Service
  - a. Provide a system with the following features:
    - (1) Modular design.
    - (2) Self-diagnostic capability.
    - (3) Historical data storage.
    - (4) Secure, simple access to key components.
5. Energy Efficiency
  - a. Provide the following control functions or features:
    - (1) Holiday scheduling.
    - (2) Night setback/ setup for both systems and rooms levels.
    - (3) Outside air economizer.
    - (4) Boiler staging.
    - (5) Boiler optimization.
    - (6) Chiller staging.
    - (7) Optimum start.
    - (8) Optimum stop.
    - (9) Chilled water temperature reset.
    - (10) Heating water temperature reset suitable for condensing boilers.
    - (11) Variable speed pumping.
    - (12) Demand limiting and load shedding.
    - (13) Carbon dioxide space occupancy sensors & monitoring system.

## **PRODUCTS**

### **A. Building Control System Types**

1. Use the following:
  - a. Direct digital control (DiDC) system, web based open protocol, BACnet/Lonworks; capable of seamlessly tying into and interfacing with the district's existing 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 as required by Section 01820, Operation and Maintenance Data and Training. Training shall be provided after the system has been commissioned and demonstrated to the district.
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. Comply with ASHRAE 135 for DiDC system control components.
4. Hydronic control valve sizing: Maximum 5-psig pressure drop at design flow rate.
5. 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 of the following methods or procedures:**

1. Purchase of control equipment from a wholesale distributor will not be accepted.

**END OF SECTION D8010.50**



# **ELEMENT E**

# **EQUIPMENT AND**

# **FURNISHINGS**

## **SECTION E1010.50**

### **LOADING DOCK EQUIPMENT**

#### **PERFORMANCE**

##### **A. Basic Function**

1. Provide loading dock equipment to facilitate loading and unloading of supplies and equipment and to protect personnel, building elements and vehicles from physical damage, and constructed to achieve fire ratings required by code and all other project requirements.
2. Loading dock equipment includes the following elements:
  - a. Dock bumpers.
3. Where elements also must function as elements defined within another element group, meet requirements of both element groups.
4. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

##### **B. Amenity and Comfort**

1. Convenience: Provide equipment with fittings and controls that are manageable without special instruction or the need for excessive force.
2. Appearance: Provide equipment that is coordinated in design with other elements of interior construction, using compatible materials, colors, and textures.
3. Texture: Provide durable, low maintenance exposed surfaces for equipment that are within reach of occupants engaged in activities normal for the particular space in which they are installed.

##### **C. Health and Safety**

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

##### **D. Structure**

1. Provide suspended equipment that has been engineered and installed to withstand dead and live loads and the effects of operation as required by code without excessive deflection or permanent distortion.
2. Seismic loads: Provide equipment that has 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 non-concurrently in any horizontal direction.

##### **E. Operation and Maintenance**

1. Ease of Use
  - a. Language of identifying devices: All text in English.
  - b. Equipment with movable components: Easy to use without special instruction and designed to prevent misuse.

2. Ease of repair: Provide equipment that is designed to permit repair or replacement of individual components without removal of fixture.
3. Ease of replacement or relocation: Provide equipment that is modular in form, detachable from substrate without damage to fixtures, and relocatable.
4. Theft resistance: Provide equipment that is attached to substrates with concealed, tamper-resistant, or tamperproof fasteners to minimize theft and vandalism.

## **PRODUCTS**

### **A. Dock Bumpers**

1. Laminated Extra-Long Rubber Dock Bumpers
  - a. Fabric reinforced rubber pads laminated between structural steel angles and secured with 3/4 inch (19 mm) steel supporting rods; anchor bolts protected by rubber.
  - b. Projection from wall: 6 inches (152 mm).
  - c. Vertical height: 12 inches (305 mm); 4 inch (102 mm) bolt hole centers.
  - d. Length: As necessary to protect building where loading docks are not protected by bollards
  - e. Finish for exposed metal: Hot-dipped galvanized.
  - f. Anchor bolt protection: Minimum 3" thick rubber coverage.

### **B. Basis of Design: Durable Corp., Norwalk, OH.**

## **METHODS OF CONSTRUCTION**

### **A. Dock Bumpers**

1. Provide cast-in-place embedments for attachment of dock bumpers.

**END OF SECTION E1010.50**

**SECTION E1030.80**  
**FOOD SERVICE EQUIPMENT**

**PERFORMANCE**

A. Basic Function

1. Provide all new food service equipment and appliances as shown on the drawings and listed in the “Schedule of Equipment” and as necessary for a safe, sanitary and efficient food service facility.
2. 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.
3. 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.
4. In addition to equipment and appliances scheduled and shown in drawings, provide the following as necessary to complete the installation of food service equipment:
  - a. Electrical service and connection to food service equipment, including overload protection requirements wiring between starters, when starters and controls are not integral with equipment.
  - b. Plumbing work and connections, including fittings which are not integral part of equipment; floor drains, water and waste lines to refrigeration compressors including their connections; and miscellaneous plumbing work.
  - c. Heating, ventilating and air conditioning.
  - d. Concrete, masonry and miscellaneous metals.
  - e. Stainless steel corner guards attached to building structure.
5. Dining tables, chairs, cash registers, cashiers' stools, pots, pans, dishes, glassware, trays, and silverware will be provided by others.
6. Where food service elements also must function as elements defined within another element group, meet requirements of both element groups.

7. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.
- B. Amenity and Comfort
1. Accessibility: Comply with barrier-free accessibility codes and requirements.
  2. Noise reduction: Construct to minimize noise produced by equipment and reduce reverberation in spaces
  3. Appearance
    - a. Apparent cleanliness: Provide visible materials of uniform color, preferably light in color, for maximum visibility of food debris and dirt.
    - b. Provide food service equipment that is consistent in appearance and finishes.
    - c. Conceal wiring and piping wherever possible. Where wiring and piping are exposed, install horizontal and vertical runs close to walls, floors, ceilings or equipment.
  4. Convenience
    - a. Provide a layout and equipment consistent with convenience and efficiency in use, for food preparation staff and those being served.
    - b. Install equipment so that food preparation, storage, service, and cleaning operations function smoothly, without unnecessary effort, and for optimum food hygiene
- C. Health and Safety
1. Comply with all applicable codes and standards, including those of the National Sanitation Foundation.
  2. Safety: Fabricate and install equipment to eliminate conditions that might snag, trip, tear, or otherwise injure food preparation staff and those being served.
  3. Sanitation: Provide smooth, impervious, and water-resistant surfaces and equipment that will allow necessary cleaning and maintenance practices, including chemical cleaning and sterilization, without damage.
  4. Safety of fire sources: Provide equipment that is certified by an independent testing agency recognized by the local authority for safety.
  5. Flammability: Do not use any flammable materials in the construction of food service equipment.
  6. Food safety: Maintain temperature inside chilled food storage units within ranges required by code and to prevent spoilage as follows:
    - a. Refrigerators and refrigerated display units: Constant interior temperature of 45 deg F, plus/minus 5 deg F maximum.
    - b. Freezers: Constant interior temperature of 25 deg F, plus/minus 5 deg F maximum.
  7. Accident prevention: 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.
  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.

## **PRODUCTS**

- A. Materials
1. Stainless steel, where specified, shall be Type 302, No. 4 finish.
  2. Galvanized steel sheets shall conform to ASTM A164, Type RS. Where galvanized steel has been welded, seams shall be thoroughly cleaned and finished with one coat of zinc rich paint (70% zinc). Galvanized structural steel shall conform to ASTM A123 and A 153. Hot dip galvanization shall conform to ASTM A386.
  3. Steel pipe shall be fully galvanized. All threads are to be cleaned and coated with rust resistant coating.
  4. Structural shapes: All angles, band channels, etc., used for framing shall conform to ASTM A36.
  5. Fastenings: All bolts, screws, nuts, and washers shall be galvanized or cadmium plated steel, except that where brass or stainless steel is fastened, the fastenings shall be brass or stainless steel respectively. Where dissimilar metals are fastened, bolts, screws, and nuts shall be made of an approved non-corrosive metal.
- B. Workmanship
1. Fasteners
    - a. Except as otherwise specified or approved by the Authority, exposed finished surfaces shall be free from bolts, screws, and rivet heads.
    - b. Wherever threads of bolts and screws occur on the inside of fixtures and are either visible or might come in contact with hands or wiping cloths, such bolts and screws

shall be capped with a suitable lockwasher and chrome plated brass or bronze acorn nut.

- c. Where screw threads are welded to the underside of trim and tops, the spacing and intent of rivets, bolts, and screws shall be such as to insure proper fastening and prevent bulging of the materials fastened.

## 2. Welding

- a. Welding shall be done by the electric fusion metal arc method. Carbon arc and gas welding will not be permitted.
- b. Welds shall be continuous, strong, and ductile, with excess metal ground off joints finished smooth to match adjoining surfaces.
- c. All joints in tops of fixtures, tables, drainboards, overshelving, sinks and other equipment shall be welded.
- d. Butt welds made by spot welding straps under seams and filling in the voids with solder and finish by grinding, are not acceptable.
- e. Tops of fixtures shall be fabricated in the factory with welded joints to reduce field joints to a minimum.
- f. Field joints shall be welded and exposed welds ground smooth and polished to match factory finish.

## 3. Finish

- a. Wherever material has been depressed by a welding operation, such depression shall be suitably hammered and peened flush with the adjoining surface and, if necessary, be ground again to eliminate low spots.
- b. Care shall be exercised in all grinding operations to avoid excessive heating of the metal, causing discoloration. In all cases, the grain of rough grinding shall be removed by successive polishing operations.
- c. Wherever brake bends occur, they shall be free of undue extrudence and shall not be flaky, scaly, and cracked in appearance. Where such bends mar the uniform surface appearance of the materials, all such marks shall be removed.
- d. Sheared edges shall be free from burrs, fins, and irregular projections, and shall be finished to obviate all danger of cutting and laceration when the hand is drawn over the edge.
- e. Mitres and bullnosed corners shall be welded and ground smooth.

## 4. Exposed stainless steel

- a. All surfaces shall have a No. 4 finish as specified hereinbefore. An exposed surface shall be interpreted as meaning outside surfaces exposed to view and inside surfaces exposed to view when a sliding or swinging door is opened.
- b. The underside of shelving may be a No. 80 ground finish.
- c. Final finish shall be the manufacturer's factory finish and not as furnished by mill.

5. Underside of tops
  - a. All work tops, dishtables and drainboards shall be treated with an approved spray on sound deadening material with an aluminum spray finish.
  - b. Sound deadening shall be applied to fixtures after tops have been completely fabricated.
6. Soldering
  - a. Soldering shall be done in strict accordance with recommended procedures of the stainless steel manufacturer.
  - b. In no case shall soldering be relied upon for the stability of seams and joints. The soldering shall serve only as filler to prevent leakage, and shall not at any time be considered as replacing welding or brazing.
  - c. Soldering shall not at any time be used in and on any surfaces which may come in contact with foods.
7. Control Devices
  - a. All fittings, control valves, plumbing works, or electrical operating switches furnished as part of the equipment shall match and equal in every respect those required by code and all project requirements.
  - b. Each piece of equipment shall have, in addition to mainline control valves, individual operating valves, so that any piece of equipment may be removed for repairs without interruption of the remaining apparatus.
  - c. All such valves, switches, and fittings shall be located at a point of greatest convenience for operation.
8. Appurtenances and Access Panels
  - a. Provide all appurtenances which may not be specifically mentioned in the specifications or shown on drawings but which are required for the proper functioning of the equipment.
  - b. Include plumbing fittings or electrical controls which are not normally furnished by the manufacturer for the proper equipment functioning.
  - c. Provide proper access panels to service equipment within the units.
9. Pipes, Fittings and Valves
  - a. Furnish all pipes, fittings, and valves required for proper functioning of equipment with the respective items of equipment.
  - b. Furnish steam pressure reducing valves as required for steam operated units.
  - c. Exposed plumbing, piping, fittings, valves and conduit shall be chrome plated.
10. Starting switches: Furnish starting switches including those for remote installation, to the Electrical Contractor, who shall install and wire same.
11. Equipment: All equipment shall be mechanically fastened to walls, floors, or ceiling and assembled together.



12. Protective coverings: All protective coverings shall be furnished and maintained for the protection of the equipment until ready for inspection and demonstration.
13. Field conditions: Where mechanical or structural field conditions have direct cause to alter equipment specified in any manner, notify the Authority in writing for direction before proceeding with that portion of the work.

C. Fabricated Equipment

1. Sinks and Drainboards: All sinks and drainboards shall be constructed of 14-gauge stainless steel and as follows:
  - a. Fabrication
    - (1) Joints shall be welded.
    - (2) Front and ends, unless otherwise indicated on drawings, shall be extended 3", measured at sink edge, and rolled on a diameter of 1 1/2", 180°.
    - (3) Raised, rolled rim at front and ends of drainboard shall be leveled with sink rolled rim and continuous therewith and shall not follow the pitch of the drainboard.
    - (4) Drainboards shall be pitched 1/8" per 1' 0" towards sink compartments.
    - (5) Sinks and drainboards adjacent to walls or adjoining equipment, shall have 10" high splashbacks, level and continuous, not following the pitch of drainboards.
    - (6) Where drainboards are 24" or less, they shall be supported on one inch outside diameter by 16-gauge stainless steel tubular, seamless diagonally braces and secured to sink gussets, welded around entire perimeter.
    - (7) Where drainboards exceed 24" in length, legs shall be provided.
    - (8) All vertical and horizontal corners shall be rounded to a radius of approximately one inch, with intersections meeting in the spherical sections.
    - (9) All sinks having two or more compartments shall have double dividing partitions with fully rounded corners, both vertical and horizontal.
    - (10) All penetrations in tables or countertops required to run mechanical services to any equipment shall be fitted with rubber grommets to protect these service lines.
    - (11) All troughs and drains related to tilting kettles and skillets shall be positioned in such a manner so as to fall within the pour pattern required.
    - (12) All corners of rolled rim shall be fully rounded outside roll and be concentric with inside roll.
    - (13) The bottom of each sink compartment shall be creased to a sufficient pitch toward waste outlet.
    - (14) Openings for hot and cold faucets shall be cut into splashbacks as required.
    - (15) All sinks shall be 16" deep, unless otherwise specified or indicated on the drawings.
    - (16) All divider panels where required shall be a minimum of 3/4" thick double wall stainless steel construction.

- b. Waste Fittings
    - (1) Each sink compartment including bain-marie type sink compartments shall be provided with a waste outlet.
    - (2) Each waste outlet, except as otherwise specified, shall be a two inch twist handle valve constructed of the best grade chrome plated cast brass or bronze, Model No. D50-4590, as manufactured by Component Hardware, or approved equal.
    - (3) The outlet shall be free flowing, non-clogging type, with a perforated strainer of stainless steel on the interior of the sink bottom and having two inch pipe size thread at the lower end, and shall provide chrome plated locknut washers and chrome plated tailpiece.
    - (4) The outlet shall be precision machine tee fitting protected by a sealed stuffing box which shall eliminate the possibility of leakage from key to exterior of outlet.
    - (5) The outlet shall be set into a die depression and attached without rivets to the sink bottom, and shall be furnished with externally operated stainless steel lever handles.
    - (6) The outer body shall have an opening threaded to receive 1-1/4" iron pipe size overflow at the rear. This overflow fitting shall be 1-1/4" brass chrome plated, and shall be provided with a stainless steel strainer on the sink interior and shall be connected to the waste outlet by means of 1-1/2" brass pipe tubing which shall be chrome plated, except as otherwise specified.
  - c. Sinks set into work counters or table tops shall be constructed of same gauge and materials as specified for counter top as follows:
    - (1) The top perimeter of each sink shall be integrally welded to edge of opening in table or counter top.
    - (2) Table or counter top shall be die punched to receive faucets.
    - (3) Sinks shall have vertical and horizontal corners rounded on a 1" radius, with bottoms pitched to the waste outlet.
    - (4) Sinks finish shall be the same as table or counter tops.
  - d. Water inlets shall be located in all instances above the positive water level to prevent syphoning of liquids into the water system.
  - e. Dishtables shall be constructed same as previously specified for sinks and drainboards unless otherwise indicated on drawings.
2. Stainless steel table tops: All stainless steel table tops shall be 14-gauge polished stainless steel constructed as follows:
- a. Fabrication
    - (1) Edges shall be rounded and free from burrs and any excess material left.
    - (2) Tops shall be rolled 180°, 2" in diameter on all exposed sides.

