



WAKE COUNTY
PUBLIC SCHOOL SYSTEM

DESIGN GUIDELINES
2019 Edition

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SUMMARY OF REVISIONS

Revision 2018 – Published June 18, 2018	
Section	Detail
All	Major design guideline revision. Assume changes to all sections. Please review thoroughly.

Revision 2019 – Annual Update February 2019	
Section	Detail
Various	Section updates include: 010800, 010810, 084113, 084113, 09 90 00, 114000, 114000, 116813, 230100, 230600, 230600, 230900, 230993, 265000,

Revision	
Section	Detail

Revision	
Section	Detail

Revision	
Section	Detail

DIVISION 01 - GENERAL CONDITIONS

01 01 00 GENERAL REQUIREMENTS

A. WCPSS DESIGN GUIDELINE INTRODUCTION

1. The WCPSS Design Guidelines are intended to define the Owner's Project Requirements for the design of WCPSS project sites and buildings. These Design Guidelines are to be utilized in conjunction with the WCPSS "Learning Environment Guideline Standards (LEGS)" and "Guidelines for Design and Construction of Energy-Efficient County Government Facilities and Schools". Project designers shall incorporate these requirements in to the project design. Any deviations from these guidelines shall be documented and reviewed with WCPSS staff. These guidelines shall not replace building code requirements. The guidelines are organized by CSI Masterformat 2004. Appendices include attachments, WCPSS standard specifications, and details referenced throughout the document.

The design guidelines are reviewed annually. Inquiries and proposed changes shall be submitted to WCPSS for review and assessment by the committee. To submit an inquiry or proposed change, please contact Amy Whitley at 919-588-3556 or awhitley@wcpss.net.

B. DEFINITIONS AND ABBREVIATIONS

1. Definitions:

- a) Throughout this guide, mandated requirements are differentiated from recommendations or commentary as follows:
- b) Mandates: Indicated by use of "shall", "will", "use", or "shall not", "do not"
- c) Recommendations or commentary: Indicated by words or phrases such as "should", "may", "it is recommended", and the like. Any such words or phrases indicate an option that is to be decided by the Designer.

2. Abbreviations:

- a) Owner: Wake County Public School System
- b) WCPSS: Wake County Public School System
- c) Designer: Design professional registered to practice in North Carolina. This shall be an architect for the design of all-new structures, additions, and renovations or alterations to existing structures. The scope of the architect's services shall include the services of professional engineers to design the structural, plumbing, mechanical, and electrical portions of the project. The services of the architect may be deleted and comparable services of an engineer or landscape architect may be substituted in lieu of where a project is almost entirely within the design realm of such professionals.
- d) ADA: The American's with Disabilities Act
- e) AHERA: Asbestos Hazard Emergency Response Act of 1987
- f) ASHRAE: American Society Heating, Refrigeration, and Air Conditioning Engineers
- g) ASTM: American Society for Testing Materials
- h) BOCA: Building Officials and Code Administrators International
- i) HVAC: Heating, Ventilation and Air Conditioning
- j) ICBO: International Conference of Building Officials

- k) NCSBC and/or State Building Code: North Carolina State Building Code including the following:
 - 1) North Carolina Existing Building Code
 - 2) North Carolina Fire Prevention Code
 - 3) North Carolina Mechanical Code
 - 4) North Carolina Plumbing Code
 - 5) North Carolina Electrical Code
 - 6) North Carolina Gas Code
- l) NEMA: National Electrical Manufacturer's Association
- m) NFPA: National Fire Protection Association
- n) NRCA: National Roofing Contractors Association
- o) OSHA: U.S. Occupational Safety and Health Administration
- p) SMACNA: Sheet Metal and Air Conditioning Contractors National Association, Inc.
- q) U.L.: United Laboratories, Inc.

C. DESIGN STANDARDS

- 1. Project design and construction shall meet all governing codes, standards, and regulations. These codes and standards shall supersede the WCPSS Design Guidelines in event of a conflict. Among the codes and standards to be complied with are the following:
 - a) North Carolina State Building Codes (latest editions) including the following:
 - 1) North Carolina Existing Building Code
 - 2) North Carolina Fire Prevention Code
 - 3) North Carolina Mechanical Code
 - 4) North Carolina Plumbing Code
 - 5) North Carolina Electrical Code
 - 6) North Carolina Gas Code
 - 7) Local municipal codes and ordinances
 - b) ADA Requirements
 - c) NEMA Standards
 - d) ASHRAE Guide (latest edition) including ASHRAE 90.1 and ASHRAE Standard for Energy Conservation in new buildings.
 - e) UL Standards (or compatible accepted standards by NCSBC).
 - f) NFPA Guide including the following:
 - 1) NFPA 17 – Standard for Dry Chemical Extinguishing Systems
 - 2) NFPA 31 – Standard for the Installation of Oil Burning Equipment
 - 3) NFPA 72 – National Fire Alarm and Signaling Code
 - 4) NFPA 90A – Standard for the Installation of Air-Conditioning and Ventilating Systems
 - 5) NFPA 90B – Standard for the Installation of Warm Air Heating and Air-Conditioning Systems

- 6) NFPA 91 – Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Particulate Solids
- 7) NFPA 96 – Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations
- 8) NFPA 101 – Life Safety Code
- g) ANSI Laboratory Ventilation Standard Z9.5
- h) AHERA Asbestos Hazard Emergency Response Act
- i) OSHA
- j) Local Zoning Ordinances
- k) WCPSS Learning Environment Guidelines – **LEGs Documents**

D. COMMISSIONING

- 1. Refer to Appendix B for Section 01 91 13 – General Commissioning Requirements.
- 2. Refer to Appendix B for Section 22 08 00 – Plumbing Commissioning Requirements.
- 3. Refer to Appendix B for Section 23 08 00 – HVAC Commissioning Requirements.
- 4. Refer to Appendix B for Section 26 08 00 – Electrical Commissioning Requirements.

E. ENERGY PERFORMANCE

- 1. WCPSS and Wake County Government have jointly established the following benchmarks for schools upon which to judge the project's success.

BUILDING TYPE	ENERGY BUDGET (BTU/SF/Year)	ENERGY GOAL (BTU/SF/Year)
K-5 Schools	39,600	32,400
Middle & High Schools	50,600	41,400
Gymnasiums	55,000	45,000

F. BID ALTERNATES:

- 1. Project bid alternates shall include add alternates as described in various sections of these guidelines.

G. MANUFACTURER PREFERRED ALTERNATES:

- 1. The following are WCPSS' Manufacturer Preferred Alternates to be included in the Contract Documents:
 - a) **Intrusion Detection / Burglar Alarm Panels and Associated Hardware**
 The Gemini Napco Security Group control panels and associated hardware support two-way communication with buildings or site automation systems. These products provide high-efficiency, superior performance, low maintenance, and have exhibited superior durability over other major alarm panels. The Gemini Napco Security Group provides equipment that is easily operated and maintained. Technical Support is available 24 hours a day either by phone or email. Value is added when this equipment is provided consistently throughout the WCPSS. In the unlikely event of a malfunction of any equipment, a replacement piece of equipment is readily available from another school site or in the warehouse. This item is being bid as an alternate due to the long term cost savings received through this product's quality, reliability, durability and availability.

b) Lighting Dimmers and Control Board

ETC theatrical dimming and control boards are designed for high-efficiency, superior performance, low maintenance, and have superior durability in comparison to other brands. The ETC format provides equipment that is easily operated and maintained. The training provided by the company at installation is superior to other brands and they provide on-site service as well as 24-hour emergency phone/email support. Programming of ETC equipment is consistent with our technical theatre curriculum making the product user-friendly to students and staff. Value is added when this equipment is provided consistently throughout the county. In the unlikely event of a malfunction, a replacement control board may be borrowed from one school to another. This item is being bid as an alternate due to the long-term cost savings received through this product's quality and durability.

c) Convection Oven

The Blodgett Electric and Gas single and double stack ovens are superior quality ovens that out lasts any other comparable convection oven now used in Wake County. Its standard dual pane thermal glass doors have excellent durability unlike other brands tested in the county and the oven racks can be adjusted to 11 different positions. The double stack ovens provide easy access to both ovens. Other brands are too tall and as a result the upper ovens in these other brands are rarely used by the staff. Wake County has tested the Duke, Southbend, Hobart, Franklin and Blodgett ovens. The Blodgett oven has proved to be the most durable. There are some Blodgett ovens that are still in use for over 20 years in the Wake County kitchens. We are requesting that this item be bid as an alternate due to its unique features and the long-term cost savings received through this product's quality and durability.

d) Food Processor

The Robot Coupe Model CL50E is a high quality food processor that has a continuous feed preparation system. Its exceptional durability holds up to commercial use unlike other food processors. This piece of equipment also has attachments with brand consistency from school to school, which allow the attachments to be interchanged, as program needs change. This machine also has an excellent labor and parts warranty. We are requesting that this item be bid as an alternate due to its reliability and the long-term cost savings received through the product's quality and durability.

e) Locks and Cylinders

Best cylinders and locks are high quality and provide superior performance, maintenance and durability in comparison to other brands. The service provided by this manufacturer representative is exceptional when compared to other manufacturer representatives. This product also improves the functioning of the maintenance department because the owner only has to stock replacement parts for one type of lock and cylinder. Using only one product reduces the overall required training and decreases the manhours required for repairs. Also, standardizing on Best allows the owner to keep (or form) a Grand Master keyway system which is an important security feature. We are requesting that this item be bid as an alternate due to the long-term cost savings received through the product's quality and durability.

f) Exit Devices

Precision exit devices by Stanley and Von Duprin exit devices by Ingersoll-Rand are high quality devices that provide excellent performance, maintenance and durability in comparison to other brands. In addition, they are heavier and have less moving parts, which result in fewer failures. These products also improve the functioning of the maintenance department because the owner only has to stock replacement parts for two types of exit devices. Using only two high quality products reduces overall required training and decreases manhours required for repairs while providing price competition. We are

requesting that these items be bid as an alternate due to their features and the long-term cost savings received through quality and durability.

g) Closers

Stanley Door Closers by Ryobi and LCN door closers by Ingersoll-Rand are high quality closers that provide excellent performance, maintenance and durability in comparison to other brands. In addition, they are heavier and have less moving parts, which result in fewer failures. These products also improve the functioning of the maintenance department because the owner only has to stock replacement parts for two types of closers. Using only two high quality products reduces overall required training and decreases manhours required for repairs while providing price competition. We are requesting that these items be bid as an alternate due to their features and the long-term cost savings received through quality and durability.

h) Web Based Controls

Honeywell, Johnson Controls and Schneider Electric are three manufacturers of digital control equipment that provide the Tridium AX system along with compatible field controllers. The use of these three manufacturers provides lower maintenance costs, quick, reliable and locally available authorized service, and consistent standards between schools, which provides ease of maintenance, and training.

i) Access Control Equipment

International Electronics Incorporated (IEI) provides access control equipment including plug-in door control modules, card readers and key pads, electric latch release power supplies, remote latch retraction devices, battery backup devices, power transfer modules and electric strikes. IEI provides a full spectrum of environmental and electrical testing of all product designs. In addition IEI provides adaptation to existing equipment and surface mounting component technology to adapt to already BOE approved door hardware. IEI products listed above have been tested for their reliability, proven performance, availability and technical support for all products. IEI equipment has been selected based on low cost of ownership, plug and play ease of use, and built in remote diagnostic capabilities. Value is added when equipment is provided consistently throughout the WCPSS. This item is being bid as an alternate due to the long term cost savings received through this product's quality, reliability, durability and availability.

j) Fire Alarm System Equipment

Siemens, SimplexGrinnell and Mircom are three fire alarm manufacturers that provide superior reliability, performance and durability over other major fire alarm panels. In order to keep downtime of the fire alarm life safety system to a minimum and reduce maintenance costs, M&O has found it very beneficial to develop specific standards for fire alarm design, installation, and acceptance. These fire alarm systems meet those standards and provide the high reliability required for life safety and property protection.

H. ALLOWANCES:

1. Use of allowances will typically occur during projects. If the Designer or Construction Manager uses allowances, provide a section in the specifications that summarizes all allowances. Contractors shall be required to show allowances as line items on the Schedule of Values.

01 02 00 DRAWING REQUIREMENTS

A. GENERAL DRAWING REQUIREMENTS

1. The Title Blocks shall include the following information:
 - a) Project Name
 - b) Project Address
 - c) Owner's Project Number
 - d) Owner's Project Manager's Name
 - e) Title of Drawing
 - f) Sheet Number (Format example in Appendix A – 01 02 00 – Attachment B: Drawing Sheet Numbering)
2. Please note the drawing sheet numbers shall be coordinate between disciplines such that the sheet number matches. Example: Mechanical Sheet M01.01 First Floor HVAC Plan would correspond with the Architectural Sheet A01.01 First Floor Plan and Electrical Sheet E01.01 and so on.
3. The title sheet of working drawings shall include site data, building data and building energy performance data. Copies of all UL Designs utilized for fire rated wall, column, floor, roof construction and wall penetrations shall be included on drawings. Any approved modifications (by North Carolina Department of Insurance or local building inspector) to the UL Designs shall be noted and evidence provided for permit review.
4. The working drawings shall also include a separate set of floor plans showing all code required fire rated walls, occupancy calculations, toilet fixture calculations, and egress travel distances. The landscape-planting plan shall designate which plants and planted area are required by local zoning ordinances and those which are not required.
5. Drawings shall be submitted electronically to WCPSS during the design process. Refer to Appendix A - 01 02 00 – Attachment A: Electronic Drawing Submittal Requirements.
6. Drawing Sheet Numbering: Refer to Appendix A - 01 02 00 – Attachment B: Drawing Sheet Numbering.
7. Drawing Sheet Font and Margins: Refer to Appendix A – 01 02 00 – Attachment C: Drawing Sheet Font and Margins.
8. Refer to Appendix A – 01 02 00 – Attachment D: Design Review Delivery and Formatting Guidelines for submittal information.
9. Refer to Appendix A – 01 02 00 – Attachment E: File Deliverable Requirements for submittal information.
10. Text: All text shall be minimum 3/32-inch tall at full size to maintain legibility when printed at a 50% reduction.
11. Key Plan: Provide building key plan on all floor plan sheets.
12. Legend, Symbols and Abbreviations: Provide a complete legend, symbol and abbreviation list on the first sheet of each discipline.
13. Show all MEP equipment to scale including panel boards, fire alarm panels, mechanical equipment, and plumbing equipment.
14. Maintenance Clearances:
 - a) Show dotted lines on floor plans of all mechanical rooms and all other heavily concentrated areas to designate pull spaces for equipment, (coils, motors, etc.) and maintenance space for equipment (filter change out, lubrication, belt replacement, bearing replacement, compressor replacement, valve maintenance, etc.).

- b) Show minimum of three (3) ft. of clearance around all mechanical and electrical equipment including wall clearances. Show greater clearance where recommended by manufacturer.
 - c) Show dotted lines on floor plans to designate clearance requirements for plumbing, mechanical, and electrical equipment.
15. Plumbing, Mechanical and Electrical Equipment: Indicate all equipment on plans including panel boards, fire alarm panels, sound panels, water heaters, etc.
 16. Show all fire rated walls on all drawings for all trades with the rating spelled out or show different wall symbol for each rating (1hr, 2hr, or 4hr).

B. PLUMBING DRAWING REQUIREMENTS

1. Plumbing Equipment Rooms: Provide an enlarge scale (1/4-inch = 1 foot) plan for each equipment room.

C. MECHANICAL DRAWING REQUIREMENTS

1. Mechanical Equipment Rooms: Provide an enlarge scale (1/4-inch = 1 foot) plan for each equipment room. The plan shall include maintenance clearances and key coordination items with other trades.
 - a) Provide two section details of each equipment room.
 - b) Provide isometric view of each equipment room.
2. Piping System Diagrams: Provide a complete piping system schematic for each major piping system. Include flow rates at each major piece of equipment, pump and coil.

D. ELECTRICAL DRAWING REQUIREMENTS

1. Show details of all conduit penetration details on the drawings for all fire rated walls to meet UL and the North Carolina Building Code requirements.
2. Electrical Equipment Rooms: Provide an enlarge scale (1/4-inch = 1 foot) plan for each equipment room.

E. BUILDING IDENTIFICATION AND ROOM NUMBERING

1. Each building will have a designated building identification letter as assigned by WCPSS Facility Assessment Dept.
 - a) New standalone buildings will be issued a new designated building identification letter based on the project campus building history.
 - b) Additions to existing buildings will retain the existing building identification letter.
2. All buildings shall have assigned floors per the following definitions:
 - a) Basement – Lowest part of a building that is below grade and requires a stairwell and/or ramp to grade for exiting.
 - b) Lower Level – Building area that will have a minimum of one and up to three elevations under grade, and require a minimum of one and up to three elevations that have entry/exiting at grade.
 - c) Main (1st) Floor – Building area that all elevations are at or above grade and will have a minimum of one elevation that has entry/exiting at grade. Building administration area is usually located on this floor.
 - d) Upper Floors – Building areas that are located above main (1st) floor and are accessible by stairs and elevators.

- e) Mezzanine – Building area that is dedicated for mechanical equipment that are located above assigned floors. Access shall only be from a dedicated stair and/or ladder. Mezzanines will be assigned from the floor level that provides access (example, 1st floor mezzanine, 2nd floor mezzanine, ect).
 - f) Penthouse – Building area that is dedicated for mechanical equipment. Access shall only be from the roof.
 - 1) Mechanical areas at a roof level that is accessed from an interior main stairwell will be considered a floor.
 - 2) Mechanical areas at a roof level that is accessed from a dedicated interior stair and/or ladder will be considered a mezzanine.
3. All building spaces shall be assigned a room number.
 4. All room numbers shall have four digits. Where there are additional rooms located within a room, suite and secondary corridor, the room numbering will be a combination of numbers and one letter after the four digit numbers (example, room number 1210, additional room numbers 1210A, 1210B, ect).
 5. Basement and/or Lower Level floor room numbers shall start with the number “0”.
 6. Main and Upper floor numbers shall start with its designated floor level number.
 7. Two spaces shall not receive the same number even though they may be accessed by a door.
 8. Number rooms in each area of the building in sequence order to aid in locating rooms (example, the Administrative/Media wing could be 1100-1199, Kindergarten/First Grade wing could be 1200-1299, Second/Third Grade wing 1300-1399, etc. For a second story, the numbers above those wings would be 2100-2199, 2200-2299, 2300-2399, etc).
 9. Number rooms on primary corridors consecutively with even numbers rooms on one side of a corridor and odd numbers rooms on the opposite side.
 10. Primary corridors for each wing shall end with “00”. Additional primary corridors and vestibules located in a particular wing shall end with a letter (example, main corridor 1200, additional corridors and/or vestibules 1200A, 1200B, ect).
 11. Rooms, suites and/or secondary corridors located off primary corridors shall have an assigned room numbers in sequencing order.
 12. Collaborative learning and/or locker alcove spaces adjoining primary corridors shall have an assigned room number in sequencing order.
 13. Rooms divided by folding/moving partitions shall have the same assigned room number with a letter designating each area (example, 1220A, 1220B).
 14. Mechanical, Boiler and Electrical Rooms: Each shall have a four digit room number in sequencing order from adjacent room numbers.
 - a) Mechanical rooms shall be designated “Mechanical”.
 - b) Boiler room shall be designated “Boiler”. Rooms that have both boilers and mechanical equipment shall be designated “Boiler”.
 - c) Electrical rooms shall be designated “Electrical”.
 - d) Communication/network closets shall be designated “Communications”
 - e) Fire Riser rooms shall be designated “Fire Riser”.
 15. Outdoor storage rooms shall be assigned a four digit room number and designated “Storage”.
 16. Refer to 10 14 00 Attachment A for room name requirements.
 17. Designer to confirm approval of room numbering sequencing from WCPSS Facilities Assessment Dept. prior to start of CD phase.

F. GENERAL PROJECT INFORMATION

1. Building Code Summary: Provide Building Code Summary (NC State Building Code Administrative Code and Policies, Appendix B) for each building including the mechanical and electrical sections.
2. Life-Safety Rated Assemblies: Clearly indicate all life-safety rated partition, barrier, wall, floor and ceiling assemblies and their ratings.
3. Life-Safety Penetration Details: Provide UL listed details for all life-safety rated assemblies and associated penetrations including details for duct, piping, conduit, and cabling.
4. Electrical Connections: Provide standard electrical connection detail on plumbing and mechanical sheets. Refer to discipline specific details included in Appendix C.
5. Site Development Design Considerations:
 - a) There are various issues, which need to be addressed in the site design of a school. The considerations include:
 - 1) The allowance for future building expansion and accommodation of future re-locatable classrooms.
 - 2) The development of circulation patterns that separate pedestrian from vehicular traffic, the bus drop/parking from the parent drop off and staff parking from student parking.

- 3) Main building entrances which are readily identifiable.
- 4) Building orientations and configurations which conserve energy and allow for natural day-lighting and ventilation.
- 5) The utilization of exterior terraces/patios for outdoor learning areas.
- 6) Providing handicap accessibility to all buildings and play areas as per Building Code and ADA Requirements.
- 7) The identification and preservation of natural site features such as rock outcroppings and wooded area to be used to enhance the science program.
- 8) Minimize the building's environmental impact on the site, i.e.:
 - a. Run-off control (watershed issue)
 - b. Minimize excavation
 - c. Protect trees
 - d. Minimize grounds maintenance
 - e. Protect wetlands
- 9) Projects within the City of Raleigh and Cary shall be required to comply with City of Raleigh Stormwater Management Policy.
- 10) Do not show any temporary or permanent construction on property not owned by WCPSS without the proper easements or acquisitions.

6. Building Expansion and Re-locatable Classrooms:

- a) The planning for future building expansion and re-locatable classrooms shall consider grading, circulation patterns and utility stub outs. Allow for four (4) future mobile units at Elementary School sites and for six (6) future mobile units at Middle and High School sites.
- b) Mobile units cannot be set closer than 30 ft. from the main building and must maintain a minimum of 20 ft. between mobile units. The distance between mobile units is measured building to building. Stairs and ramps are constructed within this 20 ft. area at opposite ends of one another.
- c) Mobile units must be within 200 ft. of a fire hydrant or a fire lane must be provided for access to the units.
- d) The maximum distance from mobile units to toilets/restrooms shall not exceed 200 ft. (or maximum distance allowed per code).
- e) If a portable toilet facility is required, the maximum distance from any mobile unit to the main permanent building shall not exceed 400 ft.
- f) Electrical service to each mobile unit shall be a minimum of 100 amp service.
- g) The Intercom system shall be sized to accommodate the future mobile units. Provide raceway from building stubbed out underground in the vicinity of the future mobile units.
- h) The WCPSS technology department shall be contacted regarding number of cables and requirements for data connections to mobile units. Provide raceway from building stubbed out underground in the vicinity of the future mobile units.
- i) Access to site for mobile units should be a minimum of 25 ft. clear for delivery with a turning radius to accommodate a rig approximately 50 ft. in length.