- (3) Where tables are placed against building walls, they shall be turned up in back approximately six inches, returned one inch diagonally to wall with all exposed ends welded closed.
    - (4) Corners shall be rounded or bullnosed.
  - b. Reinforcement and Underbracing
    - (1) Tops shall be reinforced with 1-1/2" x 1-1/2" x 1/8" galvanized iron angle framework reinforcing, full perimeter of underside of top, with cross angles every 30" or less.
    - (2) Reinforcing shall be secured to the underside of the top with stud welds, lockwashers, and speed nuts.
    - (3) Underbracing shall be provided for drainboards, and dishtable tops, and shall be 1" x 4" x 1" channels of 14-gauge stainless steel.
    - (4) Underbracing shall be welded to the underside of fixtures in a manner suitable to seal out vermin and also to create a noise deadening top surface.
    - (5) All channels shall extend the full length and depth of fixtures and shall be so positioned that no dimension exceeds 30" in any direction.
3. Legs
  - a. Legs shall be constructed of not less than 1-5/8" o.d., 16-gauge stainless steel pipe.
  - b. Legs shall be in no case spaced more than 6'-0" on centers.
  - c. Leg cross bracing, where required, shall be constructed of not less than 1-1/4" o.d. x 16-gauge stainless steel tubing.
  - d. All leg bracing shall run horizontal and level between all legs, approximately 10" above the floor, unless otherwise specified.
  - e. All joints shall be completely welded around the entire perimeter.
4. Leg Mountings
  - a. Units mounted on legs that are 14" or longer shall be provided with underbracing. Legs in such cases are to be provided with not less than 12-gauge stainless steel gussets, extending downward.
  - b. Gussets shall be die stamped, fully enclosed, drawn cylindrical or cone shaped of not less than 3" in length, 2-1/2" in diameter at top.
  - c. Gussets shall be welded continuously around entire circumference against the channel reinforcement.
  - d. On legs between 8" and 14" in height, gussets shall be provided, but no underbracing need be furnished.
5. Feet
  - a. Feet shall be stainless steel bullet type, Model No. A10-0851, as manufactured by Component Hardware or approved equal, having an integrally formed shaft with a minimum adjustment of approximately 1-1/2" without the use of threading or adjusting bolts.

- b. Feet shall be completely sealed at bottom and shall be close fitting between tubular leg support and foot.
6. Shelving and Undershelving
- a. Counter shelves and cabinet shelves shall be constructed of 16-gauge stainless steel.
  - b. All shelves shall be of the removable type unless otherwise specified on drawings and constructed in sections of not more than 30".
  - c. Rear of shelves shall be turned up 2" and hemmed.
  - d. Shelves shall be notched to fit the contour of legs.
  - e. Shelves shall be fully welded to legs, crevice free.
  - f. Flat undershelving shall be 16-gauge stainless steel turned down on front and sides approximately 1-1/2" and under 1/2" to form a channel shape.
  - g. Slotted undershelving is to be constructed same as above except that die stamped slots approximately 1-1/4" wide and 3" apart are to be furnished full length of shelf units running front to back.
  - h. Undershelves shall be reinforced with 1" x 4" x 1" 14-gauge stainless steel channel, full length of shelf.
7. Drawers
- a. Drawers shall be of the telescoping slide type with completely enclosed 16-gauge stainless steel housing.
  - b. The housing shall operate on a 16-gauge stainless steel outside locking track.
  - c. Drawer fronts shall have 16-gauge stainless steel front panel with full grip pull handles, Model No. P50-1011; locks hasp and staple, M80 Series(sized to suit); and heavy duty drawer slides, S52 Series, all as manufactured by Component Hardware, or approved equal.
  - d. Drawer fronts shall be double wall type construction filled with an approved sound deadener within.
  - e. Where specified, provide one 21" x 24" x 1" thick, white thermoplastic carving board as manufactured by John Boos Co. or approved equal, to fit into stainless steel "Z" slides.
  - f. Drawer liners: Provide all drawers with fitted liners as manufactured by Component Hardware or approved equal, to be removable without untracking, gray in color, smooth finish, all thermoplastic construction with all vertical and horizontal corners on a radius, with the top edges flanged out to set into a 16-gauge stainless steel track and housing combination.
8. Wall Cabinets
- a. Wall cabinets shall be of length as shown on plans or hereinafter specified, 13" deep x 30" high or shown on drawings.
  - b. Construct cabinet of 18-gauge polished stainless steel, of all welded construction.
  - c. All cabinets shall have sloped, dust proof tops.

- d. Exterior bottoms shall be of flush construction.
  - e. Cabinet interiors shall be provided with a fixed bottom shelf and two removable, adjustable, intermediate shelves.
    - (1) Shelves shall rest on clips, which shall be secured to keyhole strips fastened to interior of cabinet.
    - (2) Keyhole strips shall be Model No. T23 Series pilaster stainless steel removable thumbscrew type; shelf clips shall be Model No. T30-5032, all as manufactured by Component Hardware, or approved equal.
  - f. Cabinet doors shall be of double wall construction.
9. Wall shelves
- a. Wall shelves shall be shall be constructed of 16-gauge stainless steel, turned up 2" at both sides and rear, unless otherwise specified or shown on details.
  - b. Rear edges shall be hemmed.
  - c. Sides shall be fully welded and enclosed above and below shelf, flush with rolled edge.
  - d. Shelves shall be supported on 12-gauge stainless steel brackets spaced no more than 4'-0" o.c., welded to shelves.
10. Counter and Cabinet Doors
- a. Doors shall be double pan construction with all corners welded and shall be filled with an approved 1/2" thick sound deadener.
  - b. Doors shall be constructed of 18-gauge stainless steel exterior and 20-gauge stainless steel interior unless otherwise specified.
  - c. Doors shall permit removal for cleaning and adjustment without the use of tools.
  - d. Bolts and screws shall be kept to a minimum and shall be of corrosion resisting metal.
  - e. Sliding Doors
    - (1) Double sliding doors shall be provided with double overhead tracks and carriers for maximum clear door opening.
    - (2) Units shall be provided with trackless bottoms with concealed guide for overhead roller doors.
    - (3) Upper suspension nylon rollers shall be heavy duty to fit stainless steel track so as to minimize wear and noise.
    - (4) Doors shall operate on rollers freely without friction or rubbing between doors, door suspensions and upper sliding framework including hardware.
    - (5) Spacers, where not exposed to view, shall be 14-gauge 3/4" diameter stainless steel tubing.
    - (6) Guides shall be equipped with limit stops to prevent telescoping of doors.

D. Handles, Brackets, Locking Devices and Hardware

1. Handles, knobs, hinges, brackets, or other miscellaneous hardware shall be satin finish chrome plated or stainless steel.
2. Pull handles shall be barrier-free and of the full grip type, Model No. P50-1011, as manufactured by Component Hardware or approved equal.
3. Locks
  - a. All sliding and hinged doors and all drawers in tables, cabinets, refrigerators, storage bins, shall be furnished with extra heavy duty security type locking devices of cylinder type, chrome plated, as manufactured by Component Hardware or approved equal. .
  - b. Keying for all locking devices shall be consistent with district standards.
4. Hinges and Catches
  - a. All stainless steel hinged doors shall be provided with stainless steel lift off type hinges and adjustable tension type catches.
  - b. Hinges and catches shall be fully mortised into doors and corresponding mullions to create a flush, clean appearance.
  - c. Hinges shall be Model No. R74-8100 and R74-8101, as manufactured by Component Hardware or approved equal.
  - d. Catches shall be Model No. M27-2490, as manufactured by Component Hardware, or approved equal.
5. Casters
  - a. All mobile stands and tables shall be provided with heavy duty casters.
  - b. Provide casters equal to Component Hardware Model No. C25-1950 caster with Model No. C25-1951 brake in kitchen.
  - c. Provide casters equal to Component Hardware Model No. C23-3450 caster with Model No. C23-3451 brake in dishwashing area.

E. Motors and Electrical Characteristics

1. Motors
  - a. Motors shall be of the drip proof, splash proof, or totally enclosed type having a two hour duty cycle and ball bearings (except small timing motors which may have sleeve bearings).
  - b. All motor windings shall be impregnated to resist moisture.
  - c. Motors shall have ample power to operate designated machinery under full load operating conditions without exceeding nameplate ratings.
  - d. Fractional horsepower motors 1/2 HP and above shall operate on 208-volt, 3-phase, 4-wire service, with a magnetic pushbutton unless otherwise called for in equipment schedule.

- e. Motors 1/3 HP and under shall operate on 120-volt 60-cycle, single-phase service.
    - (1) For devices requiring automatic operation, provide magnetic switching with manual reset.
    - (2) For other devices, provide manual starting switch with thermal overload.
  - 2. Heating Elements
    - a. Provide an interconnected switch and pilot light for each separate heating element required for operation of kitchen equipment
    - b. Where a single element has a three-position setting, provide switch with a multiple setting consisting of high, medium, low and off positions.
  - 3. Portable equipment: Electrically operated portable equipment shall have a ground wire and a polarized plug approved for use with the type of receptacle provided.
- F. Faucets, Valves and Fittings
- 1. Each dishwashing machine shall have a pressure regulator valve set for twenty pounds discharge pressure. Valves shall be self-regulating and shall have a manual adjustment range between 15 and 30 pounds. Valve bodies and working parts shall be of brass.
  - 2. Provide an approved anti water hammer device for dishwashing machine, consisting of synthetic rubber chamber cased in steel housing. Devices utilizing air chambers or coiled copper tubing shall not be accepted.
  - 3. Faucets shall be furnished for all sinks as manufactured by T&S Brass and Bronze Works, Inc. or approved equal, as follows:
    - a. Kitchen
      - (1) Backsplash mounted: Model No. B-231.
      - (2) Deck mounted: Model No. B-221.
      - (3) Bain-marie: Model No. B-207
    - b. Servery
      - (1) Backsplash mounted: Model No. B-1127.
      - (2) Deck mounted: Model No. B-1122.
    - c. Hand sink integral in counter: Model No. K11-4000-WH, furnished with Model No. E32-4900 strainer type waste outlet as manufactured by Component Hardware or approved equal.
- G. Substantiation
- 1. Shop drawings shall be submitted in accordance with requirements of the Agreement and as follows:
    - a. Floor plans of all food service spaces, showing detailed dimensions for utility lines and equipment, to a scale of 3/8" equals 1'-0".
    - b. Floor plans, showing detailed dimensions for elevated bases, floor depressions, wall openings, locations of partitions and wall reinforcing as related to equipment supplied under this Section, to a scale of 3/8" equals 1'-0".

- c. Dimensioned equipment construction drawings, indicating reinforcement, anchorage and other work required for completion and installation of equipment under this Section, to a scale of 3/4" equals 1'-0".
2. Samples shall be submitted in accordance with requirements of the Agreement and of the following components:
  - a. Leg assembly, with gusset, foot, and crossrail.
  - b. Corner of table top.
  - c. Drawer assembly.
  - d. Section of hinged door.
  - e. Corner of Serving Counter.
  - f. Handles and hardware (hinges, catches, etc.).
  - g. Corner of trayslide.

## **METHODS OF CONSTRUCTION**

### **A. Protection of Work**

1. Cover and protect the exposed surfaces of such equipment in a manner that shall preclude injury to the finish by absorption of oil, grease, chemicals, etc., contact from tools and machinery, and from all other causes which may be incidental to operation performed in the area.

### **B. Cleaning**

1. Clean each item of equipment so that all traces of grease, stains, protective coatings, abrasive dust, markings, scratches, and other foreign matter are completely removed.
  - a. Eliminate the need for any further cleaning with the exception of that which would ordinarily be undertaken daily to maintain accepted standards of sanitation and appearance.

### **C. Testing**

1. Provide necessary technicians, materials, and equipment required to perform all tests on equipment.
2. Perform all tests in the presence of the Authority, the district and the authorized representative of the respective manufacturer.
3. Correct all defects disclosed by the tests.

### **D. Warranty and Maintenance**

1. Warranty and maintenance service shall be provided for a period of one year from occupancy and include the following:
  - a. Adjustment of all equipment.
  - b. Repair or replacement of electrical and mechanical parts of the equipment, using only genuine standard parts produced by the manufacturer.
  - c. Renewals and repairs, as necessary, due to ordinary wear and tear.



2. All work under this maintenance and call back provision shall be performed by competent personnel under the manufacturer's supervision. Work shall be done during the regular working hours and days, but local call-back emergency service shall be available at all times.
3. For the refrigeration systems, local service on a twenty four hour per day call basis shall be provided for a period of one year from date of initial startup.
4. In addition to the above, all hermetically sealed units shall be furnished with a warranty for a period of five years from initial startup.

E. Training and Manuals

1. Provide training and manuals in accordance with Section 01820, Operation and Maintenance Data and Training, and the following:
  - a. Properly trained authorized personnel shall demonstrate to the district's operators the operation of all equipment including refrigeration systems.
  - b. Four (4) complete printed copies of the instructions shall be furnished to the district, covering the operation and maintenance of all equipment. This information shall be submitted in the following manner for initial review by the Authority prior to use by the district:
    - (1) A covered, bound booklet containing Manufacturer's current printed manuals for all equipment hereinafter specified, including all accessories, components, faucets, etc.
    - (2) Each manual shall be clearly labeled with its respective item number designation as hereinafter specified.
    - (3) Booklet shall include a Table of Contents listing each equipment item included within the booklet, complete with corresponding item number, quantity and description as hereinafter specified.
    - (4) Booklet shall also include a Service Agency Listing including the complete name, address and phone number of the local Service Agency for all equipment included within the booklet.

**SCHEDULE OF EQUIPMENT**

ITEM NO. 1 – ONE (1) RECEIVING SCALE: Model No. HBR301-1, as manufactured by Hobart or approved equal.

ITEM NO. 2 – ONE (1) MOBILE WORKTABLE: Model No. SS-304, as manufactured by Advance or Eagle, or approved equal. NS-2020 Drawer, centered. 5” Casters (2) with Brakes

ITEM NO. 3 - SPARE NUMBER

ITEM NO. 4 – SPARE NUMBER

ITEMS NO. 5, 6 AND 7 – ONE COMBINATION WALK-IN REFRIGERATOR/ FREEZER SYSTEM: Walk-ins shall be by Bally Refrigeration or Thermo Kool or approved equal.

1. General
  - a. Walk-in coolers and freezers shall be designed with metal-clad modular panels to facilitate easy assembly and disassembly for relocation and expansion.

- b. Provide manufacturer's compressor rack system units sized appropriately for each unit.
  - c. Provide continuous floor finish run into cooler and freezer.
2. Accessories and Features: Provide the following:
- a. Deadbolt lock(s) for all hinged doors, with safety release to prevent entrapment of personnel.
  - b. Insulated, heated vision panel 14" x 14" in the center of each door.
  - c. Full-width 36" high diamond tread kick plate on interior and exterior of lower portion of each door.
  - d. Manufacturer's standard closer for each door.
  - e. Incandescent vapor-proof light, with exterior neon pilot light and toggle switch and dual intensity attenuator to dim the lamp when the light switch is placed in the off position.
  - f. A minimum of 4 ceiling-mounted incandescent vapor-proof lamps with exterior neon pilot light and toggle switch.
  - g. One surface mounted dial thermometer with a range of -40°F to +100°F for each compartment.
  - h. Audio-visual alarm with illuminated digital read-out for each compartment, with indicator light and horn alarm.
  - i. Timed toggle switch at freezer door to shut down blower fan motor temporarily..
  - j. Insulated freezer drain line heater.
  - k. Seal-off fittings to prevent condensation in electrical junction boxes; one (1) fitting for each penetration of conduit through refrigerator and freezer walls, partitions and ceilings.
  - l. Trim sections of the same material and finish of the exterior walls between top of refrigerator and finished ceiling and at ends where boxes abut masonry walls and partitions, louvered for proper ventilation of compressors.
  - m. Double bumper rails on all exposed sides, at 18" and 36" above finished floor.
  - n. Code-compliant metal housekeeping and safety release procedure placard.
3. Testing: Each system shall be cleaned and dehydrated by maintaining a vacuum of 500 microns or lower, for a minimum period of five (5) hours. The vacuum pump used shall itself be capable of developing a vacuum of 50 microns with its valve in a closed position. The required operating charge of refrigerant and oil shall then be added and each system shall be tested for performance.

**ITEM NO. 8 – ONE (1) LOT REFRIGERATOR SHELVING:** Each shelving unit shall consist of four (4) electroplated posts with epoxy finish, fitted with 5" diameter casters (two per unit) with brakes. Shelves shall be epoxy coated with four (4) shelves per unit. System shall consist of one (1) Model No. 2148NK3 and eight (8) Model No. 2160NK3, as manufactured by InterMetro Industries Corp, or similar models as manufactured by Alco or approved equal.

ITEM NO. 9 – NINETEEN (19) MOBILE PAN RACKS: Model No. RF13N, as manufactured by Inter Metro Industries Corporation or similar models as manufactured by Piper Products, or approved equal.

ITEM NO. 10 – ONE (1) LOT SHELVING: Each shelving unit shall consist of four (4) electroplated posts with epoxy finish, fitted with 5” diameter casters (two per unit) with brakes. Shelves shall be epoxy coated with four (4) shelves per unit. System shall consist of one (1) Model No. 2148NK3 and five (5) Model No. 2160NK3, as manufactured by InterMetro Industries Corp., or similar models as manufactured by Alco or approved equal.

ITEM NO. 11 – ONE (1) LOT DRY STORAGE SHELVING: Each shelving unit shall consist of four (4) electroplated posts with epoxy finish, fitted with 5” diameter casters two per unit with brakes. Shelves shall be epoxy coated with four (4) shelves per unit. System shall consist of five (5) Model No. 2160NK3 and two (2) Model No. 2172NK3 as manufactured by InterMetro Industries Corp., or similar models as manufactured by Alco or approved equal.

ITEM NO. 12 – THIRTEEN (13) MOBILE PAN RACKS: Model No. RF13N, as manufactured by Inter Metro Industries Corporation or similar models as manufactured by Piper Products, or approved equal.

ITEM NO. 13 – ONE (1) LOT STORAGE SHELVING: Each shelving unit shall consist of four (4) electroplated posts with epoxy finish, fitted with 5” diameter casters, two per unit, with brakes. Shelves shall be epoxy coated with four (4) shelves per unit. System shall consist of one (1) Model No. 2136NK3, one (1) Model No. 2148NK3 and four (4) Model No. 2160NK3 as manufactured by InterMetro Industries Corp., or similar models as manufactured by Alco or approved equal.

ITEM NO. 14 – TWO (2) HAND SINKS: Model No. 7-PS-95, as manufactured by Advance or similar heavy duty, stainless steel models as manufactured by Eagle, or approved equal; with foot pedal valve and all mounting hardware.

ITEM NO. 15 – ONE (1) PREP TABLE W/SINKS: Model No. DL-30-96, as manufactured by Advance, or Eagle, or approved equal. NS-2020 Drawer, centered. Modify Undershelf to accommodate Disposal Item No. 25. Provide Disposal Control Bracket and left sink to accept Disposal.

ITEM NO. 16 – SIX (6) CORNER GUARDS: Model No. CG-60, as manufactured by Advance, or Eagle, or approved equal.

ITEM NO. 17 – ONE (1) ADA HAND SINK: Model No. 7-PS-25, as manufactured by Advance or similar heavy duty, stainless steel models as manufactured by Eagle, or approved equal; with soap and towel dispensers and all mounting hardware.

ITEM NO. 18 – SPARE NUMBER

ITEM NO. 19 – ONE (1) MOBILE WORKTABLE W/ OVERSHELF: Model No. SAG-306, as manufactured by Advance, or Eagle, or approved equal, with NS-2020 drawer, as shown. Provide ODS-10-72 double oversheff, table mounted. Provide casters (2) with brakes.

ITEM NO. 20 - SPARE NUMBER

ITEM NO. 21 – ONE (1) MOBILE SLICER STAND: Model No. AG-MP-30, as manufactured by Advance or similar models as manufactured by Eagle or approved equal.

ITEM NO. 22 – ONE (1) SLICER: Model No. 2712, as manufactured by Hobart or similar models as manufactured by Berkel or approved equal.

ITEM NO. 23 – ONE (1) MOBILE MIXER STAND: Model No. MX-SS-242, as manufactured by Advance or similar models as manufactured by Eagle or approved equal. Provide with casters (2) with brakes.

ITEM NO. 24 – ONE(1) 20 QUART MIXER: Model No. HL-200STDDEL, as manufactured by Hobart or similar models as manufactured by Univex or approved equal, with deluxe accessories.

ITEM NO. 25 – ONE (1) DISPOSAL: Model No. SS-150, as manufactured by In-sink-erator or similar models as manufactured by Hobart or approved equal. Provide CC101K-1 Control Panel. Install in sink of Item #15.

ITEM NO. 26 – ONE (1) WORKTABLE W/ UNDERSHELF: Model No. SS-304, as manufactured by Advance, or Eagle, or approved equal. NS-2020 Drawer, as shown. Provide Casters (2) with brakes.

ITEM NO. 27 – ONE (1) STEAMER: Model No. 24CGA10 , as manufactured by Cleveland Range, Inc. or similar models as manufactured by Groen or approved equal; each with stainless steel base cabinet, compartment door steam shut off, stainless steel base frame, low water protection, boiler descaling pump kit and water filter.

ITEM NO. 28 – ONE (1) 25 GALLON TILTING KETTLE: Model No. KGL-25-T, as manufactured by Cleveland Range, Inc., or approved equal; complete with base mounted gas fired boiler for self-generated steam supply, 2” tangent draw off, stainless steel cover, food strainer FS, DPK water faucet, TD2 bracket and kettle accessory kit. Locate kettle so pour-path is over trough.

ITEM NO. 29 – SPARE NUMBER

ITEM NO. 30 – TWO (2) DOUBLE DECK CONVECTION OVENS: Model No. DFG100Xcel DOUBLE, as manufactured by Garland or similar models as manufactured by Vulcan or approved equal. Each unit shall be provided with extra oven racks, stainless steel exposed surfaces, including backs and low profile 4” casters, 48” quick disconnect gas manifold.

ITEM NO. 31 – ONE (1) FOUR BURNER RANGE: Model No. M44R, as manufactured by Garland or similar models as manufactured by Vulcan or approved equal. Each unit shall be provided with stainless steel exposed surfaces; 17” high stainless steel back guard, rear gas connection, quick disconnect, 4” casters w/ front brakes, and end cap and covers

ITEM NO. 32 – ONE (1) VENTILATOR W/FIRE PROTECTION: AVTEC Model Number AXBP, as manufactured by AVTEC or similar models as manufactured by Gaylord or approved equal.

1. General

- a. Dimensions: Approximately 18’-0” long x 96” deep x 2’-6” high with 10” high exhaust duct collars and 5” high supply collars, consisting of one (1) 10’-0” long and one(1) 8’-0” long sections.
- b. Ventilator shall be of the high velocity, dry centrifugal extractor type.
- c. Ventilator shall be U.L. listed under the category Grease Extractors for Exhaust Ducts, U.L. 710, in compliance with all recommendations of the National Fire Protection Association’s standards for kitchen cooking equipment ventilators, approved by the National Sanitation Foundation, approved by IMC and ICBO, and be in accordance with all applicable codes and project requirements.

- d. Ventilator shall be constructed of all stainless steel, #18-gauge (swg), type 201 #4 finish, all welded, grease and water tight.
  - e. Ventilator shall be mounted no more than 7'-0" AFF.
  - f. All ductwork must be built and installed in accordance with the NFPA 96 and other applicable codes.
2. Accessories and Features: Provide the following:
- a. Interior end panels cut out for continuous capture.
  - b. Centrifugal grease extraction chamber with full-length baffles located within the path of the high velocity air passing through the chamber.
    - (1) Grease extraction efficiencies shall be not less than 95%.
    - (2) All extractor cartridges shall be fully removable from the floor by means of an extractor removal tool.
  - c. Pitched trough with a removable grease collection located at one end.
  - d. Fully insulated supply plenum with duct collar/fire damper assemblies and full length 40% open stainless steel fascia panels for discharge of tempered make-up air directly into the room space.
    - (1) Percentage of make-up air shall not exceed 80% of the exhaust volume.
    - (2) Supply air shall discharge at no more than 250 FPM.
    - (3) Discharge temperature to be approximately 65 degrees.
  - e. Exhaust duct collar fire damper utilizing fusible link type detectors.
  - f. Hanger brackets at front and rear, for support from building overhead.
  - g. Removable stainless steel perimeter enclosure panels, 30" maximum height.
  - h. Four 48" long double tube vaporproof and greaseproof fluorescent light fixtures.
  - i. Complete wet chemical type fire protection system, Ansul R-102 as manufactured by Ansul Company of Marinette, Wisconsin, USA or approved equal, and as follows:
    - (1) Means for automatic and manual activation
    - (2) Means for simultaneous automatic shutting down of protected cooking equipment upon activation of said system.
    - (3) Design to provide surface, plenum and duct collar protection only.
    - (4) All exposed piping to be stainless steel or chrome plated.
    - (5) Fusible link detection system built into ventilator sections by ventilator manufacturer; recessed into top of hoods with no visible conduit.
    - (6) Manual actuation by readily accessible and plainly marked remote manual release station in each cooking area, located no less than 54" and no more than 78" above floor.
    - (7) Liquid agent stored in containers equipped with pressure gauge to verify operational readiness.

- (8) Nozzles located in plenum and duct work, capable of functioning with heavy accumulation of grease.
- j. Automatic solenoid type gas shut-off valve in gas line supplying cooking appliances under the ventilator, interconnected with gas valve to fire suppression system.
- k. Provision to shut off gas and electric supply to all cooking equipment upon actuation of the system.
- l. Ventilator shall include AS INT08801 interlock controller, with built-in 1-hour delay cool-down timer. Interlock shall be designed and installed to automatically activate the exhaust fan whenever cooking operations occur. The activation of the exhaust fan shall occur through the interlock with the cooking appliances, by means of heat sensors located at each exhaust collar, or other approved methods meeting requirements of IMC.

ITEM NO. 32.1 – CONTROL PANEL FOR EXHAUST HOOD: 14” utility cabinet, light and fan switches, fire system as manufactured by AVTEC or approved equal.

ITEM NO. 33 – SPARE NUMBER

ITEM NO. 34 – ONE (1) WORKTABLE W/ OVERSHELF: Model No. KSS-307, as manufactured by Advance, or Eagle, or approved equal. NS-2020 drawer, as shown. Provide ODS-10-84 double overshelf, table mounted, T11B sink with K50 faucet and K6 basket drain, K-2C poly cover. Close rear of backsplash w/ stainless steel.

ITEM NO. 35 – ONE (1) REACH IN FREEZER: Model No. 1F-SA, as manufactured by Continental or similar models as manufactured by Traulsen or approved equal. Finished stainless steel back; complete with cord and plug assemblies. Hinge door as shown on plan.

ITEM NO. 36 – SPARE NUMBER

ITEM NO. 37 – ONE (1) FLOOR TROUGH WITH GRATE: Model No. FFTG1860 manufactured by Advance or Eagle or approved equal. The top of trough shall be set flush with finished floor on all four (4) sides.

ITEM NO. 38 – ONE (1) WAREWASHER- POT & PAN: Model No. TWII-LR-131-205, as manufactured by Hobart or Insinger or approved equal. Unit to be provided lever-handled wastes with overflows, (2) two Fisher model No. 13218 deck mounted faucets. Provide sink heater in left sink unit.

ITEM NO. 39 – ONE (1) SHELF, WALL MOUNTED: Model No. WS-15-132, as manufactured by Advance or Eagle or approved equal. Mount 18” above Pot Sink

ITEM NO. 40 – ONE (1) HOSE REEL WITH SPRAY: Model No. 97098, as manufactured by Fisher, or T&S Brass., or approved equal. Hose Reel to be furnished with check, shut off and mixing valves, and be complete with vacuum breaker and all mounting hardware. All piping and components shall be ½”. All exposed piping to be stainless steel, components to be chrome plated. Provide Control Cabinet..

ITEM NO. 41 – SPARE NUMBER

ITEM NO. 42 – SPARE NUMBER

ITEM NO. 43 – SPARE NUMBER

ITEM NO. 44 – SPARE NUMBER

ITEM NO. 45 – MOP SINK: Model No. 9-OP-20, as manufactured by Advance, or Eagle, or approved equal. Provide Mop Hanger K-242.

ITEM NO. 46 – ONE (1) MOBILE POT RACK: Model No. PR48VX3 as manufactured by Intermetro Industries or Eagle or approved equal; with (2) MTR2448 XE tray drying shelves.

ITEM NO. 47 – TWO (2) PASS THRU REFRIGERATOR: Model No. 1RE-SS-PT, as manufactured by Continental or similar models as manufactured by Traulsen or approved equal. complete with cord and plug assemblies. Hinge doors as shown on plan.

ITEM NO. 48 – TWO (2) HOLDING CABINETS: Model No. 1016-SS-D, as manufactured by Piper Products or similar models as manufactured by Cres-Cor or approved equal, complete with cord and plug assemblies. Hinge doors as shown on plan.

ITEM NO. 49 – ONE (1) WORKTABLE: Model No. KSS-306, as manufactured by Advance, Eagle, or approved equal. NS-2020 drawer, centered.

ITEM NO. 50 – SPARE NUMBER

ITEM NO. 51 – SPARE NUMBER

ITEM NO. 52 – TWO (2) HOT FOOD COUNTER: Model No. 4 HF(501-4), as manufactured by Piper, Delfield or approved equal. Provide SRTS Solid Ribbed Tray Slide mounted at Elementary Height and CPG Protector Guard.

ITEM NO. 53 – TWO (2) COLD FOOD COUNTER: Model No. 3-CM(502-4R-CW), as manufactured by Piper, Delfield, or approved equal. Petite Elite 500 type counter system. Provide SRTS solid 3-ribbed tray slide mounted at Elementary Height , CDDL Double Displa.

ITEM NO. 54 – ONE (1) FLAT TOP COUNTER: Model No. 3-ST(500-1), as manufactured by Piper, Delfield, or approved equal. Petite Elite 500 type counter system. Provide SRTS solid 3-ribbed tray slide mounted at Elementary Height, CDDL Double Display.

ITEM NO. 55 – ONE (1) FLAT TOP COUNTER: Model No. 3-ST(500-1), as manufactured by Piper, Delfield, or approved equal. Petite Elite 500 type counter system. Provide SRTS solid 3-ribbed tray slide mounted at Elementary Height, CDDL Double Display.

ITEM NO. 56 – ONE (1) ICE CREAM CABINET: Model No. SL100, as manufactured by Nor-Lake, True or approved equal. Standard Finish, complete with cord and plug assemblies.

ITEM NO. 57 – SPARE NUMBER.

ITEM NO. 58 – TWO (2) MILK COOLERS: Provided by district's vendor.

ITEM NO. 59 – FOUR (4) DISPENSER, TRAY AND SILVER: Model No. PTS/1216MO2 as manufactured by Serv-O-Lift, Atlas Metal, or approved equal.

ITEM NO. 60 – ITEM NO. 60 – ONE (1) CASHIER COUNTER: Model No. 2-CD(503-1), as manufactured by Serv-O-Lift, Atlas Metal, or approved equal. Petite Elite 500 type counter system. Provide SRTS solid 3-ribbed tray slide as shown, mounted at Elementary Height, hinged with proper support mechanisms to support tray slide , and DOUT duplex outlet.

ITEM NO. 61 – ITEM NO. 61 – ONE (1) CASHIER COUNTER: Model No. 2-CD(503-1), as manufactured by Serv-O-Lift, Atlas Metal, or approved equal. Petite Elite 500 type counter system. Provide SRTS solid 3-ribbed tray slide, mounted at Elementary Height , hinged with proper support mechanisms to support tray slide, and DOUT duplex outlet.

ITEM NO. 62 – ITEM NO. 62 – TWO (2) CASHIER STOOLS: By district.

ITEM NO. 63–TWO (2) POS SYSTEM: By district.

ITEM NO. 64 – FOUR (4) TRAY CART: Model No. 722, as manufactured by Serv-O-Lift, Atlas Metal, or approved equal. Verify tray size.

ITEM NO. 65 – ONE (1) SERVICE FAUCET: Model No. 8253 as manufactured by Fisher Products or T&S Brass or approved equal.

**END OF SECTION E1030.80**



## SECTION E1040.10

### EDUCATIONAL AND SCIENTIFIC EQUIPMENT

#### PERFORMANCE

##### A. Basic Function

1. Provide educational and scientific equipment as required for fulfillment of the Educational Specifications and functioning of the program spaces, constructed to achieve fire ratings required by code and all other project requirements.
2. Educational and scientific equipment includes the following elements:
  - a. Laboratory fume hoods.
  - b. Laboratory chemical storage cabinets
3. Where elements also must function as elements defined within another element group, meet requirements of both element groups.
4. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

##### B. Amenity and Comfort

1. Accessibility: Provide equipment that is easily usable by disabled persons without outside assistance.
2. Light and glare: Provide equipment that is not a source of direct or reflected glare.
3. Convenience: Provide equipment with fittings and controls that are manageable without special instruction or the need for excessive force.
4. Appearance: Provide equipment that is coordinated in design with other elements of interior construction, using compatible materials, colors, and textures.
5. Texture: Provide durable, low maintenance exposed surfaces that are within reach of occupants engaged in activities normal for the particular space in which they are installed.

##### C. Health and Safety

1. Fire resistance: Provide fire ratings as required by code.
2. Health and safety: Provide safety features as required by code and manufacturer's standards for school use.

##### D. Structure

1. Provide equipment that has been engineered and installed to withstand dead and live loads and the effects of operation as required by code without excessive deflection or permanent distortion.
2. Seismic loads: Provide equipment that has 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 non-concurrently in any horizontal direction.

E. Operation and Maintenance

1. Ease of Use
  - a. Language of identifying devices: All text in English.
  - b. Equipment and safety features: 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: Motors, movable cranks, rotors, pulleys, and levers designed for trouble-free operation over a minimum anticipated service life of 20 years.
2. Ease of repair: Provide fixed furnishings 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 equipment at all locations that is modular in form, detachable from substrate without damage to fixtures, and relocatable.
4. Theft resistance: Provide equipment at all locations that is attached to substrates with concealed, tamper-resistant, or tamperproof fasteners to minimize theft and vandalism.

**PRODUCTS**

A. Laboratory Fume Hoods

1. Basis of Design
  - a. Labconco Model #6970401.
  - b. Manufacturer's standard accessories:
    - (1) Work surface with spill recess.
    - (2) Hot and cold water faucet with cupsink, cover and lead trap.
    - (3) Duplex electrical receptacle.
    - (4) Storage base with shelf, for barrier-free mounting height.
    - (5) Sash stop kit.
    - (6) Digital air flow monitor with audiovisual alarm and alarm mute.
    - (7) Night setback capability.
    - (8) By-pass air capability for constant volume flow rate and constant face velocity.
2. Provide complete, code-compliant ventilation system in accordance with requirements of Element D.