7. Bus Drop-off, Parent Drop-off and Parking Traffic:

- a) These three (3) functions shall be separated as much as possible. At all drop off areas, the discharge or pick-up of students at the loading-unloading zones shall be from the side of the vehicle opposite the driver and towards the building.

- b) Parking bays for full-service buses shall be a minimum of 15 ft. wide x 45 ft. long.
- c) Backing up of buses shall not be permitted.
- d) A minimum turning radius of 40 ft. shall be provided at bus driveways and parking areas.
- e) Linear sidewalks shall be provided at each loading/unloading area.
- f) All primary building entrances used for students shall be protected from weather by overhead cover or soffit. It is recommended that each loading/unloading area have a covered canopy and covered walkway leading into the building.
 - 1) At larger schools it is recommended the bus drop canopy be a minimum of 12 ft. and 50 ft. long and walkway canopy to the building be a minimum of 8 ft. wide.
 - 2) Bottom of canopy soffits shall be a minimum of 10 ft. above finish grade at bus drops.
 - 3) Columns supporting canopies shall be set back from curbs a minimum of 4 ft. to allow car or bus doors to open.
 - 4) Canopies shall be designed to discourage roosting of birds.
- 8. Service Docks: It is recommended service docks be covered or partially covered.
 - a) Dock height should be at 48 in.
 - b) Use concrete and not asphalt for dock surface.
 - c) Provide bumper blocks on face of dock.
 - d) No bollards shall be located between dumpsters and docks.
- 9. Also recommended is the use of deciduous trees for summer sun shading, winter sun penetration and use of conifer trees for summer sun shading and winter wind breaks
- 10. Enclosed courtyards often present maintenance problems and should be used with great discretion. If used, provide for maintenance access and do not install large tree plantings. Provide wall hydrants and/or hose bibbs and adequate sized storm drain structures.
- 11. Retaining Walls: All retaining walls with height of 5 ft. or greater or walls subjected to surcharge loading (i.e., vehicle traffic, sloping backfill, or point loads) shall be designed by a professional engineer and drawings shall be signed and sealed accordingly.
- 12. Playgrounds: Shall be provided as per program requirements.
 - a) Playground equipment to be supplied and installed by the WCPSS. Contractor to provide a flat subgrade area with draining and curb at perimeter. Playground equipment to be installed on a poured in place, ADA compliant, soft rubber surface, installed over a concrete pad. Size of surface shall be determined from equipment manufacturer's requirements. Access to playground equipment shall meet ADA requirements. Refer to Section 11 68 13 for playground equipment. Please contact Elizabeth Sharpe with WCPSS for additional details.
- 13. Exterior Mechanical Areas: Shall be enclosed with security fencing. Provide reinforced concrete slab with fenced area with proper sized pads/curbs for equipment mounting. Slope slab away from building. Refer to Section 32 31 00 Fencing for security fencing.
- 14. Bike Racks: Two (2) bike racks capable of holding 8 bikes each shall be supplied and installed by Contractor. Verify with local municipality for required number of racks.
- 15. Boiler Rooms: Shall have exterior door only with no windows allowed in door.
- 16. Main Mechanical Equipment Rooms: Shall have FRP exterior doors where possible with no windows allowed in door.

G. CALCULATION SUMMARIES

1. Design Energy and Water Calculation Summaries: Provide design calculation summaries in tabular form on the first sheet of each trade. Include data for anticipated future loads when included in the design.
 - a) Building assembly U-values
 - b) Heating (MBH) and cooling (tons) loads
 - c) Domestic hot and cold water demand (fixture units)
 - d) Electrical connected load (kW)
 - e) Electrical estimated peak demand (kW)
 - f) Gas connected load (cfh)
2. Ventilation Calculation Summaries
3. HVAC Load Calculation Summaries: Provide a copy of all load and energy calculations to WCPSS at the Design Development Phase submittal.

H. FUTURE EXPANSION

1. P/M/E Systems: Clearly indicate on the bid documents allowances for additional capacities and provisions for future expansion.
 - a) All points for future connections shall also be clearly shown and labeled on the drawings with the capacity (GPM, Tons, kW, etc.) that is available for future at each connection point.

I. RECORD DRAWINGS

1. The final drawings submitted must have a "Record Drawing". The contractor shall turnover marked up "As Built" drawings to the architect prior to Final Completion. Upon receipt of "As Built" drawings, the architect has 30 days to submit to WCPSS the final Record drawing files.

01 03 00 SPECIFICATION REQUIREMENTS

A. GENERAL SPECIFICATION REQUIREMENTS

1. The Advertisement for Bids, Information for Bidders, Form of Proposal, Bid Bond, Sample Agreement, Minority Business Enterprises, MBE Contractor Database, General Conditions, Supplementary Conditions, Temporary Facilities, Unit Cost/Allowance Definitions, and Construction Schedules and Reports sections of the specifications will be furnished by the Owner to the Designer.
2. Project Manual Specifications shall follow CSI Master Format 2004.
3. The requirement for electronic drawing submittals are contained in Attachment 01 02 00-A Electronic Drawing Submittal Requirement.
4. The Design Consultant shall submit to owner at 100%CD submittal, square foot take off quantities for grass area, landscape planted area, each type of asphalt paving and each type of floor finish.
5. The Design Consultant shall submit to owner at 100%CD submittal, a measurement of "Gross Square Footage". This shall be an accurate measurement of the overall area of each building, using the following criteria:
 - a) Gross Square Footage (GSF): The entire area of the building within the outside face of the exterior walls:
 - 1) Rooms extending vertically through more than one floor level (Auditoriums, Gyms, Lobbies) are counted only once, at the level of the room's floor, except for balconies with seating.
 - 2) Stairs and shafts for elevator and utility are counted at each floor level.
 - 3) Mechanical rooms, pipe chases, etc. with 7'-0" or higher ceilings are counted at 100%.
 - 4) Mechanical rooms and pipe chases with ceiling of 7'-0" or lower are counted at 50%.
 - b) Not included in GSF:
 - 1) Exterior terraces and courtyards, balconies
 - 2) Covered walks between buildings, bus canopies, car drop-off canopies
 - 3) Exterior covered areas
 - 4) Mechanical mezzanines and penthouses including the stairs serving them
 - a. These are spaces that could not be converted to program space even if the mechanical equipment was removed
 - 5) Minor projections (pilasters, etc.) extending beyond the outside face of the building
 - 6) Roof Overhangs
 - 7) Loading Docks (covered and uncovered) even if included in the program

NOTE: Program space square footage should be counted regardless of the above criteria (e.g. Spot deck in a high school is included since it is programmed space. Catwalk is not, because square footage is included elsewhere.
6. The General Requirements section of the specifications will be written by the Designer. It shall address coordination of Prime Contractor's work (single prime or multi-prime), project meetings, temporary heating, operation of HVAC system (use of filters to be required during construction), shop drawing review, specific site use requirements, cutting and patching, the asbestos statement noted in Section 02 26 00 and project close-out requirements. Design Consultant shall obtain current close-out requirements from WCPSS Project Manager.

B. MECHANICAL SPECIFICATION REQUIREMENTS

1. Energy Efficiency: Specify minimum energy efficiency performance for each item designed to exceed the required minimums defined in the NC Energy Conservation Code.

01 07 00 CLOSE OUT REQUIREMENTS

A. ASSET INFORMATION

1. The WCPSS Maintenance Department will collect and development all equipment inventory information for updating the maintenance management system. Refer to Attachment 01 07 00-A - Asset Information Requirements, Attachment 01 07 00-B – Equipment Designations, and Attachment 01 07 00-C Data Collection Sheets.

B. OPERATION AND MAINTENANCE MANUALS

1. The contractors shall deliver one complete set of bookmarked manuals in electronic PDF format of all operation and maintenance manuals to the Owner through the Designer, two (2) weeks before the pre-final inspection is held. The manuals shall be bookmarked to a minimum of one level – ie: each major piece of equipment (chiller, boiler switchboard, water closet, water heater, etc.) or document category (warranties, parts list, contact information, etc.) The manuals shall be delivered by one of the following:
 - a) USB Drive
 - b) CD/DVD
 - c) Downloadable file from FTP Site
2. Manuals shall include the following (at a minimum):
 - a) Index and page numbers
 - b) Certificate of Substantial Completion
 - c) Summary sheet of warranties with dates noted and a copy of all warranties
 - d) List of all subcontractors and suppliers with names, addresses, and phone numbers
 - e) Special Inspection Reports
 - f) Certified Test and Balance Report
 - g) Complete start-up, operation, and shutdown procedures for each system including sequence of events, locations of switches, emergency procedures, and any other critical items.
 - h) Lubrication schedules and types of lubricants.
 - i) Complete set of all submittal data and current shop drawings (including 3rd party generated shop drawings) and equipment description showing all capacities and other operation conditions.
 - j) Equipment summary showing all capacities and ratings (HP, Tons, kW, filter size, etc.)

C. WARRANTIES

1. All work shall be fully warranted for one year from the date of substantial completion by the contractor who shall replace any defective materials and repair any defective workmanship. In addition, written warranties shall be provided for the following products and time periods. These warranties shall include any material and labor cost to repair defective materials and correct defective workmanship.
2. 5 YEAR WARRANTY:
 - a) Soil Termiticide Treatment (Division 31)
 - b) Wood Doors (Division 08)
 - c) HVAC Compressors including Refrigeration (Division 23)

- d) Elevator
- 3. 10 YEAR WARRANTY:
 - a) Glass and Glazing Materials (Division 08)
 - b) FRP Door System (Division 08)
- 4. 10 YEAR NO DOLLAR LIMIT "SYSTEM" WARRANTY:
 - a) Operable Partitions (Division 10)
 - b) Fluid-Applied Roofing (Division 07)
 - c) Lightweight Insulating Concrete System (Division 07)
- 5. 20 YEAR NO DOLLAR LIMIT WARRANTY:
 - a) Sheet Metal Roofing (this shall include a single source for full 20-year warranty period, weather-tightness, warranty including coverage for: finish cracking, peeling and/or color fading) (Division 07)
- 6. 20 YEAR NO DOLLAR LIMIT "SYSTEM" WARRANTY:
 - a) Modified Bitumen Roofing (Division 07)
 - b) Single Ply Membrane Roofing (Division 07)
- 7. 25 YEAR WARRANTY:
 - a) FRP Door (Division 08)
- 8. 30 YEAR WARRANTY:
 - a) Asphalt Shingle Roofing (Division 07)

D. FINAL INSPECTIONS

- 1. Each project shall have both a pre-final and final inspection made before it is finally accepted by the Owner. A complete and thorough training shall be conducted by the design consultant(s), contractors and subcontractors for the WCPSS Maintenance Department after the pre-final inspection.
- 2. The pre-final inspection shall be held with the Owner, Designer, and all Contractors and Subcontractors after all systems are in place and in operation. All contractors shall demonstrate to the Designer and Owner that all systems in the building are properly installed, balanced, and performing as designed and specified. All Contractors and Subcontractors shall attend this inspection including the HVAC air and water balance subcontractor. The Designer will generate a final punch list from this pre-final inspection and distribute to the owner and all applicable contractors and subcontractors.
- 3. The final inspection shall be held with the Owner, Designer, all Contractors and Subcontractors to demonstrate to the Owner that all systems in the building are operating as designed and to their satisfaction and that all punch list items have been completed.
- 4. The final turnover meeting shall be held with the Owner, Designer, and all Prime Contractors to officially "turn over" the building to WCPSS. At this meeting, any questions are responded to about operation or maintenance of the building. At this point, the Contractors will move off of the site completely.

E. SUBSTANTIAL COMPLETION

- 1. Substantial Completion is the date that the Owner and Designer determine the project is complete enough for the Owner to achieve beneficial occupancy. It is also the date that begins the warranty periods. Please refer to the CMAR Contract or the General Conditions

Section of the Specifications, as applicable, which will be furnished by the Owner for detailed listing of Substantial Completion requirements.

F. FINAL COMPLETION

1. Please refer to the CMAR Contract or the General Conditions Section of the Specifications, as applicable, for a detailed listing of documentation, certification and submittals required for Final Completion and Final Payment.

G. RECORD DRAWINGS (AS-BUILTS)

1. The Designer shall specify that during construction operations the Contractor shall faithfully record all changes from the contract drawings, including accurate dimensions where applicable including invert elevations for all below-grade outside utilities with reference to permanent above-grade objects.
2. The Designer shall also specify that at completion of the work all such changes shall be recorded neatly with red ink by the contractor on an unused set of the contract drawing prints supplied by the Designer. The red line changes shall be reviewed by the Designer who shall modify all contract drawings to reflect and incorporate all field changes.
3. Refer to Attachment 01 02 00-A Electronic Drawing Submittal Requirement.

H. POST INSPECTIONS

1. A post construction inspection shall be held by the Designer with the Contractors and Owners prior to expiration of the 1 year warranty period. It shall address general construction as well as plumbing, HVAC, and electrical work. All problems discovered during this inspections that relate to defective materials or defective workmanship shall be corrected by the Contractor at no additional cost to the Owner.

01 08 00 PERFORMANCE REQUIREMENTS – ENERGY CONSERVATION

A. ENERGY CONSERVATION

1. Reference is made to the “Wake County Guidelines for the Design and Construction of Energy-Efficient County Government Facilities and Schools”, June 2004. The document may be downloaded from the WCPSS website. See the Supplemental Documents link for further information.
2. Any discrepancies between the WCPSS Design Guidelines and the Energy Design Guideline shall be resolved by following the WCPSS Design Guidelines.

01 08 10 FACILITY PERFORMANCE SUSTAINABILITY GUIDELINES

A. FACILITY PERFORMANCE SUSTAINABILITY GUIDELINES

1. WCPSS does not pursue USGBC LEED® Certification but does endeavor to design and build buildings that model the LEED standards. Please utilize LEED v4 BD+C for Schools standard and checklist as a metric to gauge WCPSS design sustainability.
2. The design team shall review and submit the LEED v4 BD&C checklist at each project phase and provide WCPSS feedback on sustainability. Refer to Attachment 01 08 10-A for the checklist.

DIVISION 2 – EXISTING CONDITIONS

02 41 00 ASBESTOS AND LEAD-BASED PAINT

A. GENERAL

1. . No asbestos containing building materials shall be used in the construction of the project. The design consultant will be required to submit a signed statement “No asbestos containing building material was specified as a building material in any construction document for the project, or to the best of the consultant’s knowledge, was used in the building.”
2. If any materials suspected to contain asbestos are encountered in demolition or renovation work, the Owner’s “AHERA DESIGNEE” shall be immediately contacted to arrange an investigation and testing of these materials. The Owner will then determine if the removal will be included in the project construction contract or if the removal will be by a separate contractor hired separately.
3. All projects occurring on existing campuses are required to include in specifications the notice to contractors, subcontractors and short-term workers regarding asbestos containing building materials that may be present in the existing buildings (See Appendix A - 02 41 00 – Attachment A).
4. It shall also be required that all contractors and subcontractors return the completed certification form (included in Appendix A - 02 41 00 – Attachment B) prior to beginning work.
5. Demolition of, or renovations to existing buildings may encounter lead based paint. WCPSS/FD&C shall, through a third party consultant, perform inspections and reporting for all hazardous materials including but not limited to asbestos, lead based paint, and underground storage tanks. Design consultants shall request a lead paint report from the WCPSS Director of Environmental and Grounds (919) 856-8120 for existing building. If lead paint is present, the design consultant shall be responsible for notifying all contractors of the possibility of encountering lead paint. The design consultant shall include a summary of the lead paint report in the contract documents, identifying the extent of the existing lead paint. The contractor shall be responsible for removal and/or containment of the lead paint in the areas identified in the contract documents as required by OSHA Standards. Contractor shall be required to employ an accredited lead based paint abatement designer and EPA Certified contractor/renovator and coordinate these activities with the WCPSS Director of Environment Health & Safety. Contractor to be responsible for all costs and schedule implications associated with the abatement and/or containment of the lead paint. If any materials suspected to contain lead paint are encountered in demolition or renovation work outside of the areas identified in the contract documents, the WCPSS Director of Environmental and Grounds (919) 856-8120 shall be immediately contacted to arrange an investigation and testing of these materials.

02 41 16 SELECTIVE DEMOLITION

A. GENERAL

1. Equipment and Furnishings Removal: The Designer and Project Manager shall schedule time for Owner to remove material and equipment to be salvaged. Owner may designate potential items of historical significance for salvage.
2. Contractor shall legally dispose of demolition waste off-site.
3. Ensure that existing facilities are maintained in weather tight condition throughout construction duration.
4. Ensure that building components necessary to maintain the structural and fire-rating integrity of the existing building are not altered.
5. Consider sequence and process of selective demolition to minimize noise, dust, and other deleterious conditions relative to Owner's occupancy of adjacent spaces.
6. Protect existing utilities from damage during demolition. Contractor is to arrange acceptable utility shut-off times with Owner.
7. Consider sequence and locations for providing temporary barricades and other protection necessary to prevent personal injury and damage to adjacent construction.
8. All existing underground site utilities not utilized shall be completely removed, not abandoned.
9. When removing existing underground site utilities, the trenches shall be backfilled with compacted material, not #57 stone.

DIVISION 03 – CONCRETE

03 30 00 CAST-IN-PLACE CONCRETE

A. GENERAL

1. . Codes and Standards: Comply with applicable provisions of ACI 301 “Specifications for Structural Concrete for Buildings”, ACI 318, “Building Code Requirements for Reinforced Concrete”, and ACI 347, “Recommended Practice for Concrete Formwork”.
2. . Testing: Owner’s testing laboratory will perform sampling and testing as indicated in Field Quality Control paragraph.
3. . Field Quality Control: During placement of concrete the following tests and sampling shall be made:
 - a)) Sampling: ASTM C 172 b) Slump: ASTM C 143
 - c) Air Content: ASTM C 173
 - d)) Compressive Strength: ASTM C 39, one specimen tested at seven (7) days, and one specimen tested at twenty-eight (28) days, and one retained for later testing if required.
4. . Concrete Mixes: Contractor shall employ an acceptable testing laboratory to perform materials evaluation and testing, and to design concrete mixes.
5. . Recycled Materials: The use of 20% fly ash and/or 30% slag is permissible.

B. PRODUCTS

1. . Concrete: Use air-entraining admixture in all concrete specified by engineer, providing not less than 4% nor more than 6% entrained air for concrete exposed to freezing and thawing, and from 2% to 4% for other concrete. Do not allow air content of trowel-finished interior floor slabs to exceed 3 percent. Unless otherwise noted, all concrete shall have a twenty-eight (28) day strength of at least 3000 psi. When placed, concrete shall have a slump between 3 and 5 inches.
2. . Vapor Retarder: Shall meet the requirements of ASTM E 1745, Class B, five-ply, nylon or polyester cord reinforced high density polyethylene sheet, 15 mils thick.
3. . Anti-freeze: Admixtures shall not be permitted.
4. . Epoxy Seal: Shall be utilized on exposed concrete floors.
 - a)) Allow concrete to cure for 30 days prior to application of seal.
 - b)) Follow manufacturer’s recommendation for surface preparation.
 - c) Apply two (2) coats of clear solvent base epoxy seal.
 - d)) In the event that North Carolina changes its ambient air quality standard preventing the use of a solvent base, a water base epoxy seal shall be utilized.

C. EXECUTION

1. . Slab Control Joints: Construct using premolded key joints, inserts, tooled joints, or saw-cut joints. Minimum depth of control joints shall be one-fourth (1/4) of the slab thickness. Maximum spacing of joints shall be 36 times the slab thickness or 18 feet, whichever is smaller. Isolate all slabs from exterior walls.
2. . Reinforcement: Position support and secure reinforcement against displacement. 3 . Placement: Comply with ACI318.
4. . Surface Tolerance:
 - a)) For floors less than 10,000 sq. ft. in size: Finish and measure surface so gap at any point between concrete surface an unlevelled, freestanding, 10-ft.-long straightedge

resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.

- b)) For floors greater than 10,000 sq. ft. in size: Finish surfaces to the following tolerances, according to ASTM E 1155 (F-Number System), for a randomly trafficked floor surface:
- 1) For carpeted slabs: Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
 - 2) For thin floor coverings on slab-on-grade floors: Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17
 - 3) For thin floor coverings on suspended concrete floors: Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15.

DIVISION 4 – MASONRY

04 20 00 UNIT MASONRY

A. GENERAL

1. Cavity wall (masonry veneer/air cavity/concrete masonry unit backup) and veneer wall (masonry veneer/air cavity/steel stud backup construction) is strongly recommended at exterior masonry walls.
2. Control joints, expansion joints and flashing shall be located and installed per the recommendations of the Brick Institute of America and National Concrete Masonry Association, and be clearly indicated in the construction documents.
3. Use of load-bearing wall construction is acceptable (e.g. gyms, cafeterias), except where future flexibility of openings may be required. Obtain consent of Owner prior to design development phase for load-bearing wall locations.
4. Where masonry walls supported by elevated floor construction abut ground supported walls, horizontal expansion joints shall be provided to allow for deflection of elevated walls.
5. Sample mockup panels shall be required for approval by Owner.
6. Cold Weather Masonry Precautions: Masonry may be laid when the temperature of the outside air is below 40 deg. F. if protected in accordance with requirements of TMS 602/ACI 530.1/ASCE 6. Accelerator or water-reducing admixtures are not recommended for cold weather masonry work.
7. Hot Weather Masonry Precautions: Comply with TMS 602/ACI 530.1/ASCE 6.

B. PRODUCTS

1. Comply with General Masonry Standard TMS 602/ACI 530.1/ASCE 6.
2. Where fire-ratings are required, provide products listed and labeled by qualified testing agency for assemblies indicated.
3. Concrete Masonry Units:
 - a. Comply with ASTM C90.
 - b. Units shall include integral water repellent.
 - c. Concrete masonry units shall be kept free from coal cinder aggregate, waste products, organic impurities, and any other deleterious substance that will cause rusting, staining or pop outs. Blended and lightweight concrete masonry units free from the above impurities and substances are acceptable for use.
 - d. Provide special shape bullnose units at outside corners of interior CMU wall construction at all locations, including window openings, pilasters, etc. Provide square-corner units at first course above finish floor, and immediately below ceiling line.
4. Clay Face Brick:
 - a. Comply with ASTM C216.
 - b. Grade: SW.
5. Masonry cement: Comply with ASTM C91/C91M.
6. Mortar: Comply with ASTM C270.
7. Grout: Comply with ASTM C476.
8. Provide mortar net in cavity a minimum of 12" vertically above all through-wall flashing locations.
9. Pre-cast and/or pre-stressed concrete masonry components, including U-lintels, sills and other functional or decorative pieces are permitted if proper engineering documentation is provided.