B. Laboratory Chemical Storage Cabinets

1. Basis of Design: Sheldon Model #SC4236 combination acid/flammable cabinet.

**END OF SECTION E2010.00**

## **SECTION E1070.00**

### **ENTERTAINMENT AND RECREATIONAL EQUIPMENT**

#### **PERFORMANCE**

##### **A. Basic Function**

1. Provide entertainment and recreational equipment as required for fulfillment of the Educational Specifications and functioning of the program spaces, constructed to achieve fire ratings required by code and all other project requirements.
2. Entertainment and recreational equipment includes the following elements:
  - a. Stage curtain.
  - b. Athletic equipment, including:
    - (1) Gymnasium divider curtain.
    - (2) Basketball backboards, fixed and retractable where indicated.
    - (3) Volleyball system.
    - (4) Chinning Bars
    - (5) Climbing Ropes
    - (6) Climbing Wall
    - (7) Wall Pads.
  - c. Gymnasium scoreboard and controller.
3. Where elements also must function as elements defined within another element group, meet requirements of both element groups.
4. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

##### **B. Amenity and Comfort**

1. Accessibility: Provide equipment that is easily usable by disabled persons without outside assistance.
2. Light and glare: Provide equipment that is not a source of direct or reflected glare.
3. Convenience: Provide equipment with fittings and controls that are manageable without special instruction or the need for excessive force.
4. Appearance: Provide equipment that is coordinated in design with other elements of interior construction, using compatible materials, colors, and textures.
5. Texture: Provide durable, low maintenance exposed surfaces for equipment that are within reach of occupants engaged in activities normal for the particular space in which they are installed.

##### **C. Health and Safety**

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

D. Structure

1. Provide suspended equipment that has been engineered and installed to withstand dead and live loads and the effects of operation as required by code without excessive deflection or permanent distortion.
2. Seismic loads: Provide equipment that has 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 non-concurrently in any horizontal direction.

E. Operation and Maintenance

1. Ease of Use
  - a. Language of identifying devices: All text in English.
  - b. Equipment 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: Motors, movable cranks, rotors, pulleys, and levers designed for trouble-free operation over a minimum anticipated service life of 20 years.
2. Ease of repair: Provide equipment that is designed to permit repair or replacement of individual components without removal of fixture.
3. Ease of replacement or relocation: Provide equipment that is modular in form, detachable from substrate without damage to fixtures, and relocatable.
4. Theft resistance: Provide equipment that is attached to substrates with concealed, tamper-resistant, or tamperproof fasteners to minimize theft and vandalism.

**PRODUCTS**

A. Stage Curtains

- a. Fabric
  - (1) Fabric shall be inherently flame resistant or fully flame retardant by the immersion process in accordance with NFPA 701 and the International Building Code NJ Edition.
    - (a) Provide certification with a permanent label attached to the off-stage bottom hem with information pertaining to fabric type, curtain manufacture date, and dimensions.
    - (b) Include space on tag for periodic updates of flame retardant application.
  - (2) Fabric shall be 100% cotton, 25-oz minimum, all of the same dye lot.
  - (3) Basis of Design: Products by Frankel Associates, JB Martin, J.L. deBall, or Valley Forge Fabrics.
- b. Hardware: 14-gauge galvanized steel track complete with all necessary accessories for manual traverse silent operation, including an adjustable tensioning floor block.

B. Athletic Equipment

1. Basis of Design: Products by Performance Sports Systems, Porter Athletic Equipment Company, Jaypro or Draper, or as otherwise noted.
2. Gymnasium Divider Curtain
  - a. Provide a full-width electrically operated roll-up divider curtain with 8'-0" high fabric lower section and screen upper section.
3. Basketball Backboards
  - a. Provide six glass or fiberglass rectangular backboards as indicated, with standard size, markings and goals.
  - b. Provide backstops constructed of round tubular steel fully welded construction, electrically raised and lowered, with goal height manually adjustable from 8'-0" to 10'-0".
  - c. Provide two cranks for height adjustment.
4. Chinning Bar
  - a. Provide ten-foot (nominal) three-unit powder-coated bar.
  - b. Provide one unit on each side of divider curtain.
5. Climbing Rope
  - a. Provide 1-1/2" polyester rope with knotted end and rubber balls at 18" intervals.
  - b. Provide tambourine, safety cable and rope hoist.
  - c. Provide two ropes on each side of divider curtain.
6. Climbing Wall
  - a. Basis of Design: Modular panel walls by Rockwerx or Eldorado.
  - b. Provide one 4' x 16' horizontal traverse panel on each side of divider curtain.
7. Volleyball System
  - a. Basis of Design: Spectrum Complete Recreational Volleyball System by First Team Sports, Inc., adjustable from 42" to 96".
  - b. Provide anchoring system consisting of manufacturer's floor sockets and concrete footings as recommended by manufacturer.
  - c. Provide manufacturer's fitted post pads and robe covers.
8. Wall Pads
  - a. Provide standard 2'-0" x 6'-0" flame-retardant wall pads, with PVC cover and 2" urethane cushion.
  - b. Provide wall pads to cover walls without bleachers to within 2" of openings.
  - c. Provide factory-fabricated cut-outs for wall-mounted fixtures and equipment.

C. Scoreboard

1. Basis of Design: Products by Nevco, Fair-Play or Electro-Mech.

2. Provide one interior, wall-mounted multi-purpose electronic scoreboard with dual integral horns and LED displays for time, scores, period, and bonus and possession indicators.
3. Provide one direct-wired, removable controller.
4. Provide one custom team logo, factory-applied, in an area of 144 sq. in. minimum.

**END OF SECTION E1070.00**

**SECTION E2010.00**  
**FIXED FURNISHINGS**

**PERFORMANCE**

**A. Basic Function**

1. Provide fixed furnishings as required for fulfillment of the Educational Specifications and functioning of the program spaces, constructed to achieve fire ratings required by code and all other project requirements.
2. Fixed furnishings include the following elements:
  - a. Window treatments.
  - b. Telescoping bleachers.
3. Where elements also must function as elements defined within another element group, meet requirements of both element groups.
4. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

**B. Amenity and Comfort**

1. Accessibility: Provide fixed furnishings that are easily usable by disabled persons without outside assistance.
2. Light and glare: Provide fixed furnishings that are not a source of direct or reflected glare.
3. Convenience: Provide fixed furnishings with fittings and controls that are manageable without special instruction or the need for excessive force.
4. Appearance: Provide fixed furnishings 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 fixed furnishings that are within reach of occupants engaged in activities normal for the particular space in which they are installed.

**C. Health and Safety**

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

**D. Structure**

1. Provide fixed furnishings that have been engineered and installed to withstand dead and live loads and the effects of operation as required by code without excessive deflection or permanent distortion.
2. Seismic loads: Provide fixed furnishings 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 non-concurrently in any horizontal direction.

E. Operation and Maintenance

1. Ease of Use
  - a. Language of identifying devices: All text in English.
  - b. Fixed furnishings 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: Motors, movable cranks, rotors, pulleys, and levers designed for trouble-free operation over a minimum anticipated service life of 20 years.
2. Ease of repair: Provide fixed furnishings 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 fixed furnishings at all locations that are modular in form, detachable from substrate without damage to fixtures, and relocatable.
4. Theft resistance: Provide fixed furnishings at all locations that are attached to substrates with concealed, tamper-resistant, or tamperproof fasteners to minimize theft and vandalism.

**PRODUCTS**

A. Window Treatments

1. Basis of Design
  - a. Solar shades: MechoShade ThermoVeil 2100 10% open 2 x 2 open basket weave
  - b. Blackout shades: MechoShade Equinox Blackout.
2. Provide solar shades at all exterior windows except those in stairs, corridors, vestibules, and similar locations subject to traffic and abuse.
3. Provide blackout shades at all exterior windows in the following locations:
  - a. Cafetorium.
  - b. Gymnasium.
  - c. Art Room.

B. Telescoping Bleachers

1. Provide motorized telescoping bleachers in compliance with code, project requirements and the following:
  - a. Operation: Permit opening and closing allowing any or all rows to be locked open for use.
  - b. Structure: As required by code; minimum 100 psf vertical load, minimum 125 plf vertical load for seat and foot boards, and horizontal forces to keep bleachers correctly positioned when extended and in use.
  - c. Design
    - (1) Closed deck and riser design with foot level aisles.



- (2) Row Spacing: 24 inches.
  - (3) Row height: Manufacturer's standard.
  - (4) Fixed safety endrails on open end of end section of stands in accordance with applicable code.
  - (5) End closures at ends of stands to conceal framing while stored.
  - (6) Filler board to close opening between top row of seats and wall.
  - d. Accessibility: Provide accessible seating areas as required by code and to allow for companion seating.
    - (1) Provide standard seating that can be manually extended in area of accessible seating.
    - (2) Provide removable guard rails at accessible seating areas.
  - e. Operator: Non-friction mechanical pusher type, chain driven take up reel, rubber wheels on pusher arms to prevent damage to floor.
    - (1) Provide hand-held mobile key switch operator for extending or retracting all sections simultaneously, with limit switches to stop drive automatically at fully extended and fully closed positions.
    - (2) Provide all safety control mechanisms required by code and project requirements.
2. Basis of Design: MAXAM by Hussey Seating.

**END OF SECTION E2010.00**

# **ELEMENT F**

# **SPECIAL CONSTRUCTION AND DEMOLITION**

## **SECTION F1020.60**

### **MANUFACTURED CANOPIES**

#### **PERFORMANCE**

##### **A. Basic Function**

1. Provide exterior canopies as shown, free-standing and/or supported by building elements, constructed to provide cover t building entrances and satisfy requirements of code and all other project requirements.
2. Where elements also must function as elements defined within another element group, meet requirements of both element groups.
3. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

##### **B. Amenity and Comfort**

1. Accessibility: Provide canopies that comply with requirements for universal and barrier-free access.
2. Light and glare: Provide canopies that are not a source of direct or reflected glare.
3. Appearance: Provide canopies that are coordinated in design with other elements of interior and exterior construction, using compatible materials, colors, and textures.

##### **C. Health and Safety**

1. Fire resistance: Provide fire ratings as required by code.
2. Health and safety: Provide safety features as required by code and manufacturer's standards for school use.

##### **D. Structure**

1. Provide canopies that have been engineered and installed to withstand dead and live loads and the effects of operation as required by code without excessive deflection or permanent distortion.
2. Wind and seismic loads: Provide canopies that have been engineered and installed to withstand wind and seismic forces that are greater than those required by code.

##### **E. Operation and Maintenance**

1. Ease of repair: Provide canopies at all locations that are designed to permit repair or replacement of individual components without removal of entire canopy.
2. Ease of replacement or relocation: Provide canopies at all locations that are modular in form and detachable from substrate without damage.
3. Theft resistance: Provide canopies at all locations that are attached to substrates with concealed, tamper-resistant, or tamperproof fasteners to minimize theft and vandalism.

#### **PRODUCTS**

- A. Canopies: Provide freestanding and building-supported engineered metal awning system, complete with framing, enclosure, and attachment hardware.

**B. Materials**

1. Aluminum extrusions: ASTM B221 & ASTM B429 6061-T6 alloy and temper.
2. Aluminum sheet: Minimum 24-ga; heavier as required to resist wind and other loads without deformation or oilcanning.
3. Fasteners: Stainless steel.
4. Finish: Custom fluoropolymer finish, AAMA 2605, containing minimum 70 percent PVDF resins; two-coat system with added third clear coat; color(s) similar to PPG Duranar XL colors as follows:
  - a. M-1: Burlesque.
  - b. M-2: (not applicable)
  - c. M-3: Match Sherwin Williams "School Bus Yellow."
  - d. M-4: (not applicable)
  - e. M-5: (not applicable)

C. Basis of Design: MASA Architectural Canopies, Avenel, NJ.

**METHODS OF CONSTRUCTION**

- A. Install engineered embedments at time of building construction to secure canopies to building masonry or framing.
- B. Canopy Construction
  1. Provide cantilevered bents welded into single structures. Use mechanically fastened frame connections only if shipping does not allow for welded frames.
  2. Provide full welded beams at both ends to eliminate leaking of water.
  3. Provide roll-locked decking where the extruded cap and pan shall interlock to make a rigid structure. Crimped decking is not allowed.
  4. Weld pans at ends to prevent water leakage. Provide T-flashing where decking is separated at a drain beam.
  5. Do not use face-applied rivets.
- C. Provide internal stormwater drainage into stormwater system for canopy roofs.
  1. Provide positive and negative slope of 1/8" per foot to allow water drainage from top of canopy to draining columns and eliminate ponding.
  2. Provide weep holes in all non-draining columns.
  3. Construct drainage leaders within structural elements for protection to direct drainage to below-grade structures.
- D. Install canopies after other major building elements have been completed. Protect canopies from damage following installation.

**END OF SECTION F1020.60**

# **ELEMENT G**

# **SITWORK**

## **SECTION G0000.00**

### **SITWORK**

#### **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, clearing and earthwork: All modifications to the site and grades required for construction of new work and for proper functioning of the project.
  - b. Site improvements: All elements required to provide finished and durable site surfaces, stormwater control, detention and/or infiltration system, outdoor plantings, and other outdoor improvements described in the project program.
  - c. Site utilities: All outdoor and underground elements required to provide utilities, including liquid and gas services, electrical service, and communications.
3. Athletic facilities: Provide playing surfaces, enclosures, goals, fixtures, and other equipment for sports as described in the project program.
4. Where site elements also must function as elements defined within another element group, meet the requirements of both element groups.
5. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

##### **B. Environmental Requirements**

1. Comply with all environmental requirements called for in all codes and regulations and the Design-Build Information Package.

##### **C. Local Requirements**

1. Comply with Paterson Engineering Department standards and local utility requirements.

##### **D. Amenity and Comfort**

1. Heat and 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) Transformer.
    - (2) Generator.

4. Cleanliness: Provide above-grade 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 Section G2060, Site Development.
  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 (with the exception of planter boxes and tree pits); 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, preferences are as follows:
        - (a) Hardscaping.
        - (b) Landscaping, rather than paving.
        - (c) Perennial shrubbery and ground covers, rather than lawns.
        - (d) 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) Transformer.
      - (2) Generator.
- E. Health and Safety
1. Safety
    - a. Design the site to prevent public access except at the main building entrance(s). Physical education and play areas are not open to the public.
    - b. Prevent the following:
      - (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.
  2. Maximum slopes: Comply with all code requirements and the following:
    - a. Slopes with smooth pavement: 5%, unless restricted to vehicular use.
    - b. Slopes covered with grass: 1:3.
    - c. Slopes with pedestrian-inhibiting vegetation: 1:2.
    - d. Slopes with no access from top: Limited only by structural stability and resistance to erosion.
  3. Physical Security
    - a. Provide fixed mountings for all items specified in Section G2060.00, Site Development, and other site-related sections.
  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.
- F. Structure
1. Earthwork: Provide structural design in accordance with ASCE standards 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.
  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 all project requirements.
    - c. Miscellaneous site structures with floors or roofs: Designed to comply with same requirements as building superstructure.
- G. 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.
  3. Tree planter boxes: Replace trees if tree growth impinges upon the structural integrity of the surrounding planter boxes.
  4. 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.
    - e. If erosion occurs within one year after completion, provide improved erosion control measures within one week after notification.
  5. 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.
    - c. Vegetation and fencing will be used to discourage pedestrian traffic, if other functional requirements can be met.
  6. Stormwater control, detention and/or infiltration
    - a. Stormwater control and detention measures shown in the Design-Build Information Package (if any) are conceptual only. The Design-Builder must design stormwater control, detention and/or infiltration (if needed) in compliance with all codes and requirements of authorities having jurisdiction, including the New Jersey Stormwater Best Management Practices Manual.
    - b. Control storm water runoff as required to prevent damage to project elements, including vegetation, and to prevent damage to neighboring sites, including vegetation.
    - c. 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, or in accordance with the requirements of authorities having jurisdiction, whichever is more stringent.
    - d. Minimize increase in storm water runoff into rivers, streams, lakes, and other waterways and drainage ways as required by authorities having jurisdiction.
  7. Vehicular collision: Construct to minimize the probability of vehicular impact on site fixtures and accidental driving on lawns and landscaped areas.
- H. Operation and Maintenance
  1. Water conservation: Design sitework to conserve water.
  2. Ease of Maintenance
    - a. Snow removal: Design and construct to facilitate removal of snow from vehicular and pedestrian traffic ways 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.

3. 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.
  4. Warranty and Maintenance Period
    - a. Provide 2-year warranty on all plants.
    - b. Maintain the landscape installation through acceptance and during the 2-year maintenance period following Substantial Completion.
- I. Environmental Impacts
1. Perform all sitework in accordance with all codes, regulations, and the requirements and restrictions detailed in the Design-Build Information Package, specifically including the following:
    - a. Site Investigation Report/Remedial Action Workplan – October 16, 2012
    - b. Remedial Action Workplan Addendum – January 3, 2013
    - c. ESP-1 Tricon Compaction Testing Results – Various Dates
    - d. Regulatory Review Report – August 2013.
    - e. Geophysical Investigation Report – July 3, 2013.
    - f. Utility Investigation Report – September 2013.
    - g. Preliminary Stormwater Management Report – August 2013.
    - h. Geotechnical Investigation Report – August 2013.
  2. Develop complete sitework plans and specifications for submission to and approval by the Authority's Licensed Site Remediation Professional (LSRP), in accordance with the all project requirements, before the commencement of any sitework.