C. EXECUTION

1. Professional workmanship shall be maintained. Masonry units shall be plumb, level, and in alignment. Provide running bond pattern with not less than 4" exposed faces at corners or jambs.
2. Protect open tops of cavity walls during construction to prevent rain infiltration.
3. Control runoff of water used for cleaning masonry.
4. All enclosed planters must have minimum 1 inch diameter weep holes every 6 ft. horizontally.
5. If any wall of planted area encloses a heated space, waterproofing shall be used from footing to finished grade.
6. Cavities shall be kept clean of mortar drippings. Provide 2" minimum air cavity between insulation and rear face of exterior masonry veneer.
7. Do not use raked mortar joints.
8. Flush masonry wall construction is preferred. Special shape (sloping) units shall be used at projecting courses. No horizontal ledges shall be allowed (minimum 10% slope to drain).
9. Direct particular attention to the design and installation of through-wall flashing.
10. Through-wall flashings shall be located at first floor location wall bases, windows sills, heads of openings, shelf angles, tops of walls and roofs, above projections and at other discontinuities in the cavity.
11. Lap continuous flashing pieces at least 6 in. and seal laps.
12. Provide stainless steel drip edge extending beyond face of masonry wall at through-wall flashing locations.
13. Turn up the ends of discontinuous flashing to form end dams, extend flashing beyond the exterior wall face. Provide solid one-piece end dams at all jamb locations.
14. Terminate UV sensitive self-adhering high-temperature flexible flashings (minimum 200 degree melting point) with a stainless-steel drip edge. Prime stainless steel drip edge prior to adhering to through-wall flashing membrane.
15. The elevation of wall base flashings and weeps shall be above planting beds, ground covers, sidewalks, etc.
16. Provide continuous watertight stainless steel flashing under all precast, stone and/or brick rowlock coping.
17. At all interior and at exterior expansion joints adjacent to high traffic areas vandal resistant. Metal covers shall be provided.
18. Provide silicone sealant for all masonry expansion and control joints for joint widths up to 1". Larger joints shall receive prefabricated expansion joint assemblies.
19. Provide temporary formwork to support overhead masonry at all openings until masonry is fully cured.
20. Return masonry at wall openings to provide 1" minimum extension beyond the jamb face of the window/door frame to facilitate installation of backer rod and sealant.
21. Provide 3/8" minimum joint width between masonry and door/window frames to allow for proper installation of joint backer rod and sealant.
22. Provide weep vents in exterior veneer wythe at top course immediately below through-wall flashings and top-of-wall copings, to allow for air movement and pressure equalization of cavity.
23. Contract Documents shall indicate to protect all open walls from rain events during construction.

DIVISION 5 – METALS

05 50 00 METAL FABRICATIONS

A. GENERAL

1. Codes and Standards: Comply with applicable provisions of ANSI/AISC 360 “Specification for Structural Steel Buildings” and AWS “Structural Welding Code”, unless otherwise indicated.
2. Steel plates and shapes: Comply with ASTM A36/A36M.
3. Steel pipe: Comply with ASTM A53/A53M.
4. Aluminum Extrusions: Comply with ASTM B221, Alloy 6063-T6.
5. Cast Iron: Comply with ASTM A48 or ASTM A47.
6. Provide Type 304 stainless-steel fasteners at exterior work.
7. Shop drawings for the design of metal stairs and railings shall be sealed by a structural engineer engaged by the fabricator and licensed in North Carolina, and shall be designed to meet all structural loads required by N.C. State Building Code

B. INTERIOR METAL STAIRS

1. Stair stringers shall be steel channels or tubing. Treads shall be concrete-filled steel pans, 2” thick minimum, with abrasive-filled aluminum nosings. Nosings are to have contrasting color relative to treads.
2. Stairs and railings are to be pre-assembled to greatest degree possible in shop.

C. RAILINGS

1. Exterior railings shall be aluminum, hot-dipped galvanized steel (unpainted), or stainless steel. Provide for thermal expansion to prevent buckling, opening of joints, or overstressing components.
2. Interior railings shall be aluminum, painted steel, or stainless steel.
3. All railings are to have smooth transitions between directions, with all surfaces ground smooth.

D. LADDERS

1. Provide steel ladder to roof with lockable scuttle or ladder guard. Provide stair for roof access, if feasible. Ladders shall be attached to or anchored in solid building materials. Anchoring in drywall is not acceptable.

E. DRAINAGE BOOTS:

1. Downspouts shall be protected with galvanized cast iron downspout boot adaptors between finished grade and two feet (2'-0”) minimum above finished grade. Adaptors shall not be painted.

F. STEEL LINTELS:

1. All steel lintels within exterior walls shall be hot-dipped galvanized, unpainted.

DIVISION 6 – WOOD, PLASTICS, AND COMPOSITES

06 10 00 ROUGH CARPENTRY

A. GENERAL

1. Grading and Inspection Agencies: Each piece of lumber or plywood shall be grade stamped by one of the following agencies:
 - a. APA – American Plywood Association
 - b. CRA – California Redwood Association
 - c. SPIB – Southern Pine Inspection Bureau
 - d. WWPA – Western Wood Products Association
 - e. NLGA – National Lumber Grades Authority
 - f. WCLIB – West Coast Lumber Inspection Bureau
2. Store lumber and plywood materials off the ground and under cover which has been vented to prevent condensation.

B. LUMBER, GENERAL

1. Provide lumber with 19 percent maximum moisture content.
2. Provide preservative-treated lumber for cants, nailers, blocking, furring, grounds, stripping and similar items associated with roofing, flashing and waterproofing or in direct contact with concrete or masonry, and as otherwise required by code. All preservative treated lumber and plywood shall be pressure treated with water-borne preservatives to comply with AWPA C2 and C9. Preservative shall not contain arsenic or chromium.
3. Provide fire-retardant-treated lumber to have flame-spread rating of 25 or less when tested in compliance with ASTM E84, exterior or interior type as appropriate. Fire-retardant treated wood shall be marked with appropriate classification of testing agency. Provide fire-retardant treated wood blocking for in-wall support for appurtenances, accessories, equipment, and casework, and as otherwise required by code.
4. Provide No. 2 grade lumber typically.

C. PLYWOOD

1. Plywood for equipment backing panels shall be DOC PS1 exterior A/C fire-retardant-treated panels, 3/4" thick.

D. FASTENERS

1. Provide stainless-steel fasteners and/or anchor bolts in pressure-treated wood.

06 16 00 SHEATHING

A. GENERAL

1. Provide gypsum sheathing products complying with the requirements contained herein for exterior walls and parapets.
2. Provide products complying with required fire ratings where required by code.

B. PRODUCTS

1. Glass-Mat Gypsum Sheathing for wall applications: 5/8" thick, Type "X" (if fire-rating required), complying with ASTM C1177 (GP DenGlass sheathing or equal).
2. Gypsum Sheathing for interior parapets: 5/8" thick complying with ASTM C1177, compatible as substrate for proposed roofing products (GP DensDeck Prime Roof Boards or equal).

C. EXECUTION

1. Install panels to fit tightly together and against abutting construction, using fasteners and spacing as recommended by manufacturer and as required by building code.

06 20 23 INTERIOR FINISH CARPENTRY

A. GENERAL

1. Grading and Inspection Agencies: Each piece of lumber or plywood shall be grade stamped by one of the following agencies:
 - a. APA – American Plywood Association
 - b. CRA – California Redwood Association
 - c. SPIB – Southern Pine Inspection Bureau
 - d. SFPA – Southern Forest Products Association
 - e. WWPA – Western Wood Products Association
 - f. WWMP – Wood Molding and Millwork Producers
2. Comply with DOC PS 20 “American Softwood Lumber Standard”
3. Comply with DOC PS 1 “U. S. Product Standard for Construction and Industrial Plywood” for plywood and for products manufactured under PS 1, with APA PRP-108. Formaldehydes in adhesives and binders shall not be permitted.

B. PRODUCTS

1. Wood for interior use shall have maximum moisture content of 15%.
2. Provide fire-retardant treated wood products where required by code, complying with flamespread rating of less than 25 per ASTM E84. Products are to be labeled.
3. Finger jointing not allowed.
4. Solid-surface material: Provide solid-surface material equal to DuPont “Corian” for window sills (typical) and column wraps (as indicated on drawings).
 - a. Provide with the following Class A (Class I) surface burning characteristics as determined by testing identical products per UL 723 (ASTM E84) or another testing and inspecting agency acceptable to authorities having jurisdiction: Flame Spread <25, Smoke Development <450.
 - b. Solid polymer components: Cast, nonporous, filled polymer, not coated, laminated or of composite construction with through body colors meeting ANSI Z124.3 or ANSI Z124.6, having minimum physical and performance properties specified. Superficial damage to a depth of 0.010 inch (.25 mm) shall be repairable by sanding and/or polishing
 - c. Thickness to be as indicated on drawings.
 - d. Provide adhesives and fasteners as recommended by manufacturer.

C. EXECUTION

1. Store lumber and plywood materials off the ground and under cover which has been vented to prevent condensation.
2. Install finish carpentry level, plumb and aligned with adjacent materials. Scribe edges to fit adjoining work.
3. Install with minimum number of joints practical. Do not use pieces less than 24” in length unless required span is less than that length.
4. Cope at returns and miter at corners to produce tight fitting joints. Use scarf joints for end-to-end joints.
5. Repair or replace damaged or defective finish carpentry to eliminate functional or visual defects. Adjust joinery for uniform appearance.
6. Install shelving and clothes rods by fastening to CMU or secure blocking within walls.

06 41 13 WOOD-VENEER-FACED ARCHITECTURAL CABINETS

A. GENERAL

1. Comply with "Architectural Woodwork Quality Standards" published by the Architectural Woodwork Institute (AWI). Casework shall comply with "Custom Grade" requirements minimum.
2. Contractors shall submit samples of transparent finishes which show the extremes in color variation within intended application.
3. Refer to Section 12 30 00 "Laminate-Clad Casework" for laminate-covered casework.

B. TRANSPARENT-FINISHED CASEWORK

1. Casework shall be of heavy-duty construction. Campbell Rhea shall be used as the Basis-of-Design, with Collegedale and Kewanee approved equals.

C. DOORS:

1. Construction and thickness shall be as required by referenced AWI standards, and be adequate to prevent warpage.

D. SHELVES:

1. Do not exceed spans of 3 ft. for 3/4 in. thick shelves and 4 ft. for 1 in. thick shelves.

E. COUNTERTOPS:

1. Plastic laminate surface. Base material for countertops may be dense particleboard (no added formaldehydes permitted), except that marine grade plywood shall be used in wet locations.

F. CABINET HARDWARE

1. Drawer and Door Pulls: Heavy duty, 4 in. rod pull.
2. Drawer Slides: 60 lb. capacity wheeled slides with self-closing feature.
3. Door Hinges: Concealed hinges, European Style, self-closing with built-in horizontal and vertical adjustment.
4. Door Silencers: shall be provided at all cabinet doors.

G. EXECUTION

1. Do not install architectural woodwork until the building is enclosed, the permanent heating and cooling system is in operation, and residual moisture from plaster, concrete, masonry or terrazzo has dissipated.
2. Use French Dovetail mortise-and-tenon to attach drawer sides to drawer fronts.
3. Where transparent finish is shown, cut doors and drawer fronts of each run of cabinets from one "Counterfront" sheet of plywood (with particleboard or lumber core) and install them in the same position so that the grain runs vertically and grain matches between adjacent doors and/or drawers.
4. Wood beams and/or wood trim are not allowed in any group or staff toilets.

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

07 00 00 THERMAL AND MOISTURE PROTECTION

A. GENERAL

1. Architectural/Engineering firms shall use a Registered Roof Consultant (RRC) if their contract involves any new roofing or roof modifications, including but not limited to: new construction, roof replacement, modifications to existing roof systems, including new penetrations. All roofing plans, details and specifications shall be stamped with a RRC seal by the registered roof consultant. All roof plans and details shall have the RRC stamp at 60% CD Submittal. RRC seal shall be signed and dated at 100% CD submittal, prior to WCPSS review and approval of the final roof design and/or modifications.
2. The RRC shall write and furnish the Architectural/Engineering firm, all (Division 7) specification sections related to the roof design, including all components. RRC shall be responsible for review and acceptance of all detailing, shop drawings and submittals pertaining to roof construction.
3. Registered Roof Consultant firm shall be responsible for review and acceptance of all shop drawings and submittals pertaining to roof construction.
4. Registered Roof Consultant firm shall be responsible for monitoring roof construction and final acceptance. Weekly inspection reports are required to be submitted to Wake County Public School System, the Construction Manager or Prime Contractor, Roof Contractor and the Architect/Engineer within three (3) working days of each visit.
5. Refer to Divisions 22 for roof drains and Division 23 for HVAC placement.

B. MEDIUM SLOPED ROOFS

1. Standing seam metal roofing is preferred for steep-slop applications. Dimensional, asphalt shingle roofing weighing 250 lbs./square or greater, is acceptable only with the special consent of the Owner, prior to the start of Design Development phase.

C. LOW SLOPED ROOFS

1. Modified bitumen is the preferred system for low slope roofs. Single-ply membrane roof systems are acceptable with the special consent of the Owner, prior to the start of Design Development phase. Single-ply membrane is acceptable at canopies and small out-buildings with special consent of Owner. Minimum slope to point of discharge for all roofing systems shall be 1/4 in./foot.
2. All low slope roof areas shall be accessible by means of a roof hatch, exterior door or exterior roof ladder.

D. LOW SLOPE ROOF DRAINAGE

1. Roof drains is the preferred system for low slope roof drainage. Gutters and downspouts may be acceptable, with the special consent of the Owner (M&O), prior to the start of Design Development phase.

E. CANOPIES AND COVERED WALKWAYS

1. Provide overhead canopies at primary building entrances. Standing seam metal or single-ply membrane are the preferred systems for canopies and covered walkways.
2. Formed sheet metal panel systems are recommended for soffit construction. Stucco and drywall soffits shall not be used.
3. Gutters and downspouts may be used at covered walkways provided runoff is discharged into

underground storm drain lines.

4. See also Section 10 53 00 Pre-Engineered Aluminum Walkway Covers.

F. WALL AND ROOF INSULATION

1. Comply with current N.C. State Energy Code for minimum R values. Review and confirm proposed insulation thickness during design phase with Owner for roof replacement projects.
2. In new construction, provide positively-sloped structural roof deck to ensure proper drainage. Tapered insulation shall not be used as the primary method to assure proper drainage except within small limited-area roof surfaces with Owner consent. Tapered insulation is permitted for crickets between drains.

G. LIGHTWEIGHT INSULATING CONCRETE AND ROOF INSULATION

1. Sloped ventilated metal roof deck with lightweight insulating concrete is the preferred system for new low slope roof deck construction.
2. Rigid board insulation is acceptable for use for canopies and small out-building roof areas with special consent of Owner. Use of tapered insulation over flat roof deck is acceptable only at canopies and small out-buildings, with special consent of Owner.
3. Roof Insulation shall require certification that insulation meets Thermal Warranty. Warranty states that roof insulation's actual thermal resistance will not vary by more than 20% from the published R-Value for a period of ten (10) years for light weight insulating concrete and 10% from the published R-Value for a period of ten (10) years for rigid board insulation.

H. SKYLIGHTS

1. Skylights and overhead sloping glazing shall be used only with the special consent of the Owner, prior to the start of Design Development phase. Skylights and overhead glazing shall meet OSHA 29 CFR 1910.23 (e)(8) requirements to support required fall protection loads. Where daylighting of interior spaces is desired, vertical clerestory glazing is recommended for use. Where practical the clerestory glazing shall face north or face south with vertical overhang solar protection. Provide additional provisions for protection of adjacent roof surfaces from reflected solar heat gain.

I. PRODUCTS

1. Roof Insulation: Shall require certification that insulation meets Thermal Warranty. Warranty states that roof insulation's actual thermal resistance will not vary by more than 20% from the published R-value for a period of ten (10) years for light weight insulating concrete and 10% from the published R-Value for a period of ten (10) years for rigid board insulation.

07 10 00 WATERPROOFING

A. GENERAL

1. All below-grade wall construction enclosing interior spaces shall be waterproofed.
2. Refer to Section 09 30 00 "Tiling" for required waterproofing of elevated floor construction at toilet rooms and showers.

B. PRODUCTS

1. Waterproofing: Modified bituminous self-adhering sheet consisting of 56-mil of rubberized asphalt laminated to 4-mil polyethylene cross-laminated carrier film. Sheet shall have minimum tensile strength of 325 lbs/sq. in. for the membrane and 5,000 lbs/sq. in. for the carrier film. Membrane shall have puncture resistance of 50 lbf, Vapor Permeance of .045, and Hydrostatic Head Resistance of 220'.
2. Protection Course Drainage Panels: Where exposed to earth and crushed stone backfill, provide a protection course over completed waterproofing. Provide composite impermeable polypropylene formed with a high-flow dimpled drainage core. Core to be laminated with a non-woven geotextile filter fabric. Core thickness to be 0.40" minimum, with compressive strength of 15,000 psi and flow rate of 21 gal/min/ft. Filter fabric puncture resistance to be 250 lbs. with a flow rate of 140 gpm/ft and an apparent opening size of #70 U.S. sieve.
3. Waterproofing of split-slab plaza decks, garden roofs, and other horizontal applications shall be discussed and approved by WCPSS prior to design.

C. EXECUTION

1. Below-grade wall waterproofing: Perforated drainage pipe shall be installed with drainable stone backfill at wall foundation. Provide geotextile fabric to prevent silting of stone or clogging of pipe. Extend foundation drain piping to allow for gravity drainage at grade or to underground storm drain lines.

07 27 00 AIR BARRIERS

A. GENERAL

1. This section includes requirements for creating an airtight building enclosure that controls infiltration or exfiltration of air.
2. Air barrier system shall be designed for continuity of the materials and components to provide a complete air barrier assembly. Continuity of all assemblies (including joint and transition materials) is to create a whole-building air barrier system.

B. PERFORMANCE REQUIREMENTS

1. Material Performance: Provide materials which have an air permeance not to exceed 0.004 cubic feet per minute per square foot under a pressure differential of 0.3 in. water (1.57 psf)(0.02 L/m² @ 75 Pa.) when tested according to ASTM E 2178.
2. Spray-Applied Rigid Polyurethane Foam: Material shall meet requirements of ULC S705.1, Standard for Thermal Insulation – Spray-Applied Rigid Polyurethane Foam, Medium Density –Material – Specification. CCMC Evaluation Report or reports from accredited testing laboratory shall be made available upon request. Materials shall meet or exceed the following performance requirements as indicated in the test reports.
 - a. Design R value minimum R-6 per inch.
 - b. Density of 1.9 pounds per cubic foot.
 - c. Smoke development not greater than 450 and flame spread not greater than 25 when tested in accordance with ASTM E 84.
3. Connections to Adjacent Materials: Design connections to prevent air leakage and vapor migration at the following locations:
 - a. Foundation and walls, including penetrations, ties and anchors.
 - b. Walls, windows, curtain walls, storefronts, louvers or doors.
 - c. Different wall assemblies including fixed openings within those assemblies.
 - d. Wall and roof connections and penetrations.
 - e. Floors over unconditioned space.
 - f. Wall, floor and roof across construction, control and expansion joint.
 - g. Walls, floors and roof to utility, pipe and duct penetrations.
 - h. All other leakage pathways in the building envelope.

C. SUBMITTALS

1. Compatibility: Contractor shall submit letter from manufacturer stating that materials proposed for use are permanently chemically compatible and adhesively compatible with adjacent materials propose for use. Submit letter from manufacturer stating that cleaning materials used during installation are chemical compatible with each of the adjacent materials proposed for use.

D. QUALITY ASSURANCE

1. Quality Assurance Program: Contractor shall submit evidence of current accreditation and certification under the Air Barrier Association of America's (ABAA) Quality Assurance Program. Submit accreditation number of manufacturer and certification number of installers.

2. **Manufacturer:** Design primary materials from a single manufacturer regularly engaged in manufacturing air and vapor barrier membranes. Obtain secondary materials from a source acceptable to the primary materials manufacturer.
3. **Preconstruction Meetings:** Specify preconstruction meeting between the trades involved in the whole building's air barrier system, Owner, and Owner Inspection Agency to review where each trade begins and ends and the responsibility and sequence of installation of all the air-tight joints, junctures, and transitions between materials, products and assemblies of products specified in the different sections, to be installed by the different trades.
4. **Field Quality Assurance:** Implement the ABAA Quality Assurance Program requirements. Cooperate with ABAA inspectors and independent testing and inspection agencies engaged by the Owner. Contractor shall not cover air and vapor barrier until it has been inspected, tested and accepted.
5. **Mock-Ups:** Specify mock-up representative of primary exterior wall assemblies and glazing assemblies including backup wall and typical penetrations. Mock-up shall be a minimum of 8 feet long by 8 feet high and include the materials proposed for use in the exterior wall assembly.
6. **Mock-Up Tests for Adhesion:** Test mock-up for adhesion in accordance with ASTM D 4541 and ABAA Quality Assurance Program.

E. WARRANTY

1. **Material Warranty:** Provide manufacturer standard product warranty, for a minimum 2 years from date of Substantial Completion.
2. **Installation Warranty:** Provide air barrier subcontractor's 2-year warranty from the date of Substantial Completion, including all components of the air and vapor barrier assembly, against failures including loss of air tight seal, loss of watertight seal, loss of adhesion, loss of cohesion, failure to cure properly.