**END OF SECTION G0000.00**

**SECTION G1000.00**  
**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. Site clearing: Removal of trash, existing built elements, and vegetation that are not needed; and temporary erosion control.
  - b. Site remediation: Removal, treatment, or other remediation of hazardous wastes found on site. See Paragraph G, Environmental Impacts, in Section G0000.00, Sitework, for environmental requirements and restrictions.
  - c. Site earthwork: 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.
3. Where site preparation elements also must function as elements defined within another element group, meet the requirements of both element groups.

B. Durability

1. Soil erosion resistance: As required by code and by authorities having jurisdiction, as specified in Section G0000.00, 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.
2. Limit continuous slopes to maximum of 30 feet measured vertically, unless intermediate terraces with drainage swales are provided.
3. Replace temporary measures with permanent measures unless made unnecessary by constructed site elements, final topography, or permanent vegetation.

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 G1000.00**

## **SECTION G1010.00**

### **SITE 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.

##### **B. Durability**

1. Erosion resistance: As specified in Section G0000.00 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.
2. Construct, maintain, and enforce utilization of vehicle washdown stations at all temporary construction exit locations.

#### **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 G1010.00**

**SECTION G1070.00**  
**SITE 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. Excavation and preparation for school building foundation.
  - b. Roadways.
  - c. Parking lots.
  - d. Playing fields.
  - e. Retaining walls.
  - f. Environmental engineering controls.
  - g. Site drainage systems, including stormwater control, detention and/or infiltration systems, as required.
  - h. Landscaping
  - i. Planter boxes and tree pits.
  - j. Permanent erosion control structures as required.
3. Provide earthwork consistent with the site's environmental and geotechnical constraints.
4. Provide radon mitigation and engineering control as called for in the Design-Build Information Package.
5. Earthwork required to achieve grades as shown on the grading plan and foundation recommendations included in the Post Demolition Site Conditions Report represent one possible approach to earthwork and foundation design. Alternate approaches are acceptable subject to compliance with all codes and project requirements and the approval of the Authority's Licensed Site Remediation Professional (LSRP).
6. Where earthwork elements also must function as elements defined within another element group, meet the requirements of both element groups.

B. Structure

1. Retaining walls: Construct retaining walls and other Earthwork elements to permanently resist soil and water pressure as well as live loads, and in accordance with all code requirements.

C. Durability

1. Erosion resistance: As specified in Sections G and G10 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.
- E. See Paragraph G, Environmental Impacts, in Section G0000.00, Sitework, for environmental requirements and restrictions.

## **PRODUCTS**

- A. Retaining Walls
  - 1. Provide one of the following:
    - a. Cast-in-place concrete.
    - b. Solid modular concrete units.

## **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.
- 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.
- D. Soil Stabilization
  - 1. Use one or more of the following methods:
    - a. Geotextile reinforcement.
    - b. Cement soil stabilization.

c. Lime soil 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.

F. Environmental Impacts

- 1. Perform all earthwork in accordance with all codes, regulations, and the requirements and restrictions detailed in the Design-Build Information Package, specifically including the following:
  - a. Site Investigation Report/Remedial Action Workplan – October 16, 2012
  - b. Remedial Action Workplan Addendum – January 3, 2013
  - c. ESP-1 Tricon Compaction Testing Results – Various Dates
  - d. Regulatory Review Report – August 2013.
  - e. Geophysical Investigation Report – July 3, 2013.
  - f. Utility Investigation Report – September 2013.
  - g. Preliminary Stormwater Management Report – August 2013.
  - h. Geotechnical Investigation Report – August 2013.
- 2. Perform all earthwork in conformance with sitework plans and specifications approved by the Authority's LSRP, in accordance with the Post Demolition Site Conditions Report and all project requirements.
- 3. Environmental Engineering Controls
  - a. Provide environmental engineering controls as specified in Remedial Action Workplan and supplemental environmental reports.
  - b. Submit plans and specifications to LSRP for review and approval.
  - c. For all planters, planting beds and tree pits, provide environmental engineering controls including three major components, consisting of a physical barrier, buffer layer and visible demarcation.
    - (1) Physical barrier: Provide a clean fill layer (top soil, fill dirt, gravel, etc.) that prevents direct human contact to underlying contaminated material(s).
      - (a) For planters and similar landscaping, the requirement is a minimum of two feet of certified clean fill.
    - (2) Buffer layer: Provide a buffer layer consisting of a separate additional clean fill layer of another specified thickness that provides added protection from exposure



in the event of breaches of the physical barrier. The buffer layer is placed immediately below the physical barrier with no space in between the layers. For planters and similar landscaping, the buffer requirement is a minimum of two feet of additional clean fill.

- (a) In the case of this project, meet the two feet of clean fill requirement through the installation of two ft. minimum thickness of amended topsoil backfill to be placed in all planters, planting beds and tree pits prior to, or in conjunction with, the installation of plant materials.
- (3) Visible demarcation: In accordance with NJDEP requirements, provide a visible demarcation such as a visible contamination boundary marker (e.g., orange plastic snow fence or geotextile fabric), to serve as a visible warning to those conducting intrusive activities beneath the buffer layer.
  - (a) The purpose of the visible demarcation is to serve notification of the vertical limit of the engineering control and beginning of the contaminated zone.
  - (b) Place the required visible contamination boundary marker (the orange plastic snow fence), as a continuous and uninterrupted barrier, in the bottom of all planters, planting beds and tree pits prior to the placement of the minimum two ft. layer of amended topsoil backfill.

#### G. 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.

#### H. Dewatering

- 1. Provide dewatering as required for all earthwork, structural and utility work.
- 2. Do not dewater to public storm sewer utilities or to street right-of-way.
- 3. Provide dewatering devices and methods that comply with all codes and authorities having jurisdiction.
- 4. Provide dewatering plan to LSRP for review and approval.

**END OF SECTION G1070.00**

**SECTION G1070.20**  
**EXCAVATION AND FILL**

**PERFORMANCE**

**A. Basic Function**

1. Provide all excavation, soil relocation, backfilling, compacting and grading required for the proper functioning of the project, and as indicated in the project program.
2. All deep excavation shall be performed according to code, OSHA and all other applicable regulations.
3. Principal finished elements required include:
  - a. Excavation, relocation and regrading of existing subgrade material to reach proposed subgrade elevation underlying the final cover.
  - b. Final cover is defined as the topsoil or concrete sidewalks in landscaped areas, the pavement section in paved areas, and the bottom of the under-slab ventilation system or first floor concrete slab in building areas.
  - c. Top of subgrade shall mean uppermost surface of an excavated area or a filled area graded to conform to the proposed elevations under the site cover. The top of subgrade material shall be compacted to support the overlying cover material.
4. Dispose of all excessive material, if any, off-site in a code-compliant manner.

**B. Safety Structure**

1. Use one or more of the following procedure/methods for excavation support and protection:
  - a. Sheet piles
  - b. Shielding system
  - c. Soldier piles and lagging

**C. Durability**

1. Provide all labor, materials and equipment and systems that have been designed and installed in accordance with high standards of engineering and workmanship that are suitable for the specified services.

**PRODUCTS**

**A. Equipment**

1. The Design-Builder shall supply all equipment necessary to complete the work specified in this section.
2. Compaction equipment shall consist of vibratory rollers, pneumatic rubber-tired rollers, or other compaction equipment capable of obtaining the required density throughout the different soil types encountered on Site.

**B. Fill Materials**

1. In areas where the proposed final subgrade top elevation is lower than existing grades excavation and cutting activities will take place. Excavated material will be reused and

utilized in backfilling areas where the proposed final subgrade elevation is higher than the existing grades but only if the material to be utilized in different areas conforms to the specifications for Select Fill Material.

2. The Design-Builder shall utilize the following material in the grading and construction of the different systems:
  - a. Borrow/in-situ backfill material to be utilized as structural fill in the building areas.
  - b. Borrow/in-situ fill material to be utilized as sand filter layer in the infiltration/detention basin areas.
  - c. Topsoil layer to be placed in the landscaped areas.
3. The Design-Builder shall provide the name and location of the source of any borrow fill material.
4. All borrow fill material shall be certified clean fill and shall conform to the requirements of the "Technical Requirements for the Site Remediation, N.J.A.C. 7:26E-1.8" and as amended.
5. All borrow fill material shall comply with code requirements and the geotechnical characteristics of the fill to be used, as described in the Project Specifications.
6. Unsuitable Material
  - a. Quantities of organic matter, stumps, frozen material, clays, rubble, refuse, cinders, rock or other material shall not be used as backfill material.
  - b. Any excavated or cleared material which is not suitable for use as backfill in the building, pavement and basin areas shall be utilized as a backfill material in landscaped areas only.
7. Suitable Materials
  - a. Suitable material from excavations shall be free from objectionable quantities of organic matter, vegetation, stumps, frozen material, rubble, refuse, cinders, rock and other deleterious materials.
  - b. Material from excavations shall be considered suitable material for reuse only if it complies with the Project Specifications and all applicable codes and requirements of authorities having jurisdiction.
    - (1) The Design-Builder is responsible for employment and payment of an independent testing laboratory to provide testing and certification of excavated material to confirm suitability for intended reuse.
8. Select Fill Material
  - a. Structural fill under the building foundation and concrete slab:
    - (1) Controlled structural fill utilized in the construction areas shall consist of inorganic, readily compactable, predominantly well-graded granular soils with no more than 10% fines (material passing the No. 200 sieve), and a maximum particle size of 3 inches.
    - (2) The sandy soil shall be classified as well-graded sandy soil or silty sand (SW or SW-SM) in accordance with the Unified Soil Classification System (USCS) ASTM D 2487, where:  $D_{60} > 4 D_{10}$  and  $1 < D_{30}^2 / (D_{10} \times D_{60}) < 3$ .

Note:  $D_{60}$  is the size of the soil particles (diameter) in mm corresponding to 60% finer in the particle size distribution curve.

- (3) The moisture content of the fill materials should be controlled to within 2% of the optimum moisture content as determined by the Modified Proctor Test (ASTM D1557).
  - (4) Controlled fill within the construction area under the footings and concrete slab should be compacted to at least 98% and 95%, respectively, of the maximum dry density as determined by the Modified Proctor Test (ASTM D1557).
  - (5) Backfilling against the footings and grade beams should be compacted to 95% of the maximum dry density (ASTM D1557).
9. Sand filter layer
- a. The sand filter layer shall be a minimum of 12 inches thick placed under the surface cover in the detention/infiltration basin area, act as a cover layer against frost, and as a filter layer against clogging of the underlying geotextile separation/filter layer.
  - b. For the particles of the overlying soil not to penetrate into the filter layer, the size of the filter soil at which 15% is finer ( $D_{15, \text{filter}}$ ) shall be less than 4 to 5 times  $D_{85}$  of the overlying soil.
  - c. The hydraulic conductivity of the filter layer must be greater than that of the overlying soil accordingly:  $D_{15, \text{filter}} > 4 D_{15, \text{overlying soil}}$ .
10. Topsoil
- a. Suitable topsoil to be used as a base for grass planting shall be friable clay loam surface soil. The topsoil shall be reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and shall be free from stones, stumps, and other objects larger than 2 inches in any dimension, and other objectionable material.
  - b. The topsoil shall meet the Topsoil Standard specified in the State of New Jersey. The standards for Soil Erosion and Sediment Control require the testing of soil pH (and the addition of lime at recommended rates if pH is below 4.0) and other tests recommended by the Rutgers Cooperative Extension, such as total organic carbon content of the soil to assess the suitability of a soil for seeding.

## EXECUTION

### A. General

1. No excavation shall be performed until all site underground structures and utilities have been field located. The Design-Builder shall take the necessary precautions to ensure no damage occurs to existing structures and utilities.
2. Prior to construction, isolate the area to be used for the detention/infiltration basin to prevent construction equipment and stockpiled materials from compacting the subgrade soils.
  - a. During basin construction, take precautions to prevent both subgrade soil compaction and sediment contamination.
  - b. Perform all excavation with the lightest practical excavation equipment.

- c. Operate excavation equipment from the top of the excavation and not at the bottom to the maximum extent practical.
  3. Damage to existing underground structures and utilities resulting from the Design-Builder's operations shall be repaired at no additional cost. Utilities encountered that were not previously shown on the approved Drawings or otherwise located shall not be disturbed without approval.
  4. Clearing shall be performed to the limits of approved disturbance (clearing limits).
- B. Surface Preparation
  1. Remove heavy growths of grass and other vegetation, roots, logs, debris, stones, objects larger than 12 inches in any dimension, and other materials that would interfere with construction operations within the clearing limits by mowing, grubbing, raking, or other methods from the surface of areas to be stripped.
  2. Remove and dispose of vegetation, including downed timber, snags, brush, rubbish, stumps, roots, organic and other debris and other vegetation, occurring within areas to be cleared.
  3. Remove and dispose of asphalt, if any, from paved areas to be reconstructed and asphalt millings from paved areas to be rehabilitated.
- C. Excavation and Cutting
  1. Excavation and cutting are predominantly performed for regrading the site except for trenching for the removal of existing abandoned utilities and installation of the new utilities and stormwater control piping and basins system. In addition, areas of severe erosions shall be excavated and backfilled to the appropriate depth and extent.
  2. Perform excavation and cutting in a manner that will limit spills and the potential for excavated material to be mixed with borrow and Select Fill Material.
  3. Control the grading and placement of the excavated material in a manner to prevent water from running into excavations. Do not permit water to accumulate in excavations.
  4. Provide dewatering systems to convey water away from excavations and dewater any water entering into the excavation. Do not discharge water from the dewatering to public storm sewer utilities or to street right-of-way. Provide dewatering devices and methods that comply with all codes and authorities having jurisdiction.
  5. Confine excavation activities in areas where excavation is required. Excessive excavation (overexcavation) shall be backfilled with suitable materials to proposed subgrade/final grades.
  6. When excavation has reached the required depths, the material and conditions shall be inspected for suitability.
  7. All on-site excavated material is considered suitable for backfilling and regrading purposes. The Design-Builder shall be responsible for the removal of any excavated material that is not required for the completion of the Work.
- D. Stockpiles
  1. In no case shall fill material be stockpiled in such manner as to endanger the stability of slopes, existing utilities, structures or persons in the construction area. Stockpiled material shall have adequate erosion control measures and shall not be located where the

possibility of siltation of any existing catch basin(s) exists. When stockpiled materials interfere with natural drainage, necessary procedures shall be employed to permit surface and subsurface flow.

2. The area for each stockpile shall be of adequate size, reasonably uniform in cross section, well drained and cleared of foreign materials.
3. Stockpiles shall be located so that there is no contamination by foreign material and no intermingling of aggregates from adjacent piles.
4. Stockpiles shall be covered or otherwise protected to prevent buildup of moisture in the stockpile.

E. Placement and Installation of Select Fill Material

1. If any foundation/subgrade soils are considered unsuitable and inadequate for the work, a designated Select Fill Material shall be used to replace the unsuitable material.

F. Backfilling

1. Overexcavated areas shall be backfilled as promptly as the excavated material has been removed.
2. Place suitable fill in the designated areas to reach the proposed final subgrade elevations.
3. Place backfill materials in lifts not more than 9 to 12 inches in loose thickness.
4. Do not place backfill material on surfaces that are muddy, frozen, icy or contain frost.
5. Frozen materials shall not be placed and compacted. Frozen material shall be removed or otherwise treated to make the material acceptable before utilization as fill material.

G. Compaction

1. The Design-Builder shall be responsible for the means, methods, techniques, sequences and procedures of the construction to properly compact the top of subgrade material in cut areas and the backfill material in fill areas to construct a stable subgrade layer capable of supporting the cover layer.
2. Do not perform compaction when the material is too wet either from rain or from excess application of water. Suspend Work at the wet locations until the previously placed and new materials have dried sufficiently to permit proper compaction.
3. Controlled fill within the construction area under the footings and concrete slab shall be compacted to at least 98% and 95%, respectively, of the maximum dry density as determined by the Modified Proctor Test (ASTM D 1557).
4. Backfilling against the footings and grade beams shall be compacted to 95% of the maximum dry density (ASTM D 1557).

H. Grading

1. Areas within the limits of grading, including adjacent transition areas, shall be uniformly graded. The finished surface shall be smooth within acceptable tolerances and with uniform levels or slopes between points where elevations are indicated or between such points and existing grades. No low areas shall remain which would inhibit proper surface drainage.

**END OF SECTION G1020.00**

## SECTION G2010.00

### ROADWAYS

#### PERFORMANCE

##### A. Basic Function

1. Provide roadways as required by the project program and by code, and 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. Roadways comprise the following elements:
  - a. Exterior paved or surfaced areas such as roadways and driveways that are intended for vehicular traffic.
  - b. Appurtenances for roadways and driveways, including curbs, gutters, guardrails, pavement markings, and parking bumpers.
  - c. Signs and striping, including traffic signals, stop, yield, and directional signs.
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 and MUTCD Manual of Uniform Traffic Control, NJ Edition.
  - b. Minimum widths: Traffic lanes not less than 12 ft wide.
  - c. Maximum slopes: 5%.
  - d. Minimum slopes
    - (1) Minimum long slope: 0.5%.
    - (2) Minimum cross slope: 1%.
  - e. Curbs: Minimum 6 inch mountable curbs at all roadways and driveways.
  - f. Gutters: Minimum 12 in width, designed in accordance with AASHTO recommendations, located on one side of all roadways and driveways.
  - g. Traffic lanes and directional markings: Permanent and highly visible, minimum width of 4 in.
4. Where roadways are within or abutting a public right-of-way, comply with standards and requirements of authorities having jurisdiction.
  - a. Replace all sidewalks and curbing surrounding the project site in accordance with local requirements for streetscape.
  - b. In conjunction with replacement of sidewalks and curbing and construction of new driveways, saw cut a minimum width of 2 feet of adjacent roadway pavement and repave to match existing road construction.

- c. Reconstruct all catch basins and replace all curb inlets and related structures adjacent to the site, in a manner compliant with all local standards and requirements.
  5. Where roadways are integral with elements defined within another element group, meet requirements of both element groups.
  6. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.
  7. See Paragraph G, Environmental Impacts, in Section G0000.00, Sitework, for environmental requirements and restrictions.
- 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: Comply with ADAAG.
  3. Noise control: Provide paving at roadways and driveways that minimizes noise from automobile tires due to rough surface texture and paving joints.
  4. Appearance
    - a. Vehicular paving: Construct paving to achieve plain, utilitarian appearance.
- C. Health and Safety
  1. 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. Durability
  1. Service life span of paved surfaces: 25 years, under normally anticipatable usage.
  2. Provide reinforcing fabric consisting of a geotextile specifically designed for asphalt reinforcement, embedded in asphaltic cement between the asphalt base course and wear course layers for all roadway surfaces.
  3. 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.

## PRODUCTS

### A. Vehicular Paving

1. All material utilized in the construction of paved areas shall be in accordance with the New Jersey Department of Transportation (NJDOT) Standard Specifications for Road and Bridge Construction, latest addition.
2. Use the following:
  - a. Bituminous asphalt paving reinforced with geotextile fabric embedded is asphaltic cement.
  - b. Concrete pavement minimum 4" thick where indicated.
    - (1) Provide minimum 3500 psi concrete with 6x6x6 welded wire mesh.
  - c. Heavy-duty concrete paving minimum 6" thick at loading docks and other locations subject to truck traffic and where indicated.
    - (1) Provide minimum 4500 psi concrete with #3 steel reinforcement at 12" o.c.
    - (2) Provide ½" stainless steel dowel pins at 2'-0" o.c. at all expansion joints.

### B. Vehicular Curbs

1. Use any of the following:
  - a. Concrete curbs.
  - b. Stone curbs.

### C. Asphalt Paving (Geotextile) Fabric

1. Basis of Design: Petromat Style 4599 by Amoco Fabrics and Fibers Company.

### D. Guardrail

1. Use only galvanized steel fully-interchangeable guardrail, guardrail parts, terminal sections and fasteners that meet AASHTO M 180 requirements and are composed of Class A, Type II beams, and ASTM B209/B209M from manufacturers approved by the NJDOT.
2. Use steel posts that meet the requirements of ASTM A709 (A709M), Grade 36 (250) or ASTM A769 (A769M) Class I, Grade 40 (380).
3. Steel components (except cables, if any) are to be galvanized according to ASTM A123A/123M.
4. Steel posts and offset blocks are to be galvanized according to ASTM A123A/123M.
5. Steel fasteners, bolts, washers, etc., are to be galvanized according to ASTM A153A/153M.

### E. Pavement Markings

1. Use thermoplastic paint and local standards for all striping within public right-of-way.

2. Basis of Design for on-site striping: Zoneline Traffic and Zone Marking Paint as manufactured by PPG Architectural Finishes, Inc., Pittsburgh, PA.
3. Apply two coats of Traffic and Zone Marking Paint to the asphalt surface as shown on the Site Plan. Apply undiluted, following the manufacturer's recommendations.

**END OF SECTION G2010.00**

## **SECTION G2020.00**

### **PARKING LOTS**

#### **PERFORMANCE**

##### **A. Basic Function**

1. Provide parking lots and loading/service courts 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. Parking lots comprise the following elements:
  - a. Exterior paved or surfaced areas for parking lots and loading/service areas.
  - b. Appurtenances for parking lots, including curbs, gutters, guardrails, pavement markings, and parking bumpers.
  - c. Signs, including traffic signals and signs, directional signs, and parking space marking and identification.
3. Parking lots: Provide standard and heavy-duty paved surfaces as required for vehicular access to the project site and to various functional areas requiring vehicular access, parking stalls (standard and designated as barrier-free or handicap), freight docks, and loading and unloading zones.
  - a. Comply with recommendations of AASHTO "A Policy on Geometric Design of Highways and Streets", 2004 and MUTCD Manual of Uniform Traffic Control, NJ Edition.
  - b. Minimum widths: Traffic lanes not less than 12 ft wide.
  - c. Maximum slopes: 5%.
  - d. Minimum Slopes
    - (1) Minimum long slope: 0.5%.
    - (2) Minimum cross slope: 1%.
  - e. Curbs: Standard concrete street curb with 6" reveal, depressed concrete curb and mountable concrete street curb as designated on the Site Plan.
  - f. Gutters: Minimum 12 in width, designed in accordance with AASHTO recommendations, located on one side of all roadways and driveways.
  - g. 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: Locate and size to prevent damage to fixed objects, or excessive encroachment on pedestrian walkways.

- c. Wheel stops: Not required. Wheel stops are to be avoided because of an inherent trip hazard, and the difficulty they create with respect to snow removal operations.
    - d. Space markings: Permanent and highly visible, minimum width of 4 in.
    - e. Parking signage: As required by code and project program.
  - 5. Where parking lots are integral with elements defined within another element group, meet requirements of both element groups.
  - 6. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.
  - 7. See Paragraph G, Environmental Impacts, in Section G0000.00, Sitework, for environmental requirements and restrictions.
- 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 applicable codes requiring barrier-free access, including number, locations and dimensions of parking stalls
  - 3. Noise control: Provide paving at parking lots that minimizes noise from automobile tires due to rough surface texture and paving joints.
  - 4. Appearance
    - a. Vehicular paving: Construct paving to achieve plain, utilitarian appearance.
- C. Health and Safety
  - 1. 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. Durability
  - 1. Service life span of paved surfaces: 25 years, under normally anticipatable usage.
  - 2. Provide reinforcing fabric consisting of a geotextile specifically designed for asphalt reinforcement, embedded in asphaltic cement between the asphalt base course and wear course layers, for all asphalt parking lot surfaces.
  - 3. 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.

## PRODUCTS

### A. Parking Lot Paving

- 1. All material utilized in the construction of paved areas shall be in accordance with the New Jersey Department of Transportation (NJDOT) Standard Specifications for Road and Bridge Construction, latest addition.
- 2. Use the following:
  - a. Bituminous asphalt paving reinforced with geotextile fabric embedded in asphaltic cement.
  - b. Concrete pavement minimum 4" thick where indicated.
    - (1) Provide minimum 3500 psi concrete with 6x6x6 welded wire mesh.
  - c. Heavy-duty concrete paving minimum 6" thick at loading docks and other locations subject to truck traffic and where indicated.
    - (1) Provide minimum 4500 psi concrete with #3 steel reinforcement at 12" o.c.
    - (2) Provide ½" stainless steel dowel pins at 2'-0" o.c. at all expansion joints.
- 3. Do not use:
  - a. Concrete pavers.
  - b. Stone pavers
  - c. Brick pavers.
  - d. Stamped concrete.
  - e. Stamped asphalt.

### B. Parking Lot Curbs

- 1. Use any of the following:
  - a. Concrete street, depressed and mountable curbs.
  - b. Stone curbs where noted.
- 2. Do not use:
  - a. Pre-cast concrete curbs.
  - b. Asphalt curbs.
  - c. Steel-faced concrete curb.

C. Asphalt Paving (Geotextile) Fabric

1. Basis of Design: Petromat Style 4599 by Amoco Fabrics and Fibers Company.

D. Guardrail

1. Use only galvanized steel fully-interchangeable guardrail, guardrail parts, terminal sections and fasteners that meet AASHTO M 180 requirements and are composed of Class A, Type II beams, and ASTM B209/B209M from manufacturers approved by the NJDOT.
2. Use steel posts that meet the requirements of ASTM A709 (A709M), Grade 36 (250) or ASTM A769 (A769M) Class I, Grade 40 (380).
3. Steel components (except cables, if any) are to be galvanized according to ASTM A123A/123M.
4. Steel posts and offset blocks are to be galvanized according to ASTM A123A/123M.
5. Steel fasteners, bolts, washers, etc., are to be galvanized according to ASTM A153A/153M.

E. Pavement Markings

1. Use thermoplastic paint and local standards for crosswalk markings and all striping within public right-of-way.
  - a. Basis of Design: Sherwin-Williams Smart Mark Alkyd Thermoplastic Pavement Marking.
    - (1) Comply with AASHTO M249.
    - (2) Extrude at 120-mil thickness and heat fuse.
    - (3) Provide glass traffic beads complying with AASHTO M247 Type 1.
    - (4) Color: White, unless otherwise indicated.
2. On-Site Striping
  - a. Basis of Design for on-site striping not otherwise indicated: Zoneline Traffic and Zone Marking Paint as manufactured by PPG Architectural Finishes, Inc., Pittsburgh, PA.
  - b. Apply two coats of undiluted Traffic and Zone Marking Paint in accordance with manufacturer's recommendations.
3. Pavement marking colors: Three standard colors of traffic and zone paint shall be used: WHITE, YELLOW and Handicap BLUE.
  - a. Use WHITE to define the parking stalls
  - b. Use YELLOW to define the loading/service area (including the chevrons)
  - c. Use YELLOW for direction-of-travel arrows
  - d. Use YELLOW for the aisle aligned with the pedestrian ramp between handicap parking stalls.
  - e. Use Handicap BLUE for barrier-free parking stall designation.

**END OF SECTION G2020.00**

**SECTION G3000.00**  
**LIQUID AND GAS SITE UTILITIES**

**PERFORMANCE**

**A. Basic Function**

1. Provide the following site services:
  - a. Water supply: Means of distributing water from municipal system for all purposes required in buildings and on site.
  - b. Sanitary sewer: Means of removing liquid waste generated in buildings on site.
  - c. Storm sewer: Means of removing, controlling, and storing rainwater runoff from buildings and site areas.
  - d. Site elements of energy supply: Means of storing and distributing natural gas for energy-using services.
2. Where site services elements must also function as elements defined within another element group, meet requirements of both element groups.

**B. Local Requirements**

1. Comply with Paterson Engineering Department standards and local utility requirements.

**C. 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.
3. Odor: Provide trap(s) at connection(s) (if any) between storm sewer and sanitary sewer.

**D. 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 and damage caused by rodents and insects.



E. Structure

1. Concealed or buried piping and components: Provide code-compliant cover or concealment so that components are not subjected to damaging stresses due to applied loads.
2. Supports for piping and components: Support piping and components using the following:
  - a. Provide supports that allow movement of the pipe without undue stress on the piping, tubes, fittings, components, or foundations.
3. Seismic Protection
  - a. Provide flexible joints where differential movement is anticipated.
  - b. Provide seismic supports in compliance with local code requirements.

F. Durability

1. Weather Resistance
  - a. Storage tanks and distribution components: Prevent freezing. Provide automatically controlled supplemental heating where necessary.
  - b. Burial depth of piping: In accordance with code. Minimum burial depth is the deeper of 42 inches or 6 inches below local frost depth.
  - c. Electrical equipment: Provide equipment which is waterproof.
2. 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.

3. Resistance to Accidental Damage and Abuse
  - a. Provide barriers or protected locations for services, to prevent damage due to vehicular traffic.
  - b. Buried components: As required by code; minimum of 24 inches below surface of ground.
  - c. Underground piping: Watertight and rootproof.
  - d. Storm Grates and Inlets
    - (1) Provide storm grates and inlets with the strength to withstand repetitive loading without damage or undue wear.
    - (2) Provide storm grates and inlets with the strength to withstand concentrated loads up to 2000 psig.
    - (3) Provide storm grates which resist corrosion.
    - (4) Provide tamper-resistant anchors on grates and covers.
- G. Operation and Maintenance
  1. Capacity
    - a. Water and drainage: As required by code and as specified.
    - b. Heating, cooling, and ventilating: Provide site services sufficient to maintain interior environment within ranges specified.
    - c. Fire protection: As required by code and as specified.
  2. Service connections: Provide separate service connections for domestic water service and fire water service in a manner that complies with all codes and local utility requirements.
  3. Ease of use: Provide easy access to and working clearances around system components.
  4. Minimization of misuse: Provide locking devices to stop unauthorized access.
  5. Ease of Maintenance
    - a. Provide shutoff valves and backflow preventers as required by code and at utility service mains and service entry points.
    - b. 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.
    - c. Storm and Sanitary Sewer
      - (1) Maximum manhole spacing: 300 feet or as required by code.
      - (2) Maximum cleanout spacing: 50 feet or as required by code.
    - d. Provide drains and inlets with replaceable covers.
- H. See Paragraph G, Environmental Impacts, in Section G0000.00, Sitework, for environmental requirements and restrictions.

- I. All materials and installation shall comply with the most stringent regulatory requirements of authorities having jurisdiction.
- J. All utilities shall be designed and installed to meet HS20-44 loadings.

## **PRODUCTS**

### **A. Sanitary Sewer**

#### **1. Pipe**

##### **a. Use one or more of the following:**

(1) HDPE/PVC pipe and fittings.

##### **b. Do not use:**

(1) Cast iron soil pipe and fittings, hubless.

(2) Concrete pipe.

(3) Clay pipe.

(4) Copper tube or pipe.

(5) ABS pipe and fittings.

#### **2. Manholes**

##### **a. Use one or more of the following:**

(1) Prefabricated concrete.

(2) Poured-in-place concrete.

#### **3. Sump Pumps**

##### **a. Use one or more of the following:**

(1) Submersible pumps.

(2) Sewage pumps.

(3) Grinder pumps.

##### **b. Do not use:**

(1) Pedestal pumps.

#### **4. Grease interceptor: Single heavy-duty commercial grease interceptor located outside the building in an underground, lined precast concrete pit with cover.**

### **B. Storm Sewer**

#### **1. Pipe**

##### **a. Use one or more of the following:**

(1) Cast iron soil pipe and fittings, hub and spigot.

(2) Concrete pipe.

(3) PVC pipe and fittings.

- b. Do not use:
  - (1) Cast iron soil pipe and fittings, hubless.
  - (2) Clay pipe.
  - (3) Copper tube or pipe.
  - (4) ABS pipe and fittings.
- 2. Culverts
  - a. Use one or more of the following:
    - (1) Concrete pipes.
- 3. Storm Drains
  - a. Use one or more of the following:
    - (1) Cast iron.
    - (2) Stainless steel.
    - (3) HDPE.
  - b. Do not use:
    - (1) Bronze.
    - (2) Wrought iron.
- 4. Manholes
  - a. Use one or more of the following:
    - (1) Prefabricated concrete.
    - (2) Cast-in-place concrete.
- 5. Trench Drains
  - a. Basis of Design: Series R-4996 self-forming trench pan as manufactured by Neenah Foundry, Neenah, WI, sized as required, with Type Q grates at all locations within Play Areas and where required for barrier-free access, and bolted Type C grates elsewhere.

**END OF SECTION G3000.00**

**SECTION G3030.00**  
**STORM DRAINAGE UTILITIES**

**PERFORMANCE**

**A. Basic Function**

1. Provide storm drainage components as required by the project program and by code to maintain adequate drainage, control soil erosion, control stormwater quantity and quality, and maintain groundwater recharge at the project site.
2. The storm drainage system requires the following activities:
  - a. Grading of the site for the collection of stormwater runoff.
  - b. Construction of appropriate, properly sized underground conveyance systems such as underground pipe runs.
  - c. Adherence to the structural requirements for the stormwater conveyance system due to hydraulic loads, as well as static and dynamic earth loads.
3. Grading and collection: Grade the project site to maintain adequate drainage during small-volume precipitation events. Provide inlets and roof drains to collect stormwater runoff.
4. Incorporate nonstructural stormwater management strategies into the design as required by N.J.A.C. 7:8-5.3.
5. Underground stormwater pipes: Provide adequate underground piping system with sufficient capacity to convey stormwater runoff safely to discharge locations in accordance with the requirements of authorities having jurisdiction.
6. Provide structural stormwater management measures which may include infiltration trenches, ponds, subsurface basins, dry wells and other related measures such as total suspended solid (TSS) filters.
7. Design-Builder must demonstrate through hydrologic and hydraulic analysis that the stormwater control systems meet the minimum design and performance standards and all applicable codes and regulations.
8. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

**B. Local Requirements**

1. Comply with Paterson Engineering Department standards and local utility requirements.

**C. Amenity and Comfort**

1. Leakage: Provide underground pipe systems which are leak-free.
2. Accessibility: Provide clearances around components that are adequate for service and use.
3. Appearance: Grade and stabilize soil layers over the structure and take appropriate measures as described in Section G2080.00.

D. Health and Safety

1. Safety from injury: Stormwater inlets on the playground and pavement shall comply with requirements of the New Jersey Department of Transportation (NJDOT) and Americans with Disabilities Act (ADA).
2. Unauthorized access: Provide chain link fence and locking devices to stop unauthorized access to the site.