F. FLUID-APPLIED AIR AND VAPOR BARRIER

1. Specify fluid-applied materials. Provide related accessories including primer, seam tape, mastic, fluid and sealant as recommended by manufacturer. Acceptable manufacturers include:
 - a. Carlisle Coatings and Waterproofing: Barriseal, 40 mils thick (dry)
 - b. Grace Construction Products: Perm-A-Barrier Liquid, 60 mils thick (wet)
 - c. Holmann & Barnard, Inc: Enviro-Barrier Liquid Air and Vapor Barrier, 60 mils (wet), 40 mils (dry)
 - d. Tremco, Inc.: ExoAir 120 SP (Spray Grade) or ExoAir 120 R (Roller Grade), 60 mils (wet), 40 mils (dry)

G. SHEET AIR AND VAPOR BARRIER

1. Specify self-adhering membrane composed of flexible facing material coated completely and uniformly on one side with adhesive material, formed into uniform, flexible sheets, interleaved with disposable release liner that is removed prior to application. Provide related accessories including primer, seam tape, mastic, fluid and sealant recommended by manufacturer. Acceptable manufacturers include:

- a. Carlisle Coatings and Waterproofing: CCW-705, 40 mils thick
- b. Grace Construction Products: Perm-A-Barrier, 40 mils thick
- c. Tremco, Inc.: ExoAir 110, 40 mils thick

H. SPRAY POLYURETHANE FOAM AIR BARRIER

1. Specify spray-applied materials. Provide related accessories including primer, mastic, fluid and sealants as recommended by manufacturer. Acceptable manufacturers include:
 - a. Walltite Us by BASF
 - b. Heatloc Soy by Demilec (USA) LLC
 - c. Insulstar by NCFI Polyurethanes
 - d. Insulbloc by NCFI Polyurethanes

I. ACCESSORIES

1. Sheet Rubberized-Asphalt Barrier (SRAB) tape: 36 mils of self-adhesive rubberized asphalt integrally bonded to 4 mils of cross-laminated, high-density polyethylene film to provide a minimum 40 mil thick 4 or 6 inch wide membrane tape.
2. Liquid Seal: Elastomeric modified bitumen, trowel applied, nominal total thickness of 1/8 inch.

J. EXECUTION

1. Provide 6" scale details showing all air barrier conditions and terminations. Show air barrier membrane, all required components, and air barrier assemblies.
2. Owner's Inspection and Testing/ABAA audits: Contractor shall cooperate with Owner's inspection/testing agency and ABAA auditors. Allow access to work areas and staging. Notify Owner's inspection agency/ABAA auditor in writing of schedule for Work of this Section to allow sufficient time for inspections. Contractor shall not cover Work of this Section until testing and inspection is accepted.

07 31 13 ASPHALT SHINGLE ROOFING

A. GENERAL

1. Where required by project budget constraints, asphalt shingle roofing is acceptable with the special consent of the Owner, for use on medium pitched roofs, 4/12 minimum slope.
2. Provide ventilated nail-base over metal decking.
3. Provide roof fall-protection (tie-off) as required by OSHA. Reference current edition of the North Carolina Occupational Safety and Health Standards for the Construction Industry, Section 1926.500.

B. PRODUCTS

1. Asphalt Shingle Roofing: Shall be dimensional, laminated strip shingles of mineral surfaced, algae resistant, self-sealing, laminated multi-ply overlay construction, bearing UL Class "A" external fire exposure label and UL "Wind Resistant" label, weighing not less than 250 lbs. per square.
2. Roofing Underlayment: Shall be a self-adhering high temperature membrane to be installed to provide 100% coverage. Membrane shall be minimum 55 mil thickness SBS dualmodified asphalt with a polyester reinforcement with an anti-slip synthetic surface.
3. Flashing and sheet metal: Refer to Section 07 62 00.
4. Warranty: Refer to Section 01 07 00.C.X.

C. EXECUTION

1. Asphalt shingle roofing shall be installed along with underlayment according to the recommendations of shingle manufacturer and details, and recommendations of NRCA Steep Roofing Manual. Install valleys using a closed cut or closed woven valley.
2. Underlayment shall be installed as noted above.
3. Snow guards shall be installed at roof eaves over entrances and walkways. Snow guards shall not penetrate shingles. Snow guards are not required at small outbuildings.
4. All shingle roof areas shall drain into external aluminum gutters and downspouts. Downspouts shall extend to cast iron boots at grade with an air gap, which shall connect to an underground stormwater drainage system.

07 50 00 MEMBRANE ROOFING

A. GENERAL

1. Provide minimum slope of 1/4 in. per foot to point of drainage discharge.
2. All low slope roof areas shall be accessible by means of a roof hatch, exterior door or fixed exterior roof ladders.

B. MODIFIED BITUMENT ROOFING

1. Cold adhesive or torch applied is the preferred systems for modified bitumen roofing. Torch applied is preferred for new construction over LWIC. Modified bitumen roofing shall be a minimum of two plies and shall have factory-applied surfacing. Modifiers and reinforcements shall be as recommended by the Design Consultant; however no organic products shall be specified. The complete roofing system including membrane, insulation and attachments shall meet the requirements of N.C. State Building Code (including ASCE-7 for wind uplift) and UL Class A. Acceptable manufacturers include:
 - a. Siplast. Inc.
 - b. Soprema
 - c. Derbigum Americas, Inc.
 - d. Johns Manville
2. Other modified bitumen roof systems shall be reviewed by the RRC, and if accepted, shall be included in an Addendum prior to the bid opening.

C. SINGLE-PLY MEMBRANE ROOFING

1. Single-ply membrane roofing shall be a fully adhered type. Minimum thickness of the membrane shall be as required by manufacturer to achieve warranty. The complete roofing system including membrane, insulation and attachments shall meet requirements of N.C. State Building Code (including ASCE-7 for wind uplift) and UL Class A. Acceptable manufacturers include:
 - a. Fibertite
 - b. Bondcote
 - c. Sarnafil
 - d. Johns Manville
2. Other single ply roof systems shall be reviewed by the RRC, and if accepted, shall be included in an Addendum prior to the bid opening.

D. ACCESSORIES

1. Roof Insulation: Provide insulation thickness as required to meet specified thermal resistance. Type of insulation must be approved for use by membrane manufacturer and meet requirements of the above noted N.C. State Building Code (including ASCE-7 for wind uplift) and UL designs.
2. Flashing: Base flashing shall be type recommended by membrane manufacturer to meet warranty requirements. WCPSS prefers the use of foil clad modified bitumen base flashings for modified bitumen roof systems. Refer to Section 07 62 00 Sheet Metal Flashing and Trim.

E. EXECUTION

1. Install entire roof system according to recommendations of membrane manufacturer and requirements of the above noted design requirements. Roof drain grates shall be cast iron and anchored.

2. All (cold adhesive applied) modified bitumen membrane laps shall be heat welded at the end of each work day.
3. Provide provisions in the specifications for safety items such as: fire extinguishers, torch requirements, fire safety precautions, and fire watch.

07 56 00 FLUID-APPLIED ROOFING

A. GENERAL

1. Use of fluid-applied roofing will be used for restoring existing roofing systems only.

B. FLUID-APPLIED ROOFING

1. Fluid-applied roofing shall be ~~an acrylic~~ a **silicone or polyurethane** type roof coating bearing **proper** ASTM, Liquid Applied Elastomeric **Acrylic** Coating Used in Roofing and UL Class A Fire Rated material **in compliance with latest NC Building Code**.

Acceptable **Silicone** Manufacturers include:

- a. Aldo Cont 397
- b. GE Enduris 3500
- c. Inland RC 1800
- d. Lexis Energy Max
- e. Polysil 2500 High Solids

Acceptable Polyurethane Manufacturers:

- a. Aldo 384 (Base), 385 (Finish)
- b. ER Systems 300
- c. Lexis Energy Guard
- d. Tremco Alpha Guard

2. Other fluid applied roof systems shall be reviewed by the RRC, and if accepted, shall be included in an Addendum prior to the bid opening.
3. Refer to Section 07 62 00 for Sheet Metal Flashing and Trim
4. Refer to Division 1 sections for required warranties.

C. EXECUTION

1. Fluid-applied roofing shall be installed by manufacturer authorized roof contractor according to the **written technical** recommendations of the manufacturer.
2. Repair existing roof system to a watertight condition. Clean and prepare existing roof system per manufacturer's **written technical** requirements. **Verify there is no wet insulation in the existing roof system via a moisture survey. Ponding water should be addressed via mechanical means to eliminate ponds that hold over 1 inch of water for more than 48 hours. Conduct dry adhesion testing prior to the coating system application similar to ASTM C-794.**
3. Single-Ply Systems: Prepare all existing seams with application of roof coating, polyester fabric and a second application of roof coating, allow to thoroughly dry. Apply base coat at a minimum rate of **≥ 1.5** gallons per square or ~~46~~ **30** mils dry film thickness, allow to thoroughly dry. Apply surface coat of roof coating at a minimum rate of **≥ 1.5** gallons per square or ~~46~~ **30** mils dry film thickness. A full fabric system may be used with special consent and approval of the Owner.
4. Modified Bitumen or Built-up Roofing System (smooth): Apply first coat at a minimum rate of **≥ 2** gallons per square or to accurately cover surface for fabric installation. Embed polyester fabric into wet material, allow to thoroughly dry. Apply base coat at a minimum rate of **≥ 1.5** gallons per square or ~~46~~ **30** mils dry film thickness, allow to thoroughly dry. Apply surface coat of roof coating at a minimum rate of **≥ 1.5** gallons per square or ~~46~~ **30** mils dry film thickness.
5. Built-up Roofing System (gravel): Power sweep and remove all loose gravel and debris. Apply first coat at a liberal rate of ~~40~~ **5** gallons or more per square to squeegee material to

- flow easily over the top of the embedded gravel. Embed polyester fabric into wet material, allow to thoroughly dry. Apply base coat at a minimum rate of 3 gallons per square or ~~24~~ 30 mils dry film thickness, allow to thoroughly dry. Apply surface coat of roof coating at a minimum rate of 3 gallons per square or ~~24~~ 30 mils dry film thickness.
6. Metal Roof System (minimum 3:12 slope): Remove all scaled rust and clean. Prime all rusted areas with an approved rust inhibitor primer. At all joints, seams and protrusions, apply a coat of rust inhibitor roof coating, polyester fabric and a second application of rust inhibitor roof coating, allow to thoroughly dry. Apply base coat at a minimum rate of 1 gallon per square or ~~8~~ 15 mils dry film thickness, allow to thoroughly dry. Apply surface coat of roof coating at a minimum rate of 1 gallon per square or ~~8~~ 15 mils dry film thickness.
 7. Flashings: All flashings and counterflashing shall receive a base coat, polyester fabric, and 2 coats roof coating for a minimum 80 mils dry film thickness.

07 61 00 SHEET METAL ROOFING

A. GENERAL

1. Standing seam roofing is the preferred roof system for medium pitched roofs.
2. Provide (hands free) fall protection roof tie-off as required by OSHA. Reference current edition of the North Carolina Occupational Safety and Health Standards for the Construction Industry, Section 1926.500. Provide fall protection system at roof ridge. Prime and paint to match metal roof color.

B. SHEET METAL ROOFING

1. Provide pre-fabricated, pre-finished metal panel roofing system. The system shall include the metal panels, sliding clips and other attachments, flashing to adjacent construction and other accessories. The complete systems shall meet the requirements of N.C. State Building Code (including ASCE-7 for wind uplift) FM I-90 and Class 1A and UL Class A. The complete system installation (flashing, deck, etc. including all penetration flashings, eaves, ridge, hips, and valleys), shall be warranted by the manufacturer for the full warranty term of 20 years (20-year weathertight and 20-year finish). Finish of all roofing panels, trim and accessory elements shall be shop-applied, Kynar 500 (or equal) coating. Any exposed fasteners shall be minimal and of stainless steel construction and shall match color of roofing by means of factory-applied coating. Acceptable manufacturers include:
 - a. MBCI
 - b. AEP-Span
 - c. McElroy Metal
 - d. Architectural Metal Systems
 - e. Dimensional Metals Inc.
2. Other materials and types of metal panel roof systems shall be reviewed by the RRC, and if accepted, shall be included in an Addendum prior to the bid opening.
3. Refer to Division 1 sections for required warranties.

C. EXECUTION

1. Sheet metal roofing shall be installed by manufacturer authorized installers according to the recommendations of the manufacturer and the requirements of the above noted UL and FM designs design requirements.
2. Roofing Underlayment: Shall be a self-adhering high temperature membrane to be installed to provide 100% coverage. Membrane shall be minimum 55 mil thickness SBS dualmodified asphalt with a polyester reinforcement with an anti-slip synthetic surface.
3. Snow Guards shall be installed at all roof eaves. Provide snow guards that attach to the metal roof panel seams. Snow guards shall not penetrate or be adhered to metal roof panels. Snow guard systems shall have attachments to catch and/or block ice from the roof panels. Consult with manufacturer to determine require number of rows of snow guards required.
4. All metal panel roof areas shall drain into external gutters and downspouts. Downspouts shall drain into an underground drainage system. Internal gutters and downspouts are acceptable only for pre-engineered aluminum walkway covers and canopies.

07 62 00 SHEET METAL FLASHING AND TRIM

A. GENERAL

1. Materials and details used for through-wall flashing, gravel stops, gutters and downspouts shall be permanent and require low maintenance. Details shall be in accordance with the NRCA Roofing Manual, Architectural Sheet Metal Manual by SMACNA, and meeting wind uplift requirements of N.C. Building Code. Wake County Public School System prefers the use of shop-fabricated metal flashings in lieu of extruded metal flashing components.
2. Where roofs discharge at eaves it is recommended exposed gutters and perimeter downspouts be installed. Internal gutters and downspouts shall not be used.
3. Thru-wall scuppers shall not be used for primary discharge. Thru-wall scuppers are acceptable for secondary drainage use only.

B. PRODUCTS

1. Exposed Thru-Wall Masonry Flashing: 28 gauge stainless steel.
2. Cap Flashing, Parapet Caps, Drip Edges, Gutters and Downspouts: Same materials as recommended above for exposed through-wall flashing. At copper and lead-coated copper valley installations, the minimum thickness shall be 20 oz. and 21 oz. respectively. At sheet metal roof installations, it is recommended material and finish of gutters and downspouts match roof panels. Provide solid metal gutter guards.

C. EXECUTION

1. Downspouts shall be protected with cast iron downspout boots.
2. Provide clean-out flush with finish grade within 10 ft. of building wall or downspout location at all underground storm drainage lines. Install concrete protection block around clean-out opening.

DIVISION 8 – OPENINGS

08 11 13 HOLLOW METAL INTERIOR DOORS AND FRAMES

A. GENERAL

1. Heavy-duty hollow metal door and frames are required for interior school usage especially at high traffic areas. Particular attention shall be given to the preparation and reinforcement of doors and frames for finish hardware. Doors shall be 1-3/4 in. thick and 7 ft. in height. Generally door design will be full flush. Interior stair/corridor doors shall have vision lites as allowed by the NC State Building Code. Swinging exterior and interior "A" label and "B" label double doors shall be hollow metal unless otherwise approved by the Owner. All interior doors frames and sidelight frames shall be hollow metal unless otherwise approved by the Owner.
2. All door frames shall be welded, not knock-down, construction. Fabricate in one piece unless shipping limitations require multiple sections.
3. Align tops of door frames with masonry coursing typically.
4. Exterior hollow metal doors and frames are not to be used except with specific written approval from the Owner. In approved cases, hollow metal may be used if SDI A250.8 Level 3, extra heavy duty, Model 2 Seamless, with face sheets of 0.053" (16 gauge) steel minimum. Exterior doors and frames shall be of unpainted galvanized steel construction including reinforcement, louvers and other accessories. Top of exterior doors shall be closed flush and welded watertight. Frames shall be fabricated from 14 gauge cold rolled steel.
5. Entrance, Storefront, and Curtain walls: Refer to Section 08 41 13.
6. Approved Manufacturers:
 - a. Ceco – Milan, TN – 888-264-7474, www.cecodoor.com
 - b. Curries – Mason City, IA – 641-423-1334, www.curries.com
 - c. Metal Products – Corbin, KY – 606-523-0461, www.metalproductsinc.com

B. INTERIOR HOLLOW METAL DOORS AND FRAMES

1. Hollow metal doors and frames:
 - a. Doors shall be SDI A250.8 Level 3, extra heavy duty, Model 2 Seamless, with face sheets of 0.053" (16 gauge) steel minimum.
 - b. Interior frames shall be fabricated from 16 gauge cold rolled steel.
2. Glazing Frames: Frames shall be fabricated from 14 gauge cold rolled steel. Where used on the exterior both frame and glazing stops shall be made from galvanized sheet metal and glazing stops shall be prime coated prior to assembly.
3. Door frames where doors are equipped with automatic openers shall have 4" reinforced top rail for attachment of automatic opener.
4. Frame Anchorage: Jamb anchors for frames at masonry wall openings shall be standard wire anchors. Frames at masonry walls shall be filled with grout. Jamb anchors for plaster and gypsum wallboard partition openings shall be a minimum of 18-gauge steel. Provide floor anchors at all frames.
5. Finish Hardware Reinforcement: Reinforcement for door hardware shall be a minimum of 12 gauge for hinges and be a continuous channel for the full height of door, 12 gauge for closers and be a continuous channel for the full length of the header and 14 gauge for strikes and be a continuous channel for the full height of the door. 7-gauge reinforcements shall be used for hinges on frames. 26-gauge steel plaster guards or mortar boxes welded to the frame shall be provided at hardware cutouts where installed

in concrete, masonry or plaster openings.

6. Vision lites: Lites shall be provided at stairs/corridor doors, except at 3-hour labeled openings. Glaze with UL labeled tempered glass. Light size shall be 3 in. x 33 in. at fire-rated doors with light located 10 in. from strike side of door and bottom of light 3 foot - 4 inches above finish floor. Glazing kits shall be (concealed type) flush with door surface.
7. Louvers: Do not utilize louvers in doors, due to them being a security risk.
8. Finish Preparation: The exposed surfaces of door and frame units shall be cleaned; bonderized and shop primed using manufacturer's standard baked-on rust inhibitive primer. Do not paint galvanized steel frames.

C. EXECUTION

1. Door and Frame Layout: It is recommended for exterior, main entrance doors to be multiple single doors swinging in the same direction. Do not use double doors except with keyed removable mullions and /or on equipment rooms.
2. Frames shall be installed in compliance with SDI A250.11. Install non-fire-rated steel doors per SDI A250.8. Particular attention shall be paid to squareness, plumbness and spreaders. Caution: Angle iron braces shipped with frames at bottom does not qualify as a "spreader".
3. Install fire-rated frames and doors in compliance with NFPA 80.
4. Frames installed in masonry walls shall have frames filled with grout. Frames installed within metal stud partitions shall be filled with mineral-fiber insulation.
5. Contractor shall store doors and frames properly at job site off ground and protected from moisture.
6. Boiler Rooms shall have exterior doors only.
7. Main Mechanical Equipment Rooms shall have exterior doors where possible.

08 14 16 FLUSH WOOD DOORS

A. GENERAL

1. Structural Composite Lumber (SCL) core flush wood doors with transparent finish in hollow metal frames shall be used at most interior doors, including at 20-minute fire-rated openings.
2. Fire Doors with ratings of 60 and 90 minutes are preferred to be hollow metal (See Section 08 11 13 "Hollow Metal Interior Doors and Frames"). Wood 60- and 90-minute fire-rated doors may be used only with Owner's approval.
3. Doors shall be pre-fitted, pre-finished and pre-machined at factory for finish hardware. High-density mineral core blocking reinforcement for mineral core doors shall be provided at hinge, closer, lock and strike locations. Doors shall be 1-3/4 in. thick and 7 ft. high. Generally, door design will be full flush.

B. WOOD DOORS

1. Wood doors shall be solid core doors complying with requirements of WDMA I.S.10 and Section 9 "Doors" and Section 5 "Finishing" of AWI "Architectural Woodwork Quality Standards". Cores shall be Structural Composite Lumber (SCL) except for fire-rated doors, which shall have solid core as required to meet rating requirements. With approval in writing by Owner labeled wood doors over 20 minutes requiring flush bolts, surface bolts, and exit devices, are to receive proper blocking for attachment of hardware. At high traffic doorways in Middle and High Schools, use metal doors.
2. All doors shall be 5-ply hot pressed (cold pressed will not be acceptable) bonded core.
3. Interior wood doors with transparent finish shall be AWI Custom (Grade A Veneer faces), with hardwood veneer face, pre-finished at factory utilizing WDMA System TR6 catalyzed polyurethane finish (AWI System 11).
4. Specify doors which do not use formaldehyde based glue in the manufacturing process.
5. Only domestic species of wood should be specified.
6. Two coat hooks shall be installed by contractor on the back of all office doors in new schools and renovated spaces.
7. Louvers: Do not utilized louvers in doors, due to them being a security risk.
8. Vision Lites: All doors at instructional areas shall have vision lites. Glaze with 1/4 in. (minimum) UL labeled glass at fire rated doors and 1/4 in. tempered glass at other doors. Light size shall be typically 3 in. x 33 in. at fire-rated doors and 6 in. x 33 in. at other doors. Locate light 10 in. from strike side of door with bottom edge of light 3'-4" above finish floor. Glazing kits shall be (concealed type) flush with door surface.
9. Acceptable Manufacturers:
 - a. Algoma Hardwoods – Algoma, WI – 920-478-5221, www.algomahardwoods.com
 - b. Eggers Hardwood Products Corporation – Two Rivers, WI – 920-793-1351, www.eggersindustries.com
 - c. Marshfield – Marshfield, WI – 800-869-3667, www.marshfielddoors.com
 - d. VT Industries – Holstein, IA – 712-368-4381, www.vtindustries.com

C. EXECUTION

1. Doors: Do not hang doors until the building is enclosed, the permanent heating and cooling systems are in operation and residual moisture from plaster, concrete, masonry or terrazzo work has dissipated.
2. Delivery, Storage, and Handling: No doors shall be delivered to the building until weatherproof storage space is available. Store doors in a space having controlled temperature and humidity range between 30 and 60 percent (conditioned air). Stack doors

flat and off the floor, supported to prevent warpage. Protect doors from damage and direct exposure to sunlight. Do not walk or place other material on top of stacked doors. Do not drag doors across one another. Contractor shall use all means necessary to protect doors from damage prior to, during, and after installation. All damaged doors shall be repaired or replaced by the contractor at no cost to the owner. Factory finished doors shall be individually wrapped in polybags to protect the finish from damage by contact with other doors. Doors shall be palletized at factory in stacks of no more than 30 doors per pallet. Door edges shall be protected with heavy corner guards.

3. Warranty: Refer to Section 01 07 00-C.

All work in this Section shall be warranted by a Full Door Warranty (from the date of installation) against defect in materials and workmanship, including the following:

- a. Delamination in any degree.
- b. Warp or twist of $\frac{1}{4}$ " or more in any 3'6" x 7'0" section of a door.
- c. Telegraphing of any part of core assembly through face to cause surface variation of $\frac{1}{100}$ " or more in a 3" span.
- d. Any defect which may, in any way, impair or affect performance of the door for the purpose, which it is intended. Replacement under this warranty shall include hanging, installation of hardware, and finishing.

08 31 00 SPECIAL DOORS

A. GENERAL

1. Overhead coiling doors and grilles are acceptable to limit access to certain areas of the facility but shall not interfere with required egress from occupied spaces. All overhead doors and grilles shall be of metal construction.
2. Exterior sliding glass doors shall not be used.

B. ACOUSTICAL DOORS AND WINDOWS

1. Where acoustical doors or windows are specified they shall be manufactured by a company that specializes in manufacturing high performance STC (Sound Transmission Class) rated doors and windows. Do not use standard hollow metal or wood doors where STC ratings are required.
2. Acceptable Manufacturers:
 - a. Krieger Steel Products Company, www.kriegersteel.com
 - b. Overly Manufacturing, www.overlymanufacturing.com

C. FIBERGLASS REINFORCED POLYESTER (FRP) DOORS

1. Doors at exterior locations for utility and similar rooms shall be smooth faced FRP doors (preferred over pebble faced) with aluminum frames (including sidelites and panels). Doors shall be Model F500HD doors with an abuse resistant engineered surface by Commercial Door Systems, FRP Architectural, Special Lite, or approved equal.
2. Main Frame Stile Wall Thickness:
 - a. Side Stiles: Minimum 3/16" thick hinge edge wall, 5 1/2" width.
 - b. Bottom Rail: Minimum 1/8" thick face walls, 10" width.
 - c. Top Rail: Minimum 1/8" thick all walls, 6" width.
3. Manufactured doors with cutouts for vision lites or panels as scheduled. Factory to furnish and install all glass, and panels prior to shipment.
4. Pre-machine doors in accordance with templates from the specified hardware manufacturers and approved hardware schedule. Factory install hardware except door closers.
5. Warranty: Refer to Section 01 07 00-C.
 - a) FRP doors are to carry a 25-year limited warranty on door's structural integrity, mainframe, and the lamination between face sheets and core.
 - b) System manufacturer will guarantee the entire system for a period of 10 years.
6. FRP Panels:
 - a. FRP face sheets with finish color throughout.
 - b. FRP Option: Construct insulated panels of two .120" minimum thickness sheets with core of minimum 2 1/2 pound psi density polystyrene.
 - c. Class A option for flame spread and smoke developed rating on interior faces of exterior panels and both faces of interior panels as shown. Flame spread no greater than 25, smoke developed no greater than 450 per ASTM E-84.

D. OVERHEAD COILING DOORS

1. Interior overhead coiling service doors shall comply with the following:
 - a. 20,000 operating cycle rating.
 - b. 2-3" wide flat profile steel slats.
 - c. Adjustable-tension helical torsion spring counterbalance system.
 - d. Double angle bottom bar.

- e. Motor operation, suitable for size of door, unless Owner specifically allows push-up or chain operation. Provide with control switch, safety listing per UL 325, automatic obstruction detection system
 - f. Equip coil box with full enclosure hood.
 - g. Provide baked enamel or powdercoat finish.
 - h. If opening is required to be fire-and/or smoke- rated, provide door assemblies complying with NFPA 80. Provide with resettable release mechanism.
 - i. Confirm locking device required with Owner.
2. Acceptable manufacturers:
- a) Cookson
 - b) Cornell
 - c) Raynor
 - d) Overhead Door Corporation
 - e) or approved equal
3. Factory-authorized service representative shall provide operating and maintenance training for Owner's personnel.

08 41 13 ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

A. GENERAL

1. All exterior doors shall be aluminum stile and rail doors, except where FRP doors are specifically otherwise allowed.
2. Standard Aluminum entrance systems shall not be used.
3. Main entrance doors shall be multiple single doors swinging in the same direction. Do not use pairs of doors on exterior openings except with exit devices used with a keyed removable mullion and at electrical and mechanical rooms.
4. Aluminum frames for doors with automatic operators shall have jamb heads of at least 6" to mount the operator positively.
5. [Stanley S988 strike be used for all storefront and curtainwall door jambs where rim exit devices are to be installed. See Appendix C for detail as needed.](#)
6. A/E is encouraged to utilize punched openings to allow use of stock windows in lieu of storefront or curtain walls.
7. A/E is encouraged to limit window width to prevent excessive steel lintels/beams.
8. A/E is encouraged to use storefront assemblies on each floor to eliminate the need for curtain wall systems.
9. Windows shall not include operable sections.

B. STANDARDS AND PERFORMANCE

1. Comply with the requirements and recommendations in applicable specification and standards by AAMA, except to the extent where more stringent requirements are indicated herein. Each unit system shall bear the AAMA Certification label.
2. A minimum ten-year record of production manufacturing of frames, doors and panels and completion of similar type and size projects is required.
3. The manufacturer or his representative will be available for consultation to all parties engaged in the project including instruction to installation personnel.
4. The supplier shall field verify all information prior to fabrication and furnishing of materials. Omitted details due to lack of verification shall be furnished at no additional cost to Owner.
5. Comply with the current edition in force at the project location of all local, state, and federal codes and regulations, including the Americans with Disabilities Act of 1992.
6. Provide signed and sealed design shop drawings and calculations for all assemblies.

C. SUBMITTALS

1. Product Data: Submit manufacturer's product data, specifications and instructions for each type of door and frame required in accordance with Section 08 41 13 E. Warranty and the following:
 - a. Include details of core stile and rail construction, trim for lites and all other components.
 - b. Include details of door hardware and mounting.
 - c. Include samples of each aluminum alloy to be used on this project. Where normal finish color and texture variations are expected, include two or more samples to show the range of such variations.
 - d. Include one sample of typical fabricated section, showing joints, fastenings, quality of workmanship, hardware and accessory items before fabrication of the work proceeds.
2. Submit shop drawings for the fabrication and installation of the doors and frames, and associated components. Details to be shown full scale. Include glazing details and finish hardware schedule. Drawings shall indicate actual installation conditions with surrounding work, not just generic stock details.

D. PRODUCT DELIVERY, STORAGE & HANDLING

1. Deliver materials to job site in their original, unopened packages with labels intact. Each door and frame shall be tagged with a mark or number, which correlates with designation system used for shop drawings. Inspect materials for damage and advise manufacturer immediately of any unsatisfactory materials.
2. Package door assemblies in individual corrugated cartons so no portion of the door has contact with the outer shell of the container. Package and ship frames pre-assembled to the greatest possible extent.
3. Store material in a secure, weatherproof space.
4. Handle doors and frames with care. Do not walk or place other material on top of stacked doors. Contractor shall use all means necessary to protect doors from damage prior to, during, and after installation. All damaged doors shall be repaired or replaced by the contractor at no cost to the owner.

E. WARRANTY

1. Provide a written warranty signed by manufacturer agreeing to replace at no cost to the Owner, any doors, frames, hardware, or factory hardware installation which fail in materials or workmanship, within the warranty period. Failure of materials or workmanship includes: excessive deflection; faulty operation of entrances; deterioration of finish, or construction, in excess of normal weathering; and defects in hardware installation
2. Full system warranty for aluminum doors and framing shall be 10 years.
3. Attachment of hardware by the manufacturer shall be warranted for a minimum of 10 years.

F. STILE AND RAIL ALUMINUM DOORS

1. Manufacturer: Subject to compliance with requirements, provide products manufactured by:
 - a. Commercial Door Systems (CDS)
 - b. Special-Lite
 - c. Kawneer
 - d. Old Castle Inc.
 - e. FRP Architectural
 - f. Or other manufacturers meeting these specifications and approved in writing by Owner prior to bid date.
2. Materials and Construction:
 - a. Stile and rails of type 6063-T6 aluminum alloy 1-3/4" minimum thickness and with tubular extrusions with a minimum .125" wall thickness. Overall stile and rail requirements for type R500 Doors are: 6-1/2" wide top rail, 5-1/2" wide stiles and a 10" minimum bottom rail.
 - b. Thermally-broken construction.
 - c. True mortise and tenon joinery at corners with full width 3/8" diameter tie rods secured with locking washers and hex nuts.
 - d. No welding of joinery is used, except by owner request.
 - e. Exterior glazing stops are permanent and integral to stile and rail extrusions. Provide interior glazing stops with counter punched holes and flat head screws. No applied snap-on stops are permitted. Factory to furnish and install glass, panels and louvers.
 - f. Mid-Rail Options for doors are as follows:
 - i. 4", 7" or 8 1/2" mid rails are available with Mortice & Tenon joinery secured with a tie rod.
 - ii. 14" Mid Panel option is available with either FRP or ALUMINUM face sheets and a polystyrene core. Two Tie Rods secure panel to stiles with extruded spline and interlocking edges to secure the face sheets..
 - g. Pre-machine doors in accordance with templates from the specified hardware manufacturers and approved hardware schedule. Factory to install hardware and shall guarantee the installation for the term of the door guarantee.

- h. Warranty on Stile and Rails doors shall be minimum limited 10-year duration.

G. MATERIALS

1. Aluminum Members: Alloy and temper as recommended by manufacturer for strength, corrosion resistance, and application of required finish and control of color; ASTM B 221 for extrusions, ASTM B209 for sheet/plate with a minimum wall thickness of 0.125".
2. Components: Furnish door and frame components from the same manufacturer. The use of a different manufacturer of door and frame components is not permitted.
3. Fasteners: Provide Aluminum, non-magnetic stainless steel or other non-corrosive metal fasteners, guaranteed by the manufacturer to be compatible with the doors, frames, stops, panels, hardware, anchors and other items being fastened. For exposed fasteners (if any) provide Oval Phillips Head screws with finish matching the item to be fastened. The use of hex bolts or thru bolts will not be accepted.
4. Glazing Gaskets: For glazing factory-installed glass, and for gaskets which are factory installed in "captive" assembly of glazing stops, manufacturer's standard stripping of molded neoprene, complying with ASTM D 2000 (designation 2BC415 to 3BC620), or molded PVC complying with ASTM C 509 Grade 4.

H. FABRICATION

1. The required sizes for door and frame units, and profiles requirements are shown on the drawings.
2. Field measure before fabrication and show recorded measurements on final shop drawings.
3. Complete the cutting, fitting, forming, drilling and grinding of all metal work prior to assembly. Remove burrs from cut edges, and ease edges and corners to a radius of approximately 1/64".
4. No welding of joinery of doors or frames will be provided except with owner request.
5. Maintain continuity of line and accurate relation of planes and angles. Secure attachments and support at mechanical joints, with hairline fit at contacting members.

I. ALUMINUM FRAMING SYSTEMS

1. Tubular Framing: Framing system shall be by the door manufacturer and of the size and type shown. Framing shall comply with ASTM B221 with type 6063-T6 aluminum alloy, with minimum wall thickness of .125" and .625" high applied door stops with screws and weather-stripping.
2. Construction is to be thermally broken, with glazing retained mechanically with gaskets on all four sides. Open back framing is not acceptable.
3. Caulk joints before assembling from members. Secure joint with fasteners and provide a hairline butt joint appearance. Pre-fitted doors using "stick" materials are not acceptable.
4. Applied stops for side, transom and borrowed lites and panels, with fasteners exposed on interior or unsecured portion only. Pre-machine and reinforced frame members for hardware in accordance with manufacturer's standards and the approved hardware schedule. Factory install door hardware except closers. 1 15/16" stop to have 1/8" thick surface for strike reinforcing and include center support ribs to deter against dimpling. Stop shall be applied with screws top to bottom.
5. Provide anchors appropriate for wall conditions to anchor framing to wall materials. A minimum of five anchors up to 7'4" on jamb members and one additional anchor for each foot over 7'4". Secure head and still members of transom, sidelites and similar conditions.
6. Provide 4" high head rails at doors where automatic door openers are required.
7. Factory pre-assemble sidelite to the greatest extent possible, and mark frame assemblies according to location.
8. Provide storefront framing for field assembly. Smaller openings may be preassembled.
9. System is to be designed for simple glazing replacement. Factory glaze doors.
10. Provide for thermal expansion on exterior units.

J. ALUMINUM FINISH

1. Anodized surfaces; AAM12C22A41 Clear 215-R1; AAM12C22A42 Light Bronze 311, Medium Bronze 312, Dark Bronze 313, and Black 315. Special 70% fluoropolymer painted finishes may be acceptable as permitted by Owner.

K. EXECUTION

1. Comply with manufacturer's recommendations and specifications for the installation of the doors and frames. Factory install hardware, glass and louvers in doors. Factory assemble side-lites and transoms to the greatest extent possible.
2. Set units plumb, level and true to line, without warp or rack of doors or frames. Anchor securely in place. Separate aluminum and other metal surfaces with bituminous coatings or other means as approved by architect.
3. Set thresholds in a bed of mastic and backseal.
4. Clean surfaces promptly after installation doors and frames, exercising care to avoid damage to the protective coating.
5. Ensure that the doors and frames will be without damage or deterioration (other than normal weathering) at the time of acceptance.
6. Provide Owner with all adjustment tools and instruction sheets. Arrange an in-service session to Owner at Owner's convenience. Provide a minimum one-year written warranty on all labor related to this section. Any workmanship which is defective or deficient shall be corrected to the Owner's satisfaction and at no additional cost to the Owner.

08 71 00 DOOR HARDWARE

A. GENERAL

1. Occupant life safety and durable low maintenance product quality and installation are key considerations to be used in the design and selection of Finish Hardware. In this regard, Wake County Public School System has decided to require use of heavy-duty hardware such as mortise locksets, the installation of magnetic holders at interior high traffic fire doors and the use of multiple single doors in lieu of double exterior doors. Also, to standardize and better maintain installation on a school system basis, a single manufacturer is preferred for lock cylinders, panic devices, door closers and key cabinets.
2. An add alternate for single source manufacturers for Best Cylinders and locks, Stanley (by Ryobi) or LCN (by Ingersoll Rand) Door Closers, and Precision or Von Duprin Exit (Panic) Devices, shall be incorporated on the bid form for each project.
3. Hardware schedule must be prepared and included in the specifications. Hardware shall not be included in documents as an allowance. The specifications shall include a cross-index showing numerical listing of door numbers and the associated hardware sets. The contractor shall include a similar cross-index in their submittal.
4. At aluminum and wood doors, through bolts shall be used for attachment of closers, overhead holders and exit devices.
5. Hardware supplier shall have a permanent office staffed with permanent employees located within 120 miles of Wake County Public School's Rock Quarry Road Service Center.
6. All hardware and cylinders/cores shall be installed by the hardware supplier. Final adjustments of all hardware shall be performed prior to building turn over. Installation shall be performed by the hardware supplier using personnel that are experienced in the installation of hardware for schools. Personnel shall have a minimum of 5 years of documented experience doing this type of work.
7. Refer to Appendix A for 08 71 00-A Door Hardware Attachment.

B. PRODUCTS

1. Materials and Finishes: Generally, finish hardware shall be of non-ferrous construction with plated finish; interior door hinges shall be steel with plated finish except at areas subject to excessive moisture or chemical corrosion such as shower rooms or laboratories where stainless steel hinges are required. Exterior doors shall have aluminum continuous geared hinges. Standard finish for all hardware shall be US26D (satin chrome), except exit devices which will have all exposed surfaces US32D (satin stainless steel), and aluminum continuous geared hinges to be standard anodized.
2. Panic Devices: Preferred device shall be Precision 2100 series rim type (by Stanley) or Von Duprin 98/99 Series (by Allegion).
 - a. At exterior doors, devices shall be "dogged" for push-pull door operation during school hours with ANSI 03NL "night latch" operation for night time entrance doors and ANSI 02 "entrance when dogged only" operation on "exit only" doors. Dogging device shall be operated by an Allen wrench, not a key. Function of device at fire-rated doors shall be 08L with dogging feature omitted and supplied with "vandal resistant" trim (V908L).
 - b. Fire rated double doors with fire/smoke magnetic releases actuated by fire/smoke alarm system shall be equipped with concealed vertical rod exit devices.
 - c. Cross corridor and double egress doors shall be supplied with less bottom rod (LBR) devices except where security and fire ratings requirements require latching at bottom of

- door. Double egress doors shall have no trim on the pull side.
- d. Other acceptable products are Sargent exit devices #19-HC8804 series and (labeled) 12-19-HC8843 series with 740 Free Wheeling ET trim; and Von Duprin 99 series and (labeled) 99F series with 994L trim.
 - e. At exterior doors to single classrooms, Precision 2103 series aluminum rim device is preferred in lieu of the 2100 series device, in US26D or US32D.
 - f. The centercase on all exit devices must be through bolted to the outside trim (pull) and the hinge end shall be through bolted, except on Fiberglass Reinforced Polyester (FRP) doors which have 3/16" steel reinforcing.
3. Lock and Latch Sets:
- a. Provide heavy-duty mortise locksets at all areas predominantly used by students. Exposed screws in knobs and/or rose are not acceptable. Use only mortise-type locks. The following manufacturers and model numbers of mortised locks are acceptable with forged or cast trim and rose. Other material for trim and roses require written approval:
 - i. Best - (see Attachment 08 71 00-A for details)
 - ii. Sargent – 8100Series x LNJ, and at teaching stations 8283 x LNJ lever
 - iii. Schlage – L9000 Series x 03 lever, and at teaching stations 9071 x 03 lever
 - b. Lockset Functions: Locksets for classroom doors (teaching stations) shall function as follows: Latch is retracted by lever from either side unless outside lever is locked by key from either side. When locked, latch bolt is retracted by key outside or by lever inside. Auxiliary latch deadlocks latch when locked.
 - c. Lock Cylinders: It is preferred that cylinders be manufactured by "Best" on new projects. Other acceptable manufacturers are Schlage and Sargent. Match existing cylinders on renovation/addition projects. The same manufacturer shall supply both cores and cylinders.
4. Door Keying:
- a. Doors shall be grandmaster keyed using patented keying system. Key to existing system on renovation/addition projects. All keying must be approved by the WCPSS Lock Shop, during a keying conference, before cylinders/locks are ordered. A "key schedule" will be determined at this time. Four (4) keys shall be supplied with each core combination.
 - b. The manufacturer shall furnish the WCPSS Lock Shop with final keying schedule and biting list on all projects as soon as possible after the cylinders and cores are ordered. Use only one keyway per school and each keyway must be exhausted before using another. On all projects the exterior locksets, locksets on mechanical and electrical rooms and exit devices shall be provided with construction key cores. Construction keyed cores are to be replaced with "permanent" cores in the presence of owner and turn over all building keys.
 - c. Hardware Installer shall install permanent cores at substantial completion. All keys shall be stamped with appropriate key symbols and "DO NOT DUPLICATE." No biting numbers are to be stamped on the key.
 - d. Hardware Supplier shall supply both a Best KS600IMP code import CD and KS600NDB facility data base upgrade with each new project.
5. Key Cabinet: Acceptable manufacturers are Lund, MMF Industries, Tel-Kee and P.O. Moore Company. Size of cabinet shall provide for 50% expansion capacity. Hardware Supplier shall supply, set up, compile Hook to Key Schedule, hang keys, and install key cabinet.
6. Key Box: Each facility shall have a recessed Knox Series Dual Key Lock Box installed on the exterior of the building at the main entrance and other entrances as required by the Wake County Fire Marshal. WCPSS will provide the Knox box order form to the contractor that

contains a key code and a required WCPSS authorized signature. The contractor uses that form to order the boxes. The form will specify the model number of the box.

7. Surface Closers: At interior and exterior doors, use overhead surface mounted parallel arm closers, Stanley (by Ryobi) 4550 series X EDA arm or LCN (by Allegion) closers
8. 4040 Super Smoothee X EDA arm are preferred. Closers shall be mounted on inside of building. Provide parallel arm closers with EDA type arm, and/or hold open type where use dictates. Closers with pressure relief valves will not be accepted. Where stop arm closer arms are used, they shall be compression or spring stop only. Dead stop closer arms will not be accepted.
9. Overhead Concealed Closers: Door closers are preferred to be surface mounted parallel arm type.
10. Automatic Door Operators: Approved manufacturers are LCN Pneumatic operated unit and Precision electrical operated unit. The use of Concealed Overhead Automatic closers is prohibited. ADA required door openers shall have pneumatic or electric operation.
11. Smoke/Fire Doors: At interior high-traffic fire doors such as stairwells, horizontal exit door and corridor smoke doors, use wall mounted magnetic hold open device connected to the fire alarm system, furnished under this division, which release upon activation of fire/smoke alarm system. Wall magnets and door portions shall be manufactured from metal and be thru-bolted on door. Products manufactured from plastic or with plastic covers will not be accepted. Units to be standard selectable 24 VAC or VDC and 120 volts AC. Armatures shall have field adjustable projection up to 5" and 360-degree rotation for alignment. Chains or other extension devices shall not be used. Combination closer / holder devices to be used only where doors cannot reach a wall. These applications shall be used only with owner approval.
12. Hinges: Provide full mortise, 5-knuckle type with ball bearings. Continuous geared hinges shall be used on all exterior doors, aluminum doors, FRP doors and all doors over 36" in width.
13. Flush Bolts: are recommended for use at foot and head of inactive leaf of double doors to unoccupied areas such as storage and equipment rooms. Inactive leaf of doors shall be supplied with (LBR) less bottom latch flush bolts except where security or fire ratings requirements require latching at bottom of door. Bolts shall be automatic mortise type not surface mounted. Manual flush bolts are not permitted on doors of occupied spaces.
14. Floor and Wall Stops: Use concealed fasteners. Wall stops are preferred wherever feasible; however, when required use heavy duty stops similar to Rockwood #462 (or ABH 1803) mounted as not to be tripping hazard and at maximum degree of swing. Reinforce gypsum wallboard partitions with wood blocking at wall stop locations.
15. Overhead Holders: When necessary holders should be surface mounted type with shock absorber. They shall be manufactured so that channel mounting screws extend through the end cap and channel.
16. Kick Plates: High pressure plastic laminate plates with bevelled edges are recommended for the push sides of all high traffic doors with closers, except for plates at kitchen areas which shall be stainless steel and be extended to half door height. Be sure door manufacturer specification is approved for use of armor plates over 16 in. high if labeled opening. Door must be tested for half door height plates.
17. Door Silencers: shall be gray rubber and suitable for wood or metal jamb.
18. Accessible Door Operators: shall be pneumatic or electric operators.
19. Acceptable Manufacturers: The following manufacturers will be considered acceptable provided they meet all specifications noted above.