**PRODUCTS**

A. Grading and Stormwater Collection

1. Construct all impervious surfaces at no less than a 1.0% grade, and all pervious surfaces at no less than a 2% grade. Construction must be in compliance with all codes and requirements of authorities having jurisdiction.
2. Stormwater inlets shall comply with requirements of the New Jersey Department of Transportation (NJDOT) and Americans with Disabilities Act (ADA).
3. Provide roof drains and collection pipes with fittings and appurtenances according to applicable standard specifications recommended by American Society of Testing and Materials (ASTM) and American Water Works Association (AWWA).

B. Underground Stormwater Pipes

1. Provide underground pipe system with sufficient capacity to convey stormwater runoff safely for 25-year storm event or in accordance with the requirements of authorities having jurisdiction.
2. Underground pipe system shall comply with all codes and requirements of authorities having jurisdiction.
3. Pipes with fittings and appurtenances shall comply with applicable standard specifications recommended by American Society of Testing and Materials (ASTM) and American Water Works Association (AWWA).

C. Structural Stormwater Management Measures

1. Design and construct subsurface detention/ infiltration/ basins and dry wells to store and infiltrate the stormwater runoff at the project site as part of the required stormwater quality and quantity management.
2. Design and install subsurface detention/infiltration basins according to New Jersey Stormwater Best Management Practices Manual and comply with all codes and requirements of authorities having jurisdiction.
3. The work may include, without limitation, the following:
  - a. Trench/basin excavation.
  - b. Bedding of all piping and structures.
  - c. Installation of pipes and fittings.
  - d. Installation of inlets, catch basins, trench drains, area drains and manholes including all necessary appurtenances and connections.
  - e. Backfilling and compaction of the excavation with stone.

- f. Covering the stone with a geotextile filter/separation layer.
  - g. Placement, compaction and grading of pavement or cover soil to reach designed final grade.
- 4. Pipes with fittings and appurtenances shall comply with applicable standard specifications recommended by American Society of Testing and Materials (ASTM) and American Water Works Association (AWWA).
  - 5. Install vinyl sheet piling along the underground detention/infiltration basin boundaries to reduce lateral water migration and increase the water percolation downwards into the underlying soils.
    - a. Basis of Design: ShoreGuard CL-9000, manufactured by Crane Materials International.
  - 6. Geotextile shall be placed below the sand silty layer in the infiltration pond and above the stone in detention/infiltration basins as a filter/separation layer.
    - a. Geotextile shall be at least a 10 oz/sy polypropylene, nonwoven, needle-punched and shall conform to applicable standard specifications described by the American Society of Testing and Materials (ASTM). Placement of the geotextile shall be in accordance with the manufacturer's specifications.
  - 7. Catch Basins and Manholes
    - a. Catch basins and manholes shall be precast reinforced concrete with minimum compressive strength of 4000 psi in 28 days, conforming to ASTM Specification C 478, C150, C33 and C 913.
    - b. Joints shall conform to the requirements for rubber gaskets as specified under the latest ASTM standards C 443 and C990.
  - 8. Total Suspended Solid Filters
    - a. Inlets and manholes shall include a stormwater filtration device when collected runoff is directed to the subsurface infiltration trench and/or basin.
    - b. Filtration devices must be NJDEP approved.
      - (1) Basis of Design: Jellyfish Filter by Imbrium.
  - 9. Cover soil/filter layer shall consist of well graded sand with fines (material passing the 200 sieve) equal to or less than 8%, and shall conform to the Specifications provided in Section G1070.20.
  - 10. Topsoil shall be as specified in Section G1070.20.
  - 11. Riprap shall be placed in the infiltration pond area for erosion protection and shall conform to the Standards for Soil Erosion and Sediment Control in New Jersey. Riprap shall be placed on a 16 oz/sy non-woven geotextile material as a separation layer.

**END OF SECTION G3030.00**

## **SECTION G4010.00**

### **SITE ELECTRIC DISTRIBUTION SYSTEMS**

#### **PERFORMANCE**

##### **A. Basic Function**

1. Provide the following site services:
  - a. Electrical power: Adequate supply of power for all project functions.
2. Where site electric distribution system elements must also function as elements defined within another element group, meet requirements of both element groups.
3. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

##### **B. Local Requirements**

1. Comply with Paterson Engineering Department standards and local utility requirements.

##### **C. 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.
3. Appearance: Provide underground electrical power distribution with pad mounted transformers

##### **D. Health and Safety**

1. Comply with the most stringent requirements of authorities having jurisdiction.
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. Fire source: Provide site electrical elements which are incombustible.
4. Electrical shock prevention: Provide a means of disconnecting power at each piece of equipment.
5. Unauthorized access: Provide locking devices to stop unauthorized access.
6. Electrical shock: Isolate electrical conductors from personnel.
7. Accidental explosion: Provide equipment designed to withstand electromotive forces without catastrophic failure.
8. Misuse: Minimize misuse that could result in damage to property, injury, or loss of life.
9. Vermin resistance: Provide components that are resistant to the entry of and damage caused by rodents and insects.



E. Structure

1. Concealed or buried piping and components: Provide code-compliant cover or concealment so that components are not subjected to damaging stresses due to applied loads.
2. Supports for piping and components: Support piping and components using the following:
  - a. Provide supports that allow movement of the pipe without undue stress on the piping, tubes, fittings, components, or foundations.
3. Seismic Protection
  - a. Provide flexible joints where differential movement is anticipated.
  - b. Provide seismic supports in compliance with local code requirements.

F. Durability

1. Weather Resistance
  - a. Burial depth of piping: In accordance with code.
  - b. Electrical equipment: Provide equipment which is waterproof.
2. 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.
3. Resistance to Accidental Damage and Abuse
  - a. Provide barriers or protected locations for services, to prevent damage due to vehicular traffic.

- b. Buried components: As required by code; minimum of 24 inches below surface of ground.
  - c. Underground conduit and piping: Watertight and rootproof.
- G. Operation and Maintenance
- 1. Capacity: As required by code.
    - a. Provide electrical equipment which can be modified to increase service capacity in the future.
  - 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 cleaning: Provide electrical distribution elements with removable access panels to allow cleaning.
  - 5. Ease of maintenance: Provide electrical distribution elements which are modular in design.
- H. See Paragraph G, Environmental Impacts, in Section G0000.00, Sitework, for environmental requirements and restrictions.

## **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.
- 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 G4010.00**

**SECTION G5010.00**  
**SITE COMMUNICATIONS SYSTEMS**

**PERFORMANCE**

**A. Basic Function**

1. Provide the following site services:
  - a. Communications: Power and connectivity for all telecommunications, surveillance and security systems.
2. Where site communications system elements must also function as elements defined within another element group, meet requirements of both element groups.
3. Brand Names: Where brand names are listed, they represent the Basis of Design unless those items are identified as approved proprietary items in project requirements.

**B. Local Requirements**

1. Comply with Paterson Engineering Department standards and local utility requirements.

**C. Amenity and Comfort**

1. Leakage: Provide communications systems which are leak-free.
2. Accessibility: Provide clearances around components that are adequate for service and use.

**D. 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. Fire source: Provide site electrical elements which are incombustible.
3. Electrical shock prevention: Provide a means of disconnecting power at each piece of equipment.
4. Unauthorized access: Provide locking devices to stop unauthorized access.
5. Electrical shock: Isolate electrical conductors from personnel.
6. Accidental explosion: Provide equipment designed to withstand electromotive forces without catastrophic failure.
7. Misuse: Minimize misuse that could result in damage to property, injury, or loss of life.
8. Vermin resistance: Provide components that are resistant to the entry of and damage caused by rodents and insects.

**E. Structure**

1. Concealed or buried piping and components: Provide code-compliant cover or concealment so that components are not subjected to damaging stresses due to applied loads.

2. Supports for piping and components: Support piping and components using the following:
    - a. Provide supports that allow movement of the pipe without undue stress on the piping, tubes, fittings, components, or foundations.
  3. Seismic Protection
    - a. Provide flexible joints where differential movement is anticipated.
    - b. Provide seismic supports in compliance with local code requirements.
- F. Durability
1. Weather resistance: Provide equipment which is waterproof.
  2. 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.
  3. Resistance to Accidental Damage and Abuse
    - a. Provide barriers or protected locations for services, to prevent damage due to vehicular traffic.
    - b. Buried components: As required by code; minimum of 24 inches below surface of ground.
    - c. Underground conduit and piping: Watertight and rootproof.
- G. Operation and Maintenance
1. Capacity: As required by code.
  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 cleaning: Provide electrical distribution elements with removable access panels to allow cleaning.
  5. Ease of maintenance: Provide electrical distribution elements which are modular in design.
- H. See Paragraph G, Environmental Impacts, in Section G0000.00, Sitework, for environmental requirements and restrictions.

## **PRODUCTS**

### **A. Conductors**

1. Use one or more of the following:
  - a. Solid copper.
  - b. Copper-clad aluminum.
  - c. Aluminum.

### **B. 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 G5010.00**

# **NJSDA Design Manual For Design-Build Projects**

## **Design Phase Deliverables and Submission Requirements**

June 5, 2012

# NJSDA Design Manual for Design-Build Projects

Design Phase Deliverables and Submission Requirements

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# NJSDA Design Manual for Design-Build Projects

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## Design Phase Deliverables and Submission Requirements

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### INTRODUCTION

This Design Manual defines the minimum Design Phase deliverables and submission requirements for SDA projects being delivered through a Design-Build form of Agreement. Design Phase submissions shall demonstrate conformance with the requirements of the Design-Build Contract Documents including the NJSDA Materials & Systems Standards and all Project performance requirements.

Performance Specifications for the Project have been provided as a supplement to the NJSDA Materials and Systems Standards. In the event of any variance between the requirements of Project Performance Specifications and the NJSDA Materials and Systems Standards, the requirements of the Project Performance Specifications shall take precedence. Any variance from the Materials and Systems Standards proposed by the Design-Builder must be approved by the Authority in accordance with the Variance Request procedure outlined in the Materials and Systems Standards.

Design Phase submissions shall be made in accordance with the agreed upon project schedule. In general, all Design Phase submissions shall be made in sufficient time to allow fourteen (14) days for Authority review as well as sufficient time for revision, resubmission, and acceptance prior to any subsequently required design, approval, procurement or construction actions or activities related to or dependent upon the submission.

### GENERAL SUBMISSION REQUIREMENTS

#### *Design Submission Information*

- A. All design submissions shall include the following information:
  - 1. Names of the Project, School District, Design-Builder, Construction Manager (if applicable), the NJSDA package number and the DOE project number.
  - 2. Original document date and current revision date (if applicable), formatted: YYMMDD.

#### *Design Submission Format Requirements:*

- A. Drawings: All drawings shall be submitted on consistent sheet sizes of either "Arch D", 24" x 36" or "Arch E1", 30" x 42" with all lettering at least 1/8" high. Maintain consistent orientation of building between site and floor plans (North up preferred). Where overall site or floor plans are necessary, provide key plans on larger scale drawings to indicate portion of building or site being depicted in relationship to overall building or site.
  - 1. Site Plans (all disciplines): Minimum scale: 1" = 30'-0". Where necessary, provide multiple plans at required scale and smaller scale overall site plans.
  - 2. Floor Plans (all disciplines) Roof Plans, Reflected Ceiling Plans: Minimum scale: 1/8"=1'-0". Where necessary, provide multiple floor plans at required scale and smaller scale overall building floor plans (max. 1/16" preferred).
  - 3. Enlarged Floor Plans: Minimum scale: 1/4"=1'-0".
  - 4. Elevations: Minimum scale: 1/16"=1'-0" with appropriate enlargements at 1/8" or 1/4" scale.
  - 5. Wall Sections, Details, and other drawings: Scale as appropriate to level of detail being portrayed.
  - 6. Schedules: May be included in drawings or specifications as appropriate.
- B. Color Renderings: Minimum size: 20"x30" framed with matte and glazing.

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## Design Phase Deliverables and Submission Requirements

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- C. Interior finish color/material selection boards: Format appropriate to the materials and information being presented, but not larger than 24' x 36".
- D. Specifications: 8½" x 11", utilizing the most current version of CSI/MasterFormat.
- E. Other reports, including calculations, shall be 8½" x 11"

### ***Electronic Document Submission Requirements:***

In addition to required number and type of hard copy submissions, submit electronic copies in accordance with the following requirements.

- A. Electronic File Submission Organization:
  - 1. Provide both individual document files, in formats as described below, as well as composite copies of all final end-of-phase submissions in .dwf or .pdf format, organized similar to submission organization.
- B. Electronic File Formats
  - 1. Drawings: Provide electronic copies of all files in both native AutoCad (.dwg) and .dwf formats.
  - 2. Other Documents: Provide electronic copies of all in both native (MS Word, Exel, etc.) and in .pdf format.
- C. Electronic File Naming:
  - 1. All electronic drawing files (DWG & DWF) shall be named as to refer to the sheet number referenced therein and include current revision date (formatted: YYMMDD).
  - 2. All other electronic files shall be named so as to be readily identifiable and to include current revision date (formatted: YYMMDD).

### ***Submission Requirements (Quantities):***

- A. Design Phase Submissions (Preliminary and Final Design):
  - 1. Six complete, full sized sets of all deliverables and one half sized set of all large format deliverables
  - 2. One complete electronic set of all submission documents on disk
- B. DOE Final Educational Adequacy Submission (For SDA review prior to submission to DOE)
  - 1. Six complete, full sized sets of all deliverables and one half-sized set of all large format deliverables
  - 2. One complete electronic set of all submission documents on disk
- C. Approved DOE FEA Submission, DCA Plan Release (Full or Partial Filing Submissions as applicable) and other Agency Approval Submissions:
  - 1. Three complete, full sized sets of all documents and one half-sized set of all large-format documents.
  - 2. One complete electronic set of all submission documents on disk

# NJSDA Design Manual for Design-Build Projects

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## Design Phase Deliverables and Submission Requirements

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### **PRELIMINARY DESIGN PHASE SUBMISSION REQUIREMENTS**

The Design-Builder shall submit Preliminary Design Documents as described below for review and acceptance by the Authority in accordance with the schedule and time frames established in the agreed upon project schedule. The Preliminary Design Documents shall describe the project in sufficient detail to demonstrate compliance with SDA Materials and Systems Standards as well as performance and other requirements established by the Design-Build Contract Documents.

#### ***Detailed Preliminary Design Phase Submission Requirements***

The following are the minimum Preliminary Design Phase Submission requirements.

#### **A. Drawings**

1. Cover Sheet
  - a. Name of Project, NJSDA package number, NJDOE number, Location maps, New Jersey State Seal and name of the Governor
  - b. Drawing Index, Legends and Symbols
  - c. Rendering of project (optional)
2. Site Drawings
  - a. Existing Conditions Plan(s) indicating existing site boundaries, topography, and utilities
  - b. Site Logistics Plan indicating location of temporary facilities for construction including site access, fencing, trailers, staging, lay-down, and storage areas
  - c. Demolition, abatement, and construction phasing drawings (if applicable)
  - d. Site plan(s) showing size and location of all site improvements, including:
    - i. Proposed site improvements, buildings and structures, site ingress and egress
    - ii. Site pedestrian and vehicular access, parking and circulation improvements
    - iii. Fencing, lighting, landscaping, site furniture and retaining walls
    - iv. Existing and proposed grades at 5-foot contour intervals
    - v. Spot elevations at all entrances, exits, and building corners, and on a 20-foot grid for parking lots and open areas
  - e. Preliminary Site Drainage Plan showing storm water drainage, retention, detention, infiltration and any other above or below grade drainage systems with proposed elevations and inverts in plan and profile
  - f. Preliminary Site Utility Plan showing location and sizing of all major above and below grade utilities serving the building and site
  - g. Site Plan demonstrating compliance with DCA “Best Practices” requirements
3. Architectural Drawings
  - a. Floor Plan(s)
    - i. Show layouts with sufficient detail and dimensions, including net area of all rooms, so that critical dimensions, clearances, and relationships can be ascertained and confirmed.
    - ii. Indicate wall types and ratings and all required chases and shafts.
    - iii. Include structural elements, doors and windows, and all furniture, furnishings, and equipment to be provided by Design-Builder.
    - iv. Provide overall and partial floor plans as needed to indicate all floors at the scales noted above.

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## Design Phase Deliverables and Submission Requirements

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- v. Identify and provide references for all building elevations, sections, and enlarged plans.
  - b. Room Layout Plans locating and identifying each item of required furniture, fixtures, and equipment, per DOE-approved Documents, indicating necessary clearances with schedules or other identification indicating whether each item is to be provided by the Design-Builder, NJSDA, or the District
  - c. Interior Partition schedules indicating partition types and demonstrating compliance with requirements for fire ratings and acoustic values
  - d. Coordinated Roof Plan(s) showing roof types, drainage systems, roof top equipment (including exposed duct and piping mains), walk pads, roof ladders and penetrations
  - e. Exterior Building Elevations of all major exterior conditions indicating all exterior materials, floor-to-floor heights, and section references
  - f. Building Sections (minimum of four) indicating floor-to-floor heights and ceiling heights with all spaces labeled
  - g. Interior Elevations for all typical spaces, assembly spaces and specialized instructional spaces indicating doors, windows, equipment, and any special acoustic treatment, materials, or finishes
  - h. Wall Sections and details of each major type of exterior wall and fire wall to indicating compliance with requirements for fire ratings, energy performance, acoustic values, and continuity of building envelope
  - i. Reflected Ceiling Plans including ceiling types and heights and indicating locations of lighting, registers and grilles. Indicate any special acoustic materials or treatment in assembly areas or other areas with special acoustic requirements
  - j. Finish schedules, including ceiling heights, identifying wall, base, floor, and ceiling finishes for all spaces
  - k. Preliminary details of any special items or conditions
  - l. Preliminary Door Schedules indicating door, frame and hardware types as well as fire and acoustical ratings
  - m. Window and storefront elevations (may be included with Exterior Building Elevations) indicating size and fenestration patterns and any special glazing requirements
  - n. Other typical details, as necessary, to demonstrate compliance with project requirements
4. Structural Drawings
- a. Preliminary Foundation Plan(s) showing location, type, size and depth of each foundation component. Identify expansion joints, fire walls, and any other isolation assemblies
  - b. Preliminary Structural Plans for each floor and roof, indicating columns, beams, bearing and shear walls, slabs, decks, and other major structural elements, with typical sizing. Identify expansion joints, fire walls, and any other isolation assemblies
  - c. Preliminary Structural Sections through foundations, below-grade construction, slabs on grade, walls, floors and roofs, with depths of structural elements. (May be incorporated in Architectural Wall Sections)
  - d. Preliminary Plan and section details of typical structural conditions, including building movement and fire separation conditions
  - e. Roof equipment support types and locations (Include in Coordinated Roof Plans)

# NJSDA Design Manual for Design-Build Projects

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## Design Phase Deliverables and Submission Requirements

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5. Food Service Facilities Drawings
  - a. Enlarged Floor Plans of food service areas indicating size and location of all required food service equipment and demonstrating necessary operating clearances (Ceiling mounted equipment should be indicated on Architectural Reflected Ceiling Plans.)
  - b. Equipment Schedule (drawings or specifications) of all required food service equipment with utility requirements
  - c. Roof-top equipment (Include in Coordinated Roof Plans)
6. Plumbing Drawings
  - a. Floor Plans indicating utility entrances, fixtures, equipment, pumps and drains, and location and routing of all piping systems including sanitary, storm, domestic water, natural gas and radon mitigation, with sizing
  - b. Enlarged plans and/or sections for Kitchen, Mechanical and Pump Rooms, and other spaces with special plumbing requirements
  - c. Vent stacks and other roof penetrations (include in Coordinated Roof Plans)
7. Fire Protection Drawings
  - a. Floor Plans with performance criteria noting Use Group, hazard and hydraulic flow test summary and date of test
  - b. Floor Plans noting incoming fire water service size and location, zone control valve assemblies, standpipes, fire pumps, and other major components
  - c. Enlarged Floor Plans of areas to be served by specialized fire protection systems such as dry pipe, pre-action, or chemical fire suppression systems
8. HVAC Drawings
  - a. Floor Plans showing HVAC system distribution drawings for all floors indicating equipment, piping, ductwork and unitary equipment. The following must also be indicated:
    - i. HVAC System Zoning, with floor plans highlighting HVAC zoning for each area of the building
    - ii. Diagrammatic indication of air terminal units, reheat coils, fan coil units, heat pumps, and unitary systems, noting zoning and dedicated conditions of specialized spaces
    - iii. Detailed layout of typical spaces occurring multiple times, including ductwork distribution, air devices, thermostat locations and perimeter systems
    - iv. Diagrammatic indication of perimeter systems, including finned tube panels, radiation elements, ceiling radiation, fan powered air terminals, etc.
    - v. Locations and ratings of fire and smoke dampers and other rated conditions
    - vi. Heating and cooling pipe main distribution, noting main sizes, equipment connections, typical connections to common terminal equipment, and roof and wall penetrations
    - vii. Specialized and independent systems serving areas such as computer rooms, telecommunication rooms, kitchen, etc.
    - viii. Services for special equipment
  - b. Riser and Flow Diagrams sufficient to describe basic system design
  - c. Enlarged Floor Plans of mechanical equipment rooms indicating equipment, piping and ductwork mains, and louvers, indicating all required shafts and soffits to and from mechanical equipment rooms

# NJSDA Design Manual for Design-Build Projects

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## Design Phase Deliverables and Submission Requirements

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- d. Roof-top equipment (Include in Coordinated Roof Plans)
  - e. Equipment Schedule (drawings or specifications) identifying all equipment. Indicate capacities, outside air quantity, location and area served by equipment
9. Electrical Drawings
- a. Electrical Site Plan showing utility transformer, incoming underground conduit bank to main electrical room, telephone/data conduit bank and other services, with manholes and related equipment
  - b. Site Lighting Plan with light fixture locations, photometric information and typical pole types
  - c. Lighting Floor Plans of each floor indicating type and location of light fixtures throughout building, including typical room layouts, indicating controls and emergency lighting
  - d. Power Floor and Roof Plans showing panel boards, motor control centers, transformers, conduit bank routing/size from main electric room to electric closets and risers, major HVAC and plumbing equipment, elevator motors, and any other major equipment or systems.
  - e. Photometric plans for each room type demonstrating compliance with code and project requirements
  - f. Light fixture schedule (drawings or specifications) indicating all fixtures types, including photometric and other performance information
  - g. Equipment schedules (drawings or specifications) for all switchboards, panels and motor control centers.
  - h. Fire alarm riser diagram showing fire alarm control panels and typical components
  - i. Preliminary Electrical grounding grid plan, showing building grounding. (May incorporate in Preliminary Power Plans)
  - j. Preliminary Lightning protection plan showing all components. (May incorporate in Preliminary Power Plans)
10. Information Technology and Security Drawings
- a. Floor Plans indicating MDF, IDF and designated telecom spaces, including the following:
    - i. Entrance cabling (MPOE) and conduit paths
    - ii. MDF to IDF conduit paths. Include bend radius where applicable to all conduits
    - iii. Distribution paths from MDF and IDF locations to station drops
    - iv. Paths and locations of wire trays, ladder racks, J-hooks, ceiling straps and any other distribution support systems. Display all bend radiuses
  - b. Enlarged Floor Plans for MDF and IDF indicating placements and clearances on all sides for two post telecom racks, server cabinets, free standing floor equipment, wall mounted equipment, power receptacles with NEMA type, overhead cable pathways and conduit entrances.
  - c. Interior Elevations of MDF and IDF depicting rack elevations, wall mounted equipment; cross connect blocks, overhead cable pathway access points. The diagram shall list port densities per rack with relevant patch panel count(s). Include rack, patch panel and patch panel port numbering to match station labeling.
  - d. Enlarged Floor Plans of typical instructional areas indicating type and location of all IT systems outlets, devices, equipment, and other components

# NJSDA Design Manual for Design-Build Projects

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## Design Phase Deliverables and Submission Requirements

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- e. Security Systems Plans in sufficient detail to demonstrate compliance with DCA “Best Practices” requirements

### **B. Specifications**

Provide outline specifications in the prescribed format describing the type and characteristics of all materials and systems to be incorporated in the Work. The Specifications shall describe materials and systems in sufficient detail to demonstrate compliance with Project requirements and shall identify requirements for submittals, quality assurance, warranties, and guarantees, as well as any requirements for LEED and Building Commissioning.

(Note: With Authority’s prior approval, product data for proposed materials and systems may be submitted as a supplement to or in lieu of outline specifications provided such data clearly demonstrates compliance with project performance and other requirements.)

### **C. Color/Material Selections**

1. Exterior Materials:
  - a. Exterior Material and Color Boards: Provide samples of proposed exterior materials and color finishes including masonry products and color samples of exterior doors and frames, metal roofing, copings, flashings, and other trim materials.
  - b. Exterior Renderings: Provide color renderings of exterior elevations indicating application of exterior materials including masonry patterning.
2. Interior Colors and Finishes:
  - a. Interior Color and Finish Boards: Provide samples of proposed interior materials, colors, and finishes including flooring, base, ceiling finishes, and paint colors,
  - b. Finish Plans – Provide color floor plans indicating application of interior color and finishes including floor patterns and any special finish applications

### **D. Color Renderings**

Following acceptance of exterior material and color selections, provide color rendering of one exterior view of design as selected by Authority.

### **E. LEED Compliance**

1. LEED Checklist identifying elements and features incorporated in design to achieve required LEED certification
2. Copies of any project submissions to USGBC

### **F. Building Commissioning Submissions**

(See Procedural Specifications)

### **G. Other Submission Requirements**

1. Supplementary Geotechnical Data required by code
2. Preliminary Structural analysis indicating all static and dynamic loads on major structural elements.
3. Preliminary load and energy model calculations using an approved energy modeling method.
4. HVAC control diagrams and preliminary written sequence of operation of the HVAC system depicting control devices and components, safety devices, control and monitoring points, and other system components and equipment to be interlocked.

# NJSDA Design Manual for Design-Build Projects

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## Design Phase Deliverables and Submission Requirements

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### **FINAL DESIGN PHASE SUBMISSION REQUIREMENTS**

Following acceptance of the Preliminary Design Documents, the Design-Builder shall submit Final Design Documents as described below for review and acceptance by the Authority in accordance with the schedule and time frames established in the agreed upon project schedule. The Final Design Documents shall be consistent with the accepted Preliminary Design Documents and shall describe the project in sufficient detail for purposes of construction and securing of any necessary approvals.

#### ***Detailed Final Design Phase Submission Requirements***

In addition to the requirements for the Preliminary Design Submission, the following are the Detailed Final Design Submission requirements.

##### **A. Drawings:**

1. Cover Sheet
  - a. Name of Project, NJSDA package number, NJDOE number, Location maps, New Jersey State Seal and name of the Governor
  - b. Drawing Index, Legends and Symbols
  - c. Rendering of project (optional)
2. Site Drawings
  - a. Existing Conditions Plans
  - b. Site Logistics Plan
  - c. Demolition, abatement, and phasing drawings (if applicable)
  - d. Site plan(s) showing all site improvements, in addition to Preliminary Design requirements, indicate:
    - i. Final plan and profile drawings for each utility system, including the identification of conflicting utilities.
    - ii. Final drainage plan showing storm water retention, detention, infiltration and any other above or below grade systems, in plan and profile.
    - iii. Soils erosion and Sediment Control plans in accordance with the respective Soil Conservation District rules and regulations.
  - e. Typical details and sections of all proposed improvements
  - f. Site sections and profiles, if needed to fully describe site conditions.
3. Architectural Drawings
  - a. Final Floor Plans
  - b. Final Coordinated Roof Plans showing roof types, drainage systems, roof top equipment (including exposed duct and piping mains), walk pads, roof ladders and penetrations
  - c. Final sections through the building showing floor-to-floor heights and ceiling heights with all spaces labeled
  - d. Final Interior Elevations for all typical spaces, assembly spaces and special instructional spaces
  - e. Final Interior Partition drawings and schedules identifying all partition types and demonstrating compliance with acoustic performance and other requirements
  - f. Final Wall Sections and details of each major type of exterior wall and fire wall treatment, to indicate compliance with requirements for fire ratings, acoustic values, and continuity of building envelope.
  - g. Final details of major special items or conditions



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## Design Phase Deliverables and Submission Requirements

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- h. Final Door Schedules indicating door, frame and hardware types as well as fire and acoustical ratings.
  - 4. Structural Drawings
    - a. Final structural analysis indicating all static and dynamic loads on major structural elements.
    - b. Final Foundation Plan(s) showing type, location, size and depth of each foundation component.
    - c. Final Structural Plans for each floor and roof, indicating columns, beams, bearing and shear walls, slabs, decks, and other major structural elements, with typical sizing.
    - d. Final Structural Sections through foundations, below-grade construction, slabs on grade, walls, floors and roofs, with depths of structural elements.
    - e. Final plan and section details of typical structural conditions, including building movement and fire separation conditions.
  - 5. Food Service Facilities Drawings
    - a. Final Food Service Equipment plans and schedules with utility requirements and locations.
    - b. Final equipment product data and specifications.
    - c. Final Reflected Ceiling Plan indicating equipment and utilities.
  - 6. Plumbing Drawings
    - a. Final Plumbing Plans for each floor and roof showing utility entrances, locations and quantity of fixtures, equipment, pumps and drains, and all piping systems including sanitary, storm, domestic water, natural gas and radon mitigation, with sizing.
    - b. Final Riser Diagrams of sanitary, storm, domestic water, natural gas and radon mitigation systems, with main pipe sizes and equipment indicated.
    - c. Final equipment schedules identifying each type of fixture and item of equipment, with product data and specifications.
    - d. Final enlarged plans and/or sections for Kitchen, Mechanical and Pump Rooms, and other spaces with special plumbing requirements.
  - 7. Fire Suppression Drawings
    - a. Floor plans with performance criteria noting Use Group, hazard and hydraulic flow test summary and date of test.
    - b. Floor plans noting incoming fire water service size and location, zone control valve assemblies, standpipes, fire pumps, and other major components.
    - c. Enlarged plans of areas to be served by specialized fire protection systems such as dry pipe, pre-action, or chemical fire suppression systems.
  - 8. HVAC Drawings
    - a. Final floor plans showing HVAC system distribution drawings for all floors indicating equipment, piping, ductwork and unitary equipment. The following must also be indicated:
      - i. Double-line ductwork for all mains 24 inches and larger, with sizes noted.
      - ii. Single-line ductwork downstream of air terminal units to air devices.
      - iii. Double-line ductwork within shafts and mechanical rooms and for ductwork exposed to the outdoors and penetrating walls or roofs.
    - b. Final Riser and Flow Diagrams sufficient to describe basic system design.
    - c. Final mechanical equipment room layout(s) indicating equipment, piping and ductwork mains, and louvers, indicating all required shafts and soffits to and from

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## Design Phase Deliverables and Submission Requirements

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- mechanical equipment rooms.
  - d. Final Equipment Schedule (drawings or specifications) identifying all equipment. Indicate capacities, outside air quantity, location and area served by equipment.
9. Electrical Drawings
- a. Final lighting plans showing light fixtures, exit signs, and emergency lights, indicating controls and emergency lighting.
  - b. Final power floor and roof plans showing receptacles, panel boards, motor control centers, transformers, conduit bank routing/size from main electric room to electric closets and risers, HVAC and plumbing equipment, elevator motors, and communications outlets.
  - c. Final photometric plans demonstrating compliance with code and project requirements.
  - d. Final fire alarm riser diagram showing fire alarm control panels and typical components.
  - e. Final site plan showing utility transformer, incoming underground conduit bank to main electrical room, telephone/data conduit bank and other services, with manholes and related equipment.
  - f. Final site lighting plan with light fixture locations, photometric information and typical pole types.
  - g. Final electrical grounding grid plan, showing building grounding and typical details.
  - h. Final lightning protection plan showing all components and typical details.
10. Information Technology and Security Drawings
- a. Telecom floor plans indicating MDF, IDF and designated telecom spaces, including the following:
    - i. Entrance cabling (MPOE) and conduit paths.
    - ii. MDF to IDF conduit paths. Include bend radius where applicable to all conduits.
    - iii. Distribution paths from MDF and IDF locations to station drops.
    - iv. Paths and locations of wire trays, ladder racks, J-hooks, ceiling straps and any other distribution support systems. Display all bend radiuses.
  - b. Telecom floor plan with placement and count for all data drops. Include labels for all station drops.
  - c. Enlarged MDF and IDF floor plans indicating placements and clearances on all sides for two post telecom racks, server cabinets, free standing floor equipment, wall mounted equipment, power receptacles with NEMA type, overhead cable pathways and conduit entrances.
  - d. Enlarged MDF and IDF Sectional floor plans depicting rack elevations, wall mounted equipment; cross connect blocks, overhead cable pathway access points. The diagram shall list port densities per rack with relevant patch panel count(s). Include rack, patch panel and patch panel port numbering to match station labeling.
  - e. Line diagram indicating MDF to IDF cable types, conduits, and termination types.
  - f. Riser diagram depicting cable types, counts, and total length.
  - g. MDF / IDF grounding diagram, grounding points and continuity.
  - h. Equipment Schedule for cable routing and support systems, including J-Hooks, ceiling straps, wire trays, ladder racks and other distribution mechanisms.

### **B. Specifications**

Provide detailed technical specifications in the prescribed format describing the type and characteristics of all materials and systems to be incorporated in the Work. The specifications shall describe materials and systems in sufficient detail to demonstrate

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## Design Phase Deliverables and Submission Requirements

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compliance with Project requirements and shall identify requirements for submittals, quality assurance, warranties, and guarantees, as well as any requirements for LEED and Building Commissioning.

(Note: With Authority's prior approval, product data for proposed materials and systems may be submitted as a supplement to or in lieu of technical specifications provided such data clearly demonstrates compliance with project performance and other requirements.)

### **C. LEED Compliance**

1. Updated LEED Checklist identifying elements and features incorporated in design to achieve required LEED certification
2. Copies of any project submissions to USGBC

### **D. Building Commissioning Submissions**

(See Procedural Specifications)

### **E. Other Submission Requirements**

1. Supplementary Geotechnical Data required by code
2. Structural Calculations
3. Final load calculations for all energy and utility systems
4. Final energy model calculations using an approved energy modeling method
5. Final HVAC control diagrams and written sequence of operation of the HVAC system depicting control devices and components, safety devices, control and monitoring points, and other system components and equipment to be interlocked