- a. Hinges: Bommer, McKinney Hager, Stanley
- b. Continuous Gear Hinges: ABH, Zero, Stanley
- c. Cylinders: Best, Schlage, Sargent (see alternate for Best “no substitutions”)
- d. Door Closers: Stanley by Ryobi, LCN by Allegion (see alternate for Stanley , LCN, “no substitutions”)
- e. Locks & Latches: Best, Schlage, Sargent (see alternate for Best “no substitutions”)
- f. Silencers, Stops & Flush Bolts: ABH, Burns, Trimco
- g. Kick Plates, & Misc.: Baldwin, Burns, Trimco
- h. Weatherstripping: National Guard, Reese, Zero
- i. Push/Pulls: Baldwin, Burns, Trimco
- j. Exit (Panic) Devices: Precision, Sargent, Von Duprin (see alternate for Precision or Von Duprin, “no substitutions”)
- k. Thresholds: National Guard, Reese, Zero
- l. Overhead Stops/holders: ABH, Sargent, Rixson
- m. Electronics: SDC, Locknetics, Best
- n. Automatic Operators: Precision, LCN
- o. [Strike for storefront and curtainwall door jambs where rim exit devices are to be installed: Stanley S988.](#)

C. EXECUTION

1. Locksets: Privacy locksets shall be provided at individual faculty and student toilet rooms. These locksets shall release upon turn of knob from inside and have an emergency release feature on outside, except at outward acting doors. Doors opening into traffic corridors require hotel function with indicator button.
2. Room Numbering: For all school projects, the Owner shall provide permanent room signage and numbering system for door keying and signage.
3. Closers: shall be provided at fire/smoke doors (unless otherwise accepted by code requirements), exterior doors, general office doors to lobby/corridor areas, and kitchen toilet doors.
4. Mullions: Use keyed steel removable mullions where required to provide 6 ft. wide service access to a building’s lobby corridor system and to gym, cafeteria, libraries, band rooms, etc. Provide mullion stabilizers for mullions over 7 ft. Provide mullion cap spacer.
5. Stops: Detail doors and frames to swing doors maximum degree possible. Heavy duty wall stops and floor stops (where they are not a tripping hazard) are preferred. Where possible, set stops to provide a minimum 105 deg. door swing. The minimum door swing opening shall be 95 deg. Wall stops shall be located a minimum of 3/4 width of door from hinge side. Use overhead stops in lieu of floor stops.
6. Kick Plates: shall be installed only at push side of doors with closers. At cafeteria service doors the stainless steel kickplate shall be extended to half door height and installed at both sides. If labeled door, be sure door manufacturer is approved for half-door height armor plate.
7. Door Silencers: shall be provided at each door. Install three (3) at single doors up to 7 ft.-2 in. high, four (4) at single doors over 7 ft.-2 in. and two (2) at each pair of doors.
8. Installation Instructions: For future reference and maintenance, contractor shall provide one (1) copy of the installation instructions for each hardware unit digitally, delivered to owner prior to final approval of installed hardware. All special tools and adjusting devices and installation instructions must be delivered to Owner before final payment can be approved. Owner will verify that keys and hardware are supplied, properly installed, and operational

before final payment can be approved.

08 80 00 GLAZING

A. GENERAL

1. Provide glazing for interior and exterior openings indicated to be glazed.
2. Examine fritted glass in areas where sun or glare control is desired.
3. Contractor to provide 12" x 12" samples of actual insulating glazing units proposed for usage.
4. Provide 10-year guarantee for all insulated glass products against deterioration and defects, including hermetic seal failure.
5. Glazing products shall be designed to withstand design wind loads required by code and ASTM E1300. Insulating units shall comply with SIGMA TM-3000 "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use" and ASTM E2190.
6. Tempered glass products shall be permanently marked as required by code.
7. Clear float glass shall meet ASTM C1036, Type I, Class 1 (clear), Quality Q3. Tinted units shall be Class 2 (tinted).

B. PRODUCTS

1. Insulating Glass Units: 1" thick insulating glazing units composed of two 1/4" panes of float glass and 1/2" air space shall be installed at all exterior windows. It is recommended tinted and/or low "E" glass be used at exterior glass. Highly reflective glass is not desirable.
2. Fully Tempered glass shall be installed within and adjacent to doors as required by the NC State Building Code. It is recommended interior glazing 6 ft. or less above the finish floor and exterior glazing 6 ft. or less above walkway surfaces be tempered or laminated glass.
3. Interior non-fire-rated glazing shall be 1/4" thick clear units
4. Fire-rated glazing shall be 5/16" Firelite Plus by Technical Glass Products typically, or approved equal, subject to compliance with fire ratings and size limitations required at opening.
5. Provide glazing sealants, setting blocks, tapes, gaskets, and other accessories required for complete and watertight installation of glazing units within frames. All accessories shall be compatible with glazing.

C. EXECUTION

1. Install glazing units securely within opening frames. Protect glass from contact with contaminating substances during construction period. Replace damaged units.
2. Clean all glass prior to substantial completion.

DIVISION 9 – FINISHES

09 22 16 NON-STRUCTURAL METAL FRAMING

A. GENERAL

1. Standards:
 - a. For fire-rated assemblies, comply with ASTM E119.
 - b. For STC-rated assemblies, comply with ASTM E90 and E413.

B. PRODUCTS

1. Non-Structural Steel Framing: Provide framing members complying with ASTM C754 for conditions indicated. Provide galvanizing corrosion protection of members as required by code.
2. Where partitions are indicated to extend to underside of roof or floor structure above, provide head tracks that allow for vertical deflection of structure above without imparting loads on partition framing below.
3. Provide runners, tracks, clips, resilient clips, furring, bridging, and fasteners as required to meet structural loads and acoustical criteria.
4. Sound Attenuation Batts: Provide unfaced fiberglass batts complying with ASTM C665 Type 1 (unfaced), or mineral wool batts, as required to achieve STC ratings indicated. Insulation shall extend full depth of studs.

C. EXECUTION

1. Install non-structural steel framing to comply with ASTM C 754 and ASTM C 840.
2. Do not bridge building expansion joints.
3. Install two studs minimum at each door opening jamb typically.

09 29 00 GYPSUM WALLBOARD

A. GENERAL

1. Standards:
 - a. Comply with ASTM C 841 and C 842.
 - b. Comply with applicable requirements of ANSI/ASTM C840 for application and finishing of gypsum board, unless otherwise indicated.
 - c. Comply with applicable requirements of ASTM C 754 for installation of steel framing for gypsum board.
 - d. Comply with ASTM E119 for fire-rated panels.
2. Toilet room ceilings in group toilets shall be gypsum board unless directed otherwise. Single toilet rooms, i.e., teacher/staff toilets and kindergarten / first grade toilets, shall have acoustical panel lay-in ceilings.

B. PRODUCTS

1. Non-Structural Steel Framing: Partitions and ceilings shall comply with ASTM C 754.
2. Gypsum Wallboard: Comply with ASTM C1396. Provide 5/8" thick gypsum board panels of types indicated in maximum lengths available to minimize end joints. Provide Type X or C as required by fire-rated assemblies. Edges shall be tapered and featured for prefilling.
3. High impact / Abuse Resistant Gypsum Panels complying with ASTM C1396 and C1629 shall be utilized in high traffic areas and other areas subject to abuse.
4. Moisture/Mold-Resistant Gypsum Panels complying with ASTM D3273 (with score of 10 per ASTM D3274) shall be used in all areas subject to high humidity or contact with water.
5. Provide trim, joint tape, acoustical sealants and joint compounds as required for complete installation.

C. EXECUTION

1. Precautions: In cold weather and during gypsum wallboard joint finishing, maintain temperature within the range of 55 to 70 deg. F. Adequate ventilation shall be provided to carry off excess moisture.
2. Gypsum Wallboard Installation: Install and finish gypsum board to comply with ASTM C 840. Gypsum wallboard to be installed such that the bottom of the board is not directly resting on the finish concrete floor slab.
3. Finish Levels: Provide Level 4 finish for semi-gloss paint throughout.

09 30 13 TILING

A. GENERAL

1. Standards:
 - a. Comply with ANSI A137.1 Standard Specification for Ceramic Tile
 - b. Comply with ANSI A108.02 Standards for Tile Installation Materials.
 - c. Comply with ANSI A108 series of tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile".
 - d. Designer shall reference specific TCNA standards and installation assembly numbers in project specifications.
2. Provide one (1) box each type, color and size of the tile installed on the project to owner at project completion, including ceramic tile and quarry tile.

B. PRODUCTS

1. Grout: For ceramic and quarry tile flooring, dark color grout is required. The grout for wall tile shall coordinate with the color of the tile.
2. Thresholds: Marble thresholds shall be provided at doorways of toilet rooms.
3. Quarry Tile: Flashed color ranges are recommended. A medium color such as Putty or Sand is preferred over darker colors such as Red or Brick. Slip resistance is of utmost importance in cafeteria kitchens and designers should consider using non-glazed tile in these areas. The Owner will consider any product that will provide the necessary safety while providing for easy cleaning.
4. Rubber or vinyl reducing strips that are securely glued down are required at all tile/VCT transitions to carpet except where a marble threshold is otherwise provided.
5. Waterproof membrane: shall be provided under tile floors subject to water exposure on elevated slabs, equal to Laticrete 9235 Waterproof Membrane.
6. Crack-Isolation Membrane: shall be provided at all tile floors on elevated slabs.

C. EXECUTION

1. Cold Weather Protection: Maintain a minimum temperature of 50 degrees F. in all spaces where tile will be installed for 7 days before beginning installation of setting bed or tile and until at least a week after setting tile.
2. Comply with ANSI A108.1 and A108.4 through A108.10.
3. Locate expansion, control, contraction, and isolation joints to comply with recommendations of TCNA "Handbook for Ceramic, Glass, and Stone Tile Installation".
4. Precautions: Contractor to cover tile flooring until final inspection with heavy Kraft paper or other heavy protective covering to prevent surface damage.

09 51 13 ACOUSTICAL PANEL CEILINGS

A. GENERAL

1. Standards: Acoustical Ceiling Units: ASTM E 1264. Acoustical Suspension System: ASTM C 635 for materials.
2. Surface Burning Characteristics: 25 or less for flame spread and 50 or less for smoke developed, per ASTM E 84.
3. Panel Materials: Specify 65% recycled materials in ceiling panels where possible. Specify products free of formaldehyde in binders.
4. Maintenance Stock: At time of completing installation, deliver stock of maintenance material to Owner. Furnish amount equal to 2% one (1) box each type, size and color of acoustical units installed.

B. PRODUCTS

1. Acoustical Panels (General): Provide manufacturer's standard lay-in panels, 24 in. x 24 in. grid-size panels, with white finish. Specify humidity resistant panels for all locations. 24 in. x 48 in. panels shall not be used. Acoustical panels within classrooms shall be NRC .70 or greater.
2. Metal Suspension Systems:
 - a. General Usage: Provide manufacturer's standard 15/16" direct-hung metal suspension systems with white finish.
 - b. Food Prep Areas: 15/16" type 304 non-magnetic coated stainless steel.
3. Panels, General Use: 3/4 in. thickness cane or wood fiber panels are acceptable in corridors and multipurpose rooms. Do not use soft acoustical panels at low ceiling installations.
4. Abuse-Resistant Panels: Provide panels complying with ASTM D1037 (modified) at areas where damage might be expected (along with hold down clips), such as Elementary School Multi-Purpose Rooms.
5. Humidity-Resistant and Washable Panels: Provide washable and scrubbable panels complying with ASTM E1264 (Type IX, Form 2, Pattern G, Fire Class A), D4828 and D2486 (modified procedure) in food preparation and above serving lines as required by Wake County Health Department.

C. EXECUTION

1. Precautions: Do not install acoustical tile or panels until the building is enclosed, the permanent heating and cooling equipment is in operation and residual moisture from plaster, concrete, or terrazzo work has dissipated.
2. Installation: Install acoustical ceiling systems in accordance with CISCA "Ceiling Systems Handbook".
3. Do not support fixtures or equipment such as exit lights, speakers, etc. from the ceiling system.

09 64 00 WOOD FLOORING

A. PRODUCTS AND APPLICATIONS

1. Stage Flooring: Manufacturer's standard straight edge, tongue and groove and endmatched solid wood flooring, 3/4 in. thick x 2-1/8 in. or 2-1/4 in. strips in standard random lengths.
 - a. Elementary Schools: Provide plain-sawn No. 1 common Red Oak or plain sawn, MFMA certified second and better grade, Northern Hard Maple with transparent polyurethane finish.
 - b. Middle and High Schools: Provide Southern Pine, C and better flooring, near-rift grain with flat black, exterior grade latex paint finish.
2. Elementary School Multi-purpose Area (Play): See Section 09 65 19 "Resilient Flooring and Base" for Resilient Athletic Flooring.
3. Athletic Flooring: At Middle and High Schools, provide manufacturer's standard straight edge tongue and groove end matched solid wood flooring. Wood strips should measure 25/32 in. thick x 2-1/4 in. wide x 2 ft. minimum length and averaging 4 ft.-6 in. long. Provide either double channeled base, plain sawn No. 1 common Red Oak, or plain sawn, MFMA certified second and better grade, Northern Hard Maple with transparent polyurethane finish.
4. Sprung Wood Flooring: Flooring at Middle and High School gymnasias, theatre stages and dance classrooms (and other locations per LEGs) shall consist of a shock-absorbing floor system, using neoprene or rubber pads to provide a resilient wood surface designed to enhance performance and reduce injury. The installed floor shall meet DIN 18032 Part II standards summarized below:
 - a. Shock Absorption – 53%.
 - b. Vertical Deflection – 2.3 mm minimum.
 - c. Area of deflection – 15% maximum.
 - d. Ball Bounce – 90% minimum.
 - e. Surface Friction – 0.5 to 0.7.
5. Finish: Transparent finish shall be a polyurethane co-polymer with the following characteristics:
 - a. Solids 42%.
 - b. Volatile Contents 58%.
 - c. Carrier: De-sulfurized Aliphatic solvent.
 - d. Application rate: 350 - 400 square feet per gallon.

B. EXECUTION

1. Precautions: Do not install wood flooring until the building is enclosed, the permanent heating and cooling system is in operation, and residual moisture from plaster, concrete, masonry or terrazzo has dissipated.
2. Protection: Protect completed wood flooring during remainder of construction period with heavy Kraft paper or other suitable covering, so that flooring and finish will be without damage or deterioration at time of acceptance.
3. Transparent Polyurethane Finish: shall be installed in the following manner:
 - a. Prepare floor.
 - b. Apply one (1) coat floor seal.
 - c. Paint all lines using oil base quick dry enamel (2 coats).
 - d. Apply one (1) coat floor seal.
 - e. Cut floor w/#3 steel wool.

- f. Apply one (1) coat floor seal.
- g. Cut floor w/#3 steel wool.
- h. Buff.

09 65 19 RESILIENT FLOORING AND BASE

A. GENERAL

1. WCPSS preferred type of resilient tile flooring is Vinyl Composition Tile (VCT). Other acceptable types of tile flooring are Luxury Vinyl Tile (LVT), Rubber Tile, Vinyl Tile, and Linoleum.
2. Acceptable types of wall base are Rubber Cove or Vinyl Cove. Installer shall use maximum lengths available to minimize joints and shall install preformed or molded corner units at 90 deg. intersections.
3. For each type of product required, including adhesives, cleaning compounds, and other accessories, provide the same product by one manufacturer throughout the project and specify that all products have low VOC's.
4. All tile specified shall be free of asbestos and be 1/8 in. gage minimum.
5. Provide 1 box of each type of tile for attic stock.
6. Standards:
 - a. Solid Vinyl Floor Tile: ASTM F 1700.
 - b. Rubber Floor Tile: ASTM F 1344.
 - c. Vinyl Composition Floor Tile: ASTM F 1066.

B. PRODUCTS

1. For vinyl composition tile, premium product lines of the following manufacturers, provided they comply with requirements of the contract documents and have a low VOC, will be considered acceptable:
 - a. Armstrong World Industries, Inc.
 - b. Mannington Commercial.
 - c. Tarkett.
 - d. Equal as approved by Architect.
2. Do not use solid-color VCT flooring.
3. Stairs shall be bare concrete with non-slip metal stair tread nosing. Nosings of each stair tread are to be furnished with a contrasting safety strip meeting OSHA and ADA standards. Marking of edges of stair treads with safety tape or paint will not be acceptable.
4. For wall base, products of the following manufacturers, provided they comply with requirements of the contract documents and have a low VOC, will be considered acceptable:
 - a. Burke Industries, Inc.
 - b. Flexco Company.
 - c. Johnsonite, Inc.
 - d. The R.C. Musson Rubber Company.
 - e. Roppe Corporation.
 - f. Equal as approved by Architect.
5. Resilient Athletic Flooring: Provide the following for Elementary Multipurpose (Play) Rooms:
 - a. Product is to comply with ASTM F2772, Class 3 sheet vinyl flooring for adhered athletic flooring applications. Basis-of-Design shall be to Tarkett Sports "Omnisport 8.3mm + Tarkolay" or approved equal.
 - b. Physical Properties:
 1. Ball Rebound (ASTM F2772 >90%): >90%.
 2. Shock Absorption (EN 14808): 38% +3%.
 3. Force Reduction (ASTM F2772, Class 3): 34%-45%.

- c. Sheet Vinyl Flooring with Backing: ASTM F1303.
 - 1. Type: Type I, minimum binder content of 90%.
 - 2. Wear Layer Thickness: Grade 1.
 - 3. Minimum Overall Thickness: 8.3 mm.
 - 4. Interlayer Material: Foamed Plastic.
 - 5. Reinforcing: Non-woven fiberglass mesh.
 - 6. Backing Class: Class C (Foamed plastic).
 - 7. Finish: Wood look, standard pattern as available.
 - 8. Provide manufacturer's specialty flooring composition and adhesives to allow for installation over concrete slab with moisture conditions not to exceed 12 lbs per ASTM F1869 and 92% per ASTM F2170.
- d. Seaming: Heat welded.
- e. Texture: Embossed.
- f. Applied Finish: Factory-applied UV urethane.
- g. Roll Size: not less than 48" x longest length practical to minimize splicing.
- h. Color and pattern to be approved by Owner.
- i. Provide all required accessories for complete installation, including leveling compound, adhesives, heat-welding beads, and game-line and marker paint.
- j. Install according to manufacturer's literature. Install game-lines and markings with sharp edges. At game-line intersections, break minor game line (do not overlap lines). Apply finish coats after game-line and marker paint is fully cured.

C. EXECUTION

- 1. Manufacturer's recommended moisture test shall be performed prior to installation of resilient flooring, to verify that concrete surfaces have cured sufficiently for proper adhesive bond to be achieved between the sub floor and the resilient tile.
- 2. Ventilate areas thoroughly during and after installation prior to occupancy.
- 3. Resilient edge strips shall be used in locations shown on drawings, or where otherwise required, to protect edge of resilient flooring. Install resilient edge strips securely with recommended adhesive to achieve a tightly butted joint.
- 4. Rubber or vinyl reducing strips that are securely glued down are required at all tile/VCT transitions to carpet except where a marble threshold is provided.
- 5. When using floor tile on a ramp within a building, a non-skid tile should be used and shall meet all accessibility requirements.
- 6. Floor patterns should avoid the use of small cut pieces.
- 7. Cover and protect resilient flooring from damage during construction.

09 68 13 TILE CARPETING

A. GENERAL

1. Warranties: Flooring contractor shall provide a 5-year warranty for defects in materials and workmanship. Flooring manufacturer shall provide a 20-year non-prorated warranty to cover excessive surface wear, edge ravel, zippering, backing delamination (i.e. the separation of the secondary backing from the primary backing), watermarking on any product not 100% loop construction and excessive static electricity.
2. All carpet tile and components shall be recyclable.
3. Maintenance Stock: Provide one (1) box of each type and color of all carpet installed on the project to owner at project completion.

B. PRODUCTS

1. Carpet: Tufted, commercial carpet, type 6 or 6.6 nylon, face weight: Not less than 17 oz./yd., hard-backed vinyl backing, 20-pound tuft bind, textured loop pile, permanent anti-static control, minimum of 50% solution dyed (not more than 50% yarn dyed), tweed pattern preferred. Provide modular carpet tiles. Use of "pattern match" shall be avoided –minimum of three (3) different colors in the pattern. Gauge shall be no less than 1/10 gauge. Backing system shall provide a moisture penetration barrier and the primary tufting substrate shall be synthetic non-woven.
2. Adhesives: Compound and adhesives formulated specifically for the application of the specified floor covering and shall be applied according to manufacturer's recommendations. Environmentally-safe, low odor adhesives are required. The adhesive system shall be self-adhered or low VOC.
3. Rubber or vinyl reducing strips that are securely glued down are required at all resilient tile/VCT transitions to carpet except where there is a marble threshold. Metal strips are not acceptable.

C. EXECUTION

1. Precautions: Do not install carpet until the building is enclosed, permanent heating and cooling systems are in operation and residual moisture from plaster, concrete, or terrazzo work has dissipated. Provide Kraft paper over carpet immediately following installation to protect from damage. Contractor to remove and dispose of protection just prior to furniture delivery.
2. Moisture testing with results complying with manufacturer's requirements is required prior to installation of adhesives. Reference manufacturer's recommendations regarding moisture content. Specify relative humidity meter testing of concrete slabs prior to installation of carpet.
3. Comply with CRI's "CRI Carpet Installation Standards", and carpet manufacturer's printed installation instructions.
4. Ventilate thoroughly all areas during and after installation, prior to occupancy.
5. Installation of carpet constitutes acceptance by the installer of the subfloor condition.
6. A sample of dry-laid carpet shall be provided by contractor on site in one room showing an 8-carpet-tile laid out in ashlar, brick, monolithic, and quarter turn patterns. WCPSS to select desired pattern.

09 90 00 PAINTING

A. GENERAL

1. Single-source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats.

B. PRODUCTS

1. Paint shall have a reflective value of 60-80%. All surfaces shall utilize semi-gloss paint. No eggshell or satin is desired. Provide scrubbable finish in high traffic areas.
2. Provide Level 4 finish everywhere.
3. In all areas, specify water-based solvent and mercury free paint with low or zero VOC's.
4. Provide epoxy finishes in toilet room areas.
5. Limit number of paint colors to available standards. Provide modern, colorful paint scheme to be approved by WCPSS.
6. Block filler shall be applied to all exposed CMU. Specify products with low or zero VOC's.
7. Block filler in Kitchen and Dishwasher areas shall completely fill block pores to eliminate pinholes in painted finish and shall be approved by Health Department inspector before application of finish paint coats.

C. EXECUTION

1. Color Schemes: Avoid complex color schemes. Limit paint colors to two (2) per wall surface.
2. **Exterior galvanized metal surfaces shall not be painted.** Exposed galvanized metal decking at exterior canopies shall have a metal soffit panel. Provide field-galvanized application at rusted and/or damaged galvanized surface areas, cleaned and prep per manufacture instructions.
3. All unused paint shall be removed from the job site by the contractor.
4. The contractor shall provide a final paint schedule of all paint used on the project. This schedule shall have as a minimum the following information for each paint used:
 - a. Paint manufacturer name.
 - b. Paint color name and number.
 - c. Paint swatches that can be matched.
 - d. The area of the school where each paint was applied.
5. Electrical Conduit: In finished areas exposed electrical conduits shall be painted to match the finishes in the space. Conduit shall be color banded at intervals not to exceed 10 feet. Utilize natural galvanized finish conduit for conduit that is to be painted and banded.
6. Junction box covers shall be painted according to color coding below.
 - a. Junction Box Cover Color Coding:
 - Electrical Conduit (120/208Vac): Blue
 - Electrical Conduit (277/480): Black
 - Fire Alarm Conduit: Red.
 - Telecom & A/V Raceway: Natural galvanized finish.
 - Security System Raceway: Purple.
 - Emergency Feeder/Branch Circuit Raceway: Orange.
 - Stand-by Feeder/Branch Circuit Raceway: Green.

DIVISION 10 – SPECIALTIES

10 11 00 VISUAL DISPLAY SURFACES

A. GENERAL

1. Dry erase boards and tackboards shall be provided in accordance with the building program for each specific project. Attention to the constraints of applicable codes governing the use of combustible materials is required. Please see Attachment 10 11 00-A.
2. All products shall have a 50-year warranty.

B. PRODUCTS

1. Dry Erase Boards: shall have 24-gauge (0.021") minimum porcelain enamel steel face with backer board in extruded aluminum frame with marker tray and head tackstrip. Finish shall be manufacturer's standard glossy white. Core shall be at least 7/16 in. thick particleboard material backed by either foil or aluminum for moisture seal.
2. Glass Marker Boards: 6-mm tempered glass marker board with smooth polished edge and rounded corners. Mounting shall have round, stainless-steel standoffs holding glass approximately 1-inch from wall surface, mounted in notches in standoffs at top and bottom edges of marker board. Color and surface shall be clear. Marker board tray shall be glass, supported by stainless steel clips.
3. Tackboards: shall be 1/4 in. thick composition cork mounted to 1/4 in. hardboard in extruded aluminum frame. The composition corkboard shall be made of pure cork material compounded with linseed oil and pigment on a burlap back.
4. Tackstrips: shall be 1/4 in. thick composition cork in extruded aluminum frame. Width of tackstrip shall be 1 in. at dry erase board installations and 2 in. elsewhere. Map hooks and flag holders shall be provided at all tackstrip installations including at head of dry erase boards. Provide two (2) flag holders per room. At art rooms, hooks shall also be provided.
5. Pegboards: shall be 1/4 in. hardboard with 9/32 in. diameter holes on 1 in. centers in extruded aluminum frame.
6. Accessories: Furnish standard continuous box-type aluminum markertray with slanted front, grooved tray, and cast aluminum end closures for each dry erase board. Where specified in program, furnish map rail complete with 1 in. to 2 in. wide display rail, end stops, and 2 map hooks for each 4 feet of rail.

C. EXECUTION

1. All dry erase board, tackboard, tackstrip and pegboard units shall be factory assembled.
2. Size, location and mounting height of dry erase boards, tackboards and tackstrips shall be according to building program requirements. Bottom of boards shall be no more than 34 in. from finished floor.
3. At physical activity spaces such as dance studios, gyms, and multi-purpose rooms, do not provide protruding chalk trays at dry erase board installations. Instead, provide recessed holders for markers and erasers.

10 14 00 IDENTIFYING DEVICES

A. GENERAL

1. An exterior sign shall be required at main site entrance and main building entrance as well as on each building. Interior signs shall be required at all doors and spaces. Final room names and numbers will be furnished by the Owner prior to the 60% Construction Documents Phase Submittal.

B. SIGNAGE TYPES

1. Interior Signs: shall be manufactured from 1/16 in. clear matte acrylic that is sub-surface printed with a background color and laminated to a 1/16 in. opaque white or black acrylic base and has 1/16 in. raised acrylic letters. All signage shall comply with the applicable current versions of ICC/ANSI A117.1, N.C. Building Code, and ADA Standards. All signage must have written information included below the pictograms, and include corresponding Braille. Signage shall be sized to accommodate copy. No abbreviations shall be permitted at elementary schools. Abbreviations are strongly discouraged at middle and high schools.
2. Exterior Building Signs: Each building on campus shall have mounted on the exterior (at the main entrance to that building) 6" (minimum) high aluminum letter indicating the **designated** building. The **building letter** shall correspond to the designation assigned by WCPSS Facility Assessment Dept. ~~in MAXIMO and the CAFI site maps (i.e. "BUILDING A")~~. Where possible, the mounting height shall be 8'-0" above finished grade.
3. Site Sign: The school site sign shall be designed by the architect with direction from the Facility Planner, with materials consistent and harmonious with the building design. Cast concrete or brick are to be used for the base. Sign guidelines are as follows:
 - i. Traditional School Signs: Cast concrete sign with engraved lettering (i.e. Combs Elementary School). Size: 4' high x 8' long (maximum).
 - ii. Magnet School Signs: Same as above but with attached (bolted) cast concrete panel beneath the school name, engraved with the magnet school status (i.e. Combs Elementary School, Gifted and Talented Magnet). Note: Panel should be removable in order for the magnet status to be altered if necessary.
4. See 10 14 00 Attachments A for signage details.

10 14 13 DEDICATION PLAQUES

A. GENERAL

1. Names listed on the dedication plaque shall be board members in office at the time the project Schematic Design is approved.
2. Contractor shall submit shop drawings of the dedication plaque for approval by WCPSS prior to fabrication.
3. Refer to Section 10 14 13 – Attachment A for example layout and style.

B. PRODUCTS

1. Cast aluminum plaque with background pebbled texture, single line beveled border, and characters having uniform faces, sharp corners, and precisely formed lines and profiles.
2. Plaque thickness: 0.625 inch
3. Plaque size: 20 inches wide and 20 inches high.
4. Shall have integral metal finish with aluminum for border and lettering.
5. Background shall be baked-enamel or powder coat finish in metallic grey.
6. Background texture shall be pebbled.
7. Integrally cast border style shall be single line beveled edge, raised and polished.
8. Letters shall be raised aluminum.
9. Mounting options:
 - i. Concealed studs.
 - ii. Manufacturer's standard as required for secure anchorage of plaque, non-corrosive and compatible with each material joined.
 - iii. Use concealed fasteners and anchors unless indicated to be exposed.
 - iv. Concealed Studs: Concealed (blind), threaded studs cast into to back of plaque, screwed into back of plaque, or screwed into tapped lugs cast integrally into back of plaque, unless otherwise indicated
10. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.

C. EXECUTION

1. Install plaques level, plumb, true to line, and at locations and heights indicated, with plaque surfaces free of distortion and other defects in appearance.
2. Install plaques so they do not protrude or obstruct limits beyond those allowed per accessibility standards.
3. Before installation, verify that plaque surfaces are clean and free of materials or debris that would impair installation.
4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
5. If mounting location is split faced block, provisions should be made in the design to install a section of smooth faced block at mounting location.
6. Coordinate location with WCPSS Facility Planner.
7. Please note that names included on the plaque are based on the sitting members when the School Board approves.

10 21 13 TOILET COMPARTMENTS

A. GENERAL

1. Durable, low maintenance product quality and installation is the primary consideration in the design of toilet room partitions. Therefore, floor-mounted, overhead-braced compartments with heavy-duty, institutional hardware are required.
2. Materials shall meet requirements of ASTM E84 with flame spread of <75 and smoke developed <450, and comply with NFPA Class B minimum.

B. PRODUCTS

1. Toilet Compartments: shall be of floor mounted, overhead braced type, solid polymer resin partitions at all group toilet installations. Doors shall match compartment construction.
 - a. Panel and door material: 1" thick HDPE resins, with all edges radiused.
 - b. Overhead braces: continuous aluminum headrail
2. Hardware and Fittings: shall be heavy-duty extruded aluminum construction with bright finish. Door hinges shall be self-closing (integral) at all locations. Continuous wall brackets shall be used at group toilet compartments.
 - a. Provide through-bolt (threaded insert with vandal-resistant bolt at both sides) to secure hinges, brackets, stops and latches to doors and partitions.
 - b. Stainless steel pilaster shoes.
 - c. Provide vinyl bumper strip to absorb impact at doorstops and latch.
 - d. Provide coat hook/bumper and door pull at all doors, with slide bolt/button keeper.
 - e. Use of polymer hinges, wall brackets, and base at solid polymer resin partitions are not acceptable.

C. EXECUTION

1. Toilet Compartments: shall be secured with vandal resistant stainless-steel machine screws with expansion anchors at masonry and tile walls and with toggle bolts at hollow walls and expansion anchors at other walls. Pilasters shall be secured to floor with a minimum of two #14-1.5 in. Stainless Steel screws with expansion anchors. Provide stainless steel base trim to conceal floor anchorage and leveling devices.
2. Compartment Doors: shall be provided at all compartments.
3. Urinal Screens: If required, shall be provided between adjacent urinals and where located next to lavatories. Urinal screens shall be of the same construction as the toilet compartments and be attached to the wall with continuous aluminum brackets.

10 22 39 OPERABLE PARTITIONS

A. GENERAL

1. Avoid the use of pass-through doors within operable partitions. Pass-through doors may only be used upon written consent from the owner.
2. Standards:
 - a. American Society for Testing and Materials (ASTM):
 1. E 84 Surface Burning Characteristics of Building Materials.
 2. E 90 Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements, and E413 Classification for Rating Sound Insulation.
 3. E 336 Measurement of Airborne Sound Attenuation between Rooms in Buildings.
 4. E 557 Standard Guide for Architectural Design and Installation Practices for Sound Isolation between Spaces Separated by Operable Partitions.
 5. E 596 Laboratory Measurement of the Noise Reduction of Sound-Isolating Enclosures.
 - b. Federal Specifications (FS): CCC-W-408 Wall Covering, Vinyl-coated.
 - c. National Electrical Manufacturer's Association (NEMA): LD3-2005 High Pressure Decorative Laminate.
 - d. Porcelain Enamel Institute: Performance Specifications for Porcelain Enamel Chalkboards.
 - e. Underwriters Laboratories Inc. (UL) Building Materials Directory and Fire Resistance Directory, current editions.
3. Performance Requirements:
 - a. Sound Transmission Class (STC): ASTM E90, Minimum STC of 49.
 - b. Surface Burning Characteristics of Vinyl Wall Covering Finish: ASTM E84, Class A.
 - c. Install panel partition system track capable of supporting imposed loads, with maximum deflection of L/600 of span.
4. Submittals:
 - a. Shop Drawings: Indicate opening sizes, track layout, details of track and required supports, track switches, track loads, location and details of pass door and frame, adjacent construction and finish trim, and stacking sizes; panel construction, seal and other components necessary for proper installation. General contractor shall coordinate operable wall rough-in requirements with structural steel shop drawings
 - b. Product Data: Describe partition operation, hardware and accessories, electric operating components, track switching components, colors and finishes available.
 - c. Manufacturer's Instructions: Installation instructions including specific installation sequence and special instructions. The manufacturer shall provide a video and demonstration for proper operation and maintenance of the system. Additionally, the manufacturer shall provide a copy of the operating instructions framed behind non-breakable glass (or plexiglass) and mounted on a wall within the space. These instructions will include the manufacturer's name, phone number, the year installed, warranty period, and the model number of the system.
 - d. Operation and Maintenance Data: In compliance with Division 1 Section and as specified herein.
 1. Describe cleaning materials detrimental to surfaces finish.
 2. Include recommended cleaning methods, cleaning materials, and stain removal methods

- e. Test Reports; (FIO): Independent testing laboratory reports on laboratory tests and field tests conducted by accredited acoustical consultant indicating acoustical performance when tested in compliance with ASTM E90.
5. Quality Assurance:
- a. Qualification of Installers: Minimum five years of successful experience in installing operable partitions over 25'0" high and accessories on comparable projects.
 - b. Manufacturer Qualifications: Minimum five years of experience in producing type of operable partitions specified. Provide references to architect 10 days prior to bid.
 - c. Approved Products: All manufacturers must submit samples and test reports for approval to architect 10 days prior to bid.
 - 1. Sample of panels to be furnished for this project. Provide sample with cut-away section showing panel construction and dimension of materials including steel face, framing members, and welding.
 - 2. Sample of track, trolley, hanger rod, and bracket to be furnished for project.
 - 3. Provide a test report from a nationally recognized independent laboratory showing track/trolley/bracket/hanger rod assembly sustains a load of 6,000 pounds at mid-point of 48" simple span without damage.
 - 4. Provide a test report (4' x 23' long test specimen of the same construction as proposed for this project) from a nationally recognized independent laboratory showing that the panel is capable of resisting a uniform load of 20 pounds per square foot applied to the panel face without damage when tested in accordance with ASTM E-72.
 - 5. Provide all manufacturer's standard and extended warranties and other warranties as outlined in this section.
 - d. Testing Agency Qualifications: An independent testing laboratory, or an NVLAP-accredited laboratory, with experience and capability to conduct testing indicated, as documented according to ASTM E548. NVLAP-accredited laboratories must document accreditation, based on 'Certificate of Accreditation' and a 'Scope of Accreditation' listing the test methods specified.
 - e. Fire-Test-Response Characteristics: Provide operable panel partitions with following fire-test- response characteristics, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings or applicable testing and inspecting agency.
 - 1. Surface-Burning Characteristics: ASTM E84: Flame Spread 25 or less, Smoke Development 450 or less.
 - 2. Fire Growth Contribution: Textile wall coverings complying with acceptance criteria of UBC standard 8-2 and NFPA 265.
6. Warranty: The entire system (track, trolley, panels, seals, hardware, etc.), except finishes shall be warranted by the manufacturer for a period of 10 years from the date of substantial completion. The warranty shall be a no-dollar-limit type material warranty to cover all direct and indirect costs except labor. An additional warranty shall be provided by the vendor for a period of 2 years from the date of substantial completion to cover installation/labor.

B. PRODUCTS

- 1. General: Provide overhead-hung single-panel operable partitions by one of the following:
 - a. Hufcor

- b. Panelfold
 - c. Advanced Equipment
- 2. Operation: Manually-operated top-supported single panels.
- 3. Track: Steel or aluminum with adjustable steel hanger rods (1/2" diameter preferred) for overhead support, designed for type of operation, size, and weight of operable panel partition indicated. Size track to support partition operation and storage with maximum operating force not to exceed 25 pounds through all overhead track locations including all changes in panel direction, as demonstrated by field testing
- 4. Trolleys: Four independently replaceable steel wheels and tires (nylon or composite tires are not acceptable) with thrust type roller bearings (ball bearings are not acceptable), shielded and prelubricated. Bearings and wheels shall be independently replaceable and relubricatable. Two trolleys per panel. One trolley panels are not acceptable.
- 5. Panel: Non-combustible, factory fabricated, one-piece welded acoustical panel with no visible face fasteners.
 - a. Faces and Frame: Minimum 16-gauge (1.59 mm) steel faces fusion welded at 8" on-center (203 mm) to 16-gauge (1.59 mm) steel channel perimeter frame with 14 gauge (1.98 mm) top rail and 16 gauge (1.59 mm) internal steel stiffeners or gypsum board material as required for backing and to achieve specified acoustical rating
 - b. Stiffeners shall be utilized as follows:
 - 1. Panels less than 24": 1 stiffener centered in panel fusion welded every 8" on-center.
 - 2. Panels 25"-48": 2 stiffeners equally spaced and welded on each side.
 - 3. Panels greater than 48": 3 stiffeners equally spaced and welded on each side.
 - c. Weight: Minimum 8.5 lbs per sq/ft and maximum 12 lbs. per sq/ft.
 - d. STC: 49 Minimum per ASTM E90-85.
 - e. NIC: 42 Min.
 - f. All panel faces shall have a rust inhibitive prime coat of paint on both faces.
- 5. Perimeter Sound Seals:
 - a. Top Seals: Fixed, flexible, multi-fin sweep type seal.
 - b. Drop Seals (*for Single Panels*): Retractable floor seals shall be spring loaded, internally guided and employ a waist high pivoted lever handle. The seal shall have a vertical travel range greater than 2" capable of acting as a locking mechanism to fix the panel in any desired location in the opening with constant pressure serving to seal each panel. The seal system shall be completely self-contained within each panel and have no visible mechanism or fasteners on any panel face. Seals shall be replaceable and repairable. Portal panels hinged to full width panels shall have fixed-flexible floor seals. The base of these panels shall match in appearance the base of all other panels. Seal systems requiring holes in panel face or base will not be permitted.
- 6. Finishes:
 - a. Track: Aluminum shall be 6063-T5 alloy, having Aluminum Association finish AA-C22-A21, clear satin anodized. Exposed hardware shall have powder coat finish compatible with perimeter trim. Steel track finish shall be powder coated white
 - b. Panel finish (Wall greater than 10 feet in height): Panel finish shall be Type II, 20 oz. Vinyl wall covering to 10' AFF; then Class A flame spread Acoustirib above 10' AFF. Architect to select color and pattern within this range.
 - c. Panel finish (Wall up to 10 feet in height): Panel finish shall be determined by WCPSS education specifications
 - d. Panel trim: Clear anodized.

7. Pass Doors: Pass doors may only be utilized upon written consent of the owner. Where indicated, shall be of same construction, thickness and finish as operable wall panels. Hardware includes: 4 hinges, flush pull both sides, and magnetic door seals.

C. EXECUTION

1. Examine surrounding building construction for conflicts which may affect operable partition operation.
 - a. Verify that jamb conditions are plumb and within manufacturer's acceptable standard.
 - b. Verify that floor is level to within 1/8" (3.2 mm) in 10' (3.05 m) non-accumulative.
 - c. Verify support structure location.
 - d. Ensure other conditions are within manufacturer's recommended tolerances as shown on the shop drawings
2. Comply with "Standard Recommended Practice for Architectural Application and Installation of Operable Partitions".
3. Perform work under supervision of manufacturer-approved installer. Follow manufacturer's installation instructions.
4. Adjust partition and components as required for satisfactory installation and operation.
5. Clean surfaces soiled by work as recommended by the manufacturer.
6. Upon completion of the installation, test operation of partition in the presence of the Architect and Owners Representative demonstrating compliance with operation force of less than 25 pounds.
7. Field Acoustical Performance: At Owner's initial expense, at completion, owner may choose to conduct field acoustical test by a qualified independent acoustical consultant as designated by Architect in accordance with ASTM E336.

10 28 00 TOILET ACCESSORIES

A. GENERAL

1. Toilet Accessories shall be surface mounted type unless noted otherwise. All toilet paper, paper towel and soap dispensers are to be furnished by WCPSS and installed by the Contractor unless noted otherwise below.

B. PRODUCTS

1. Paper towel dispensers shall be furnished by WCPSS and installed by the Contractor. Installation must be performed with screws.
2. Soap dispensers shall be furnished by WCPSS and installed by the Contractor. Installation must be performed with screws.
3. Toilet paper holders for non-handicapped accessible toilets and stalls shall be furnished by WCPSS and installed by the Contractor. Installation must be performed with screws.
4. Toilet paper holders for handicapped-accessible toilets and stalls shall be 2-roll, heavy duty and shall be provided by the Contractor.
5. Grab Bars shall be 1-1/2" diameter satin stainless steel with concealed fasteners, mounted securely to walls.
6. Shower Bar Soap Holder: Equal to Bobrick B-4380 Recessed Soap Dish.
7. Shower Curtain Rod: Equal to Bobrick #B-207 with #204-1 hooks and #204 vinyl curtain.
8. Towel/Robe Hooks: Equal to Bobrick B-6727 Double Robe Hook.
9. Folding Shower Seat: Equal to Bobrick #B5181 Folding Shower Seat.
10. Mirrors shall be polished stainless steel at middle & high school student toilet rooms and framed mirror glass elsewhere. Place mirrors so reflections cannot be seen from corridors.
11. Robe hooks shall be stainless steel with #4 satin finish and concealed attachment.
12. Sanitary napkin Disposal units shall be of plastic construction. Mounting shall be into toilet partitions and for recessed wall mounting. Contractor to provide, and shall be similar to "Safe-Use Sanitary Napkin Receptacle", plastic unit with lid to empty from the bottom.

C. EXECUTION

1. Paper Towel dispensers: Install one (1) dispenser for every two (2) lavatories; locate immediately adjacent to lavatories for ease of use.
2. Soap Dispensers: Locate directly over lavatories.
3. Mirrors: Size of mirrors at student toilet rooms to be approximately 20 in. wide by 60 in. high. Mirrors shall be located on walls away from lavatories and mounted approximately 9 in. above finished floor. Mirrors at staff toilets may be located over lavatories. It is desirable to have one 20 in. x 60 in. full-length mirror at the women's staff toilet rooms.
4. Sanitary Napkin Disposal: shall be provided at all women's staff and girl's elementary, middle and high school toilet rooms. Install at each compartment of group toilet rooms.
5. Robe Hooks: shall be provided at individual toilet rooms.
6. Contractor to mechanically fasten paper towel, toilet paper and soap dispensers in place per the manufacturer's recommendations. If the dispenser is indicated to be mounted to a drywall partition, the dispenser must be secured to studs or blocking.
7. Locate all toilet paper dispensers so that toilet stall doors will not hit dispensers when door is opened.

10 44 00 FIRE EXTINGUISHERS AND CABINETS

A. GENERAL

1. Fire Extinguishers shall be located per the Learning Environment Guidelines (LEGs), as required by local code officials, and in accordance with the recommendations of NFPA 10, "Standard for Portable Fire Extinguishers". In areas accessible to students where fire extinguishers are required, cabinets shall be provided.
2. Contractor shall provide fire extinguishers and cabinets.

B. PRODUCTS

1. Cabinets: shall be approximately 9-1/2 in. x 24 in. x 6 in. (inside box) for semi-recessed or recessed installation. Breakable transparent glazing shall be scored Plexiglas. Specify recessed cabinets for all corridor locations. Maintain integrity of all fire-rated walls.
2. Fire Extinguishers: shall be multipurpose 4A:80B:C, 10-lb. capacity typically unless otherwise required by code.

C. EXECUTION

1. Install cabinets at the heights required by local code officials. Mounting shall be into solid construction (i.e. metal studs/metal plate/solid wood blocking).
2. WCPSS Safety Department requires fire extinguishers at a minimum in:
 - a) Rooms with gas burning appliances.
 - b) Rooms with cooking ranges.
 - c) Wood Shop
 - d) Auto Shop
 - e) Culinary Kitchens

10 51 13 METAL LOCKERS

A. GENERAL

1. Lockers shall be recessed in wall construction or have sloping tops and masonry end walls. Bases shall be provided by manufacturer. Use closed "kitchen style" base unless noted otherwise.
2. Lockers shall have recessed hasps for receiving combination padlocks.

B. PRODUCTS

1. Student Lockers: shall be of steel construction with baked enamel finish. Doors shall be one-piece 16-gauge (0.053") minimum steel with louvered vents. Hinges shall be steel, full loop, 5 knuckle, tight pin, welded to frame, screwed to door. Provide a minimum of 3 hinges per door over 42 in. high and 2 hinges for doors 42 in. high and less. Provide manufacturer's standard ball-pointed hooks. Minimum size for student locker compartments shall be 12 in. x 36 in.
2. Athletic Lockers: Similar to student lockers except provide perforated doors at compartments for gym and athletic clothes. Perforations must be small enough such that items cannot be pulled through.
3. Staff Lockers: Similar to student lockers except minimum size shall be 12 in. x 60 in.
4. Padlocks: Provide one (1) master-keyed combination padlock for each locker. Also provide 5% spare padlocks. Provide 30 locks that are ADA-compliant such as Masterlock ADA model 2650 push key, and provide associated master key.

C. EXECUTION

1. Install securely to walls, level and plumb.

10 53 00 PRE-ENGINEERED ALUMINUM WALKWAY COVERS

A. GENERAL

1. Extruded Aluminum Walkway Cover shall consist entirely of extruded aluminum sections (roll-formed not acceptable). System shall consist of heliarc welded, one-piece rigid structural bents (column and beam assemblies), decking, fascia, accessory items and hardware to provide a complete system.
2. Water shall drain from deck into designated beams and out at grade level of columns through weepholes.
3. Submittals:
 - a. Shop Drawings: Submit detailed drawings, layout of walkway cover system, bent locations (identify drain columns and wet bents), all mechanical joint locations with complete details, connections, jointing and accessories. Include details of concrete footings and bent anchorage.
 - b. Product Data: Submit manufacturer's product data, specifications, component performance data and installation instructions.
 - c. Calculations: Provide signed and sealed structural calculations for the proposed walkway covers, by a professional structural engineer registered in the state of North Carolina. Obtain separate permits, if required by authorities having jurisdiction, for the construction of these canopies.
4. Manufacturer: Obtain aluminum covered walkway system from a single manufacturer.
5. Installer Qualification: Firm with not less than three (3) years of experience in installation of aluminum walkway covers of type, quantity and installation methods similar to work of this section.
6. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication where possible, to insure proper fitting of work. However, allow for adjustments within specified tolerations wherever taking of field measurements before fabrication might delay work.
7. Shop Assembly: Preassemble units in shop to greatest extent possible and disassemble as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
8. Coordination: Coordinate work of this section with work of other sections which interface with covered walkway system (sidewalks, curbs, building fascias, etc.).
9. System Performance: Provide aluminum covered walkway system that has been designed, produced, fabricated and installed to withstand normal temperature changes as well as live loading, dead loading and wind loading in compliance with N.C. State Building Code requirements for geographic area in which work is located:

B. PRODUCTS

1. Basis-of-Design: "Ditt-Deck Extruded Aluminum Walkway Cover System" by Dittmer Architectural Aluminum, or approved equal by Peachtree, Superior Metal, or Mapes Industries.
2. Aluminum extrusions shall be alloy 6063-T6.
3. Comply with indicated profiles, dimensioned requirements and structural requirements.
4. Bents shall consist of shop welded one piece units. When size of bents do not permit shipment as a welded unit, concealed mechanical joints may be used.
5. Mechanical joints shall consist of stainless steel bolts with a minimum of two (2) bolts per

- fastening. Bolts and nuts shall be installed in a concealed manner utilizing 1/2" thick by 1 1/2" aluminum bolt bars welded to structural members. All such mechanical joints must be detailed on shop drawings showing all locations.
6. Roof Deck: Extruded Aluminum shapes, interlocking self-flashing sections. Shop fabricate to lengths and panels widths required for field assembly. Depth of sections to comply with structural requirements. Provide shop induced camber in deck units with spans greater than 16'- 0" to offset dead load deflections. Welded dams are to be used at non-draining ends of deck.
 7. Expansion joints: Design structure for thermal expansion and contraction. Provide expansion joints as required.
 8. Apply a shop applied dip-coat of clear acrylic enamel to each column end terminating in concrete to insulate from electrolytic reaction. Column ends shall be pierced to "key" grout to bent for maximum uplift protection.

C. EXECUTION

1. Examine adjacent work for conditions that would prevent quality installation of system.
2. Sleeves (styrofoam blockouts) shall be furnished by walkway cover manufacturer and placed by general contractor.
3. Erection: Set roof support frames (bents) into pockets provided in top of footings; set to required elevations, align, plumb and level; and grout in place with 2,000 p.s.i. minimum portland cement grout. Assure that grout fills all voids and "keys" to columns. Fill downspout units with grout to bottom of discharge level. Install aluminum deflectors after grouting. Follow manufacturer's instructions. Match to finish and elevation of adjacent sidewalks.
4. Install roof deck sections, accessories and related flashing in accordance with manufacturer's instructions. Provide roof slope for rain drainage without ponding water. Align and anchor roof deck units to structural support frames.
5. Assemble all components in a neat, workmanlike manner.
6. Cleaning: Remove protective coverings at time in project construction sequence which will afford greatest protection of work. Clean finished surfaces as recommended by manufacturer. Maintain in a clean condition during construction.

10 75 00 FLAGS AND BANNERS

A. GENERAL

1. Banners, signs, and other decorative items must be tested in accordance with the small-scale tests of NFPA701 "Standard Methods of Fire Tests for Flame Propagation of Textiles and Films. In addition to a written certificate, all items must have a label permanently attached noting the certification.

DIVISION 11 – EQUIPMENT

11 40 00 FOOD SERVICE EQUIPMENT

A. GENERAL

1. Food Service equipment shall be designed to be bid as part of the prime general construction contract.
2. Inspections: Pressure vessels for cooking shall be inspected by the N.C. Boiler Bureau. Refrigeration and air conditioning equipment shall be inspected by qualified inspectors. Contractors shall provide certificates of the above inspections indicating approval.
3. Provide equipment as indicated in Attachment 11 40 00 Attachment A – Food Preparation equipment Schedule.
4. An add-alternate should be included for each of the following preferred-manufacturer food preparation equipment items:
 - a. Blodgett Convection Oven
 - b. Robot Coupe Food Processor
 - c. Colorpoint Serving Lines

B. PRODUCTS

1. Walk-in Coolers and Freezers:
 - a. Floors shall be approximately the same level as the Kitchen floor for food cart operation. Floors shall be non-slip. Locate floor drains near and outside the cooler and freezer door(s) and run copper condensate drain from evaporator unit to this floor drain. Locate temperature controls and thermometers on the outside near the cooler and freezer doors. Temperature setting for the cooler shall be 45 deg. F. and temperature for freezer shall be 0 deg. F.
 - b. Walk-in Coolers and Freezers shall share no components. Cooler and Freezer boxes shall be separated by an air gap. Condensate drains shall be run separately and not pass through both freezer and cooler.
 - c. Provide electrical heat strip around freezer door to prevent freeze up of door.
 - d. Insulation of cooler / freezer refrigerant piping should be closed cell (Armaflex, Rubates or Aerocell) with UV protection.
 - e. Cooler and Freezer Condensers: Outdoor condensers shall be located on a concrete pad. Condensers shall not be located on the roof. Maintain manufacturer recommended spacing for proper ventilation.
 - f. Architect shall specify proper shelving (similar to Metromax Q), additional lighting and non-slip floor strips to be provided for all walk-in coolers and freezers
2. Dunnage racks: Provide interlocking products similar to Metromax “Bow-Tie” 100 %resin dunnage racks.
3. Fly Fan: Provide at all exterior doors from Kitchen area with automatic operation controlled by a jamb mounted switch.
4. Natural Gas Fuel Shut-off: Provide automatic type, as required by code. Locate valve a maximum of 6 ft. above finish floor.
5. Fire-extinguishing System: Provide under-hood system, as required by code. Coordinate with mechanical for shutdown of HVAC systems when hood system is activated and with electrical for notification of fire alarm when hood system is activated. Locate remote Ansul pull station near exterior egress from kitchen. Show location of pull station on plans. Pull Station R/I back box shall be installed in-wall, with cover and handle surface mounted.
6. All new cafeteria serving lines shall be manufactured by Colorpoint or approved equal (Shelly

- Line is not an approved equal). Color selections to be approved by WCPSS prior to ordering.
7. All milk coolers shall be manufactured by True or Norlake or approved equal. (Beverage-Aire is not an approved equal)

C. EXECUTION

1. Install all food service equipment in accordance with manufacturer's requirements.
2. Fan shall be specified by Kitchen designer, furnished by kitchen equipment provider, and installed by mechanical contractor.
3. Floor drains shall be specified by Plumbing Engineer and provided by plumbing contractor.
4. Kitchen hood shall be specified by Mechanical Engineer and provided by Mechanical contractor. Refer to Section 23 03 00-B.2, Section 23 42 00. Refer to LEGs documents for typical equipment layout below Kitchen Hood.

11 52 13 PROJECTION SCREENS

A. GENERAL

1. Projection screen size shall be appropriate for location and approved by WCPSS. Screens at stage locations must be electrically powered.

B. PRODUCTS

1. Electrically Operated Screens, General: Manufacturer's standard units consisting of case, screen, motor, controls, mounting accessories, and other components necessary for a complete installation. Provide units that are listed and labeled as an assembly by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - a. Line Voltage Control: Remote, key-operated, 3-position control switch installed in recessed metal device box with flush cover plate matching other electrical device cover plates in room where switch is installed.
 - b. Motor in Roller: Instant-reversing motor of size and capacity recommended by screen manufacturer; with permanently lubricated ball bearings, automatic thermal-overload protection, preset limit switches to automatically stop screen in up and down positions, and positive-stop action to prevent coasting. Mount motor inside roller with vibration isolators to reduce noise transmission.
 - c. Screen Mounting: Top edge securely anchored to rigid metal roller and bottom edge formed into a pocket holding a 3/8-inch- (9.5-mm-) diameter metal rod with ends of rod protected by plastic caps.
2. Suspended, Electrically Operated Screens: Motor in roller units designed and fabricated for suspended mounting.
 - a. Provide metal or metal-lined motor enclosure on units with motor in roller.
 - b. Screen Case: Made from metal.
 - c. Prime paint surfaces of screen case that will be exposed to view in the finished work
3. Screen Material and Viewing Surface:
 - a. Matte-White Viewing Surface- Screens shall have vinyl-coated glass-fiber fabric with matte-white finish. Peak gain of 0.9 to 1.0, and gain of not less than 0.8 at an angle of 50 degrees from the axis of the screen surface.
 - b. Mildew Resistance: Rating of 0 or 1 when tested according to ASTM G 21.
 - c. Flame Resistance: Passes NFPA 701.
 - d. Seamless Construction: Provide screens, in sizes indicated, with horizontal seams only.
 - e. Edge Treatment: Black masking borders.
 - f. Provide extra drop length of dimension indicated.

C. EXECUTION

1. Install front-projection screens with screen cases in position and in relation to adjoining construction indicated. Securely anchor to supporting substrate in a manner that produces a smoothly operating screen with vertical edges plumb and viewing surface flat when screen is lowered.
2. Test electrically operated units to verify that screen controls, limit switches, closure, and other operating components are in optimum functioning condition.

11 53 00 LABORATORY EQUIPMENT AND CASEWORK

A. GENERAL

1. Refer to Section 12 30 00 "Laminate-Clad Casework" for detailed product information.
2. Contractor shall be required to submit samples of plastic-laminate casework finishes.
3. Both built-in and portable casework shall work together as a system and shall be by the same manufacturer.

B. PRODUCTS

1. Casework: shall be laminate-clad as indicated in Section 12 30 00 "Laminate-Clad Casework".
2. Countertops: shall be acid resistant phenolic material similar to lab grade "Trespa." Sinks shall be of the same material. Each sink shall include a point of use acid dilution tank placed in adjacent cabinet.
3. Student Tables: 24" Deep x 54" Width welded steel science tables with a 3/4" phenolic resin top, in black, with adjustable legs, equal to or better than Fleetwood's 24" x 54" science table.
4. Fittings: shall be vandal-resistant.
5. Hardware: shall be heavy-duty, stainless steel.
6. Science Lab Fume Hood:
 - a) Exterior Construction: Double wall construction, 18-gauge cold rolled steel.
 - b) Interior Construction: Galvanized steel
 - c) Left/Right Fascia: Powder coated steel, color Glacier White.
 - d) Liner Material: Molded fiberglass reinforced polyester resin.
 - e) Side Panels: Removable, color Glacier White.
 - f) Baffles: Molded fiberglass reinforced polyester resin.
 - g) Air Foil: Cold rolled steel, powder coat finish.
 - h) Sash: Vertical travel, tempered safety glass, counter weighted and balanced, pulley system.
 - i) Electrical Fixtures: Fluorescent light and tubes with switch, duplex 115v, 20-amp, GFCI receptacle.
 - j) Alarm/Monitor: Airflow monitor with alarm
 - k) Wiring: Fume Hood completely wired at factory, electrical connection made at inside junction box, 115v/60Hz.
 - l) Service Fixtures: Color-coated handles, front loading.
 - m) Plumbing: connections made with compression fittings, fully pre-piped, cold water gooseneck faucet with integral vacuum breaker, no gas connection.
 - n) Work Surface: black epoxy resin.
 - o) Sink: Cup sink, right side.
 - p) Accessories: Ceiling enclosure, 3 sides.

C. EXECUTION

1. Install tables and casework in configurations indicated on drawings.
2. Point of use acid dilution traps shall be specified by plumbing engineer and provided by plumbing contractor along with all associated trim below cabinet.
3. Sink basin, tailpiece, and faucet shall be furnished with casework.

11 61 00 STAGE EQUIPMENT

A. GENERAL

1. Dance/Drama Area: Pipe grid system for lighting shall be furnished and installed by the General Contractor.
2. Maintain adequate clearances between pipe grid and ductwork.

B. PRODUCTS

1. Pipe Battens: Shall be 1-1/2 in. dia., schedule 40 pipe. Provide in Educational Theaters and in Video Studios
2. Curtains: In the theater shall be “dead hung” from the structure. All curtain fabric shall be 25/50 flame/smoke rated. Curtains/Draperies must be tested in accordance with the large scale tests of NFPA701. In addition to a written certificate, all items must have a label permanently attached noting the certification.
3. Refer to Appendix A, 11 61 00 Attachment A for Elementary School platform curtain requirements.
4. Refer to Appendix A, 11 61 00 Attachment B for Middle School stage curtain requirements.
5. Refer to Appendix A, 11 61 00 Attachment C for High School stage curtain requirements.

11 66 00 ATHLETIC EQUIPMENT

A. GENERAL

B. PRODUCTS

1. Acoustical Treatment: Provide suitable wall and/or ceiling acoustical treatment at gymnasiums.
2. Basketball Backboards: shall be glass for main court, solid for cross-courts. Rims shall be "breakaway" type. Backstops shall be electrically operated.
3. Indoor Scoreboard: Wall mounted electronic type, with time-clock (with one-tenth of a second increment), horn, team scores, period, bonus, jump ball, next possession, and possession. Time clock shall be bi-directional with ability to directly set any number of minutes and seconds. Scoreboard shall be compatible for basketball, volleyball, and wrestling (wrestling applies to high schools only). Scoreboard to be similar to NEVCO Model 2750.
4. Football/Soccer Scoreboard: Exterior type with time-clock (with one-tenth of a second increment), team score, horn, period, down, yard-line, yards to go, and possession. Scoreboard to be similar to NEVCO Football LED Model 3614.
5. Baseball/Softball Scoreboard: Exterior type mounted behind the left field fence with team score, inning, ball and strike count and outs. Provide provisions necessary to locate the scorer's table at the home-plate area (wireless controllers are acceptable). Scoreboard to be similar to NEVCO Baseball LED Model 1610.
6. Soccer and Football Goal Posts: Goal posts shall be painted over galvanized steel.
7. Volleyball and Badminton Floor Sleeves: Provide floor sleeves for volleyball at high school and middle school gymnasiums. Sleeves shall be recessed steel with hinged floor plate. Top of floor plate must be completely encapsulated and shall be flush with wood floor. Floor plates shall be either solid brass or steel with chrome plated finish.
8. Volleyball Equipment: Contractor shall provide the standards and judge's chair(s) for volleyball.
9. Wall Pads: 2 in. thick, polyurethane foam, mounted on 3/8 in. plywood and covered with heavy-duty vinyl covering. Permanently mounted at end walls of basketball courts. In Auxiliary Gyms, end walls of side courts should also be padded.
10. Playclocks: Provide playclocks meeting requirements of NCHSAA.

11 68 13 PLAYGROUNDS AND PLAYGROUND EQUIPMENT

A. GENERAL

1. WCPSS shall provide all playground equipment.
2. Provide ADA-compliant routes from the building to all playground equipment.
3. Provide subsurface drainage, grading, utilities, etc., required for playground areas as noted elsewhere in Design Guidelines and Learning Environment Guidelines.

B. PRODUCTS

1. Rubber Surfacing: Avoid the use of all-black colors for rubber surfacing. Poured in place surface installed on a 4" thick concrete pad is the acceptable surface for all new construction. For all playgrounds, the surfaced area must be graded so that the playground surfacing meets up level with a connecting sidewalk and the remaining sides must be finished off with the Polyethylene timbers.
2. PTA projects on existing campuses may use ADA wood mulch for playground surfacing. If mulch is used, then a layer of geotech fabric must be placed below the mulch to prevent weeds and grasses from growing up through the mulch.
3. Timber Edge: Polyethylene timbers, anchored in place with #4 rebar. An area large enough for a wheelchair to pass through must be left open at the transfer station.
4. Bike Racks: Loop style nine (9) space bike racks, in-ground or surface mounted, 2-3/8 inch O.D. Schedule 40 hot-dipped galvanized pipe.
5. Flagpole: Seamless, tapered aluminum tubing, clear anodized finish, 30-foot exposed height, manufacturer's standard butt and top diameter. Provide complete with external cleats, halyards, truck and collar.
6. Outdoor Basketball Outfit: Hot dipped galvanized bent post with 6' offset, with fan-shaped poly backboard and nylon net.
7. Trash Receptacles: Provide powder-coated molded metal, in-ground or surface-mounted, 55-gallon trash receptacle with 10" to 14" flat top diameter opening. No side option door.
8. Benches: Provide powder-coated molded metal in-ground or surface-mounted benches.
9. Picnic Tables: Provide powder-coated molded metal in-ground or surface-mounted picnic tables. Plastisol dipped coating allowed. Thermal-fused plastic coating is not allowed.
10. For Pre-K Playground ONLY: Provide breathable fabric canopy shade structure 20'x22' to be incorporated with the playground equipment. 5" minimum diameter posts are required for the shade structure. All local municipality permitting requirements must be followed when installing any shade structures on a WCPSS school site.

C. EXECUTION

1. Install all equipment where indicated on the drawings, or as directed by the Owner. Provide protection of completed installations until accepted by the Owner.

11 82 26 WASTE COMPACTORS AND DESTRUCTORS

A. GENERAL

1. Incinerators shall not be used without approval from owner
2. Solid Waste Handling Equipment with discharge into sewage system shall not be used.

11 95 00 KILNS

A. GENERAL

1. Kiln and vent exhaust kit shall be provided by WCPSS. The basis-of-design kiln shall be Skutt Model KM-1027. Refer to <https://skutt.com/images/Designing-a-Kiln-Room.pdf> for manufacturer's directions on kiln room layout and requirements.
2. Kiln shall be provided with 120V circuit and disconnect by electrical contractor.

DIVISION 12 – FURNISHINGS

12 21 13 HORIZONTAL LOUVER BLINDS

A. GENERAL

1. Horizontal Louver Blinds shall be manufactured in accordance with the standards quality supplied for commercial use.
2. Certified copies of test results applicable to the model(s) offered and a certificate of compliance completed by an officer of the company must be provided to the Division of Purchase and Contract. The test results must comply with Document 1029 of the American Window Covering Manufacturers Association latest requirements and must cover all required tests:
 1. Durability – Lifting and tilting
 2. Pull force test
 3. Salt-Spray, Humidity and Weathering Test
 4. Pull Apart Test – shrinkage of stretch test
 5. Rigidity Test
 6. Flexibility
 7. All cord and tapes tests as specified in Document 1029

B. PRODUCTS

1. Headrail:
 - a. The headrail to be sheet steel .019 in. (0.483 MM) thick after painting, zinc plated, electro galvanized, or primed and painted with baked on enamel finish. Headrail to be nominal 1 in. x 1 in., 1 in. x 1 1/2 in., or 1 in. x 1 1/8 in.
 - b. All hardware to be enclosed in the metal headrail. When the blind is in the closed position, the tip slat shall barely make contact with the underside of the headrail for its full length. Adjustable end braces shall be provided for a snug fit in brackets.
2. Bottom Rail:
 - a. The bottom rail shall be a minimum of 0.020 in. (0.508 MM) corrosion resistant sheet steel for channel section or 0.018 in. (0.457 MM) for oval or lock seam, zinc plated, electro galvanized, or primed and painted, with baked on enamel finish.
3. Hardware:
 - a. In blinds over 60 inches or over 50 square feet, the tilt rod shall be of solid cross-section and manufactured from corrosion resistant steel with either metal or low friction thermoplastic at each tape drum. In blinds under 60 inches or 50 square feet, the tilt rod shall be solid cross-section or u-shaped cross-section and manufactured from corrosion resistant steel. All tilt rods shall provide acceptance torsional rigidity during operation. Tilt rod supports shall have minimal friction and be manufactured from abrasive resistant polymer or corrosion resistant steel. Tilter mechanism shall be of a corrosion resistant steel or plastic housing that may be of the open or enclosed lubricated type. Gears shall be nylon or die-cast metal or equivalent, and approximately 3/8 in. (9.525 MM) to 3/4 in. (19.05 MM) diameter.
 - a. Tilt wand to be of transparent plastic with a diameter (measured across smallest dimension on non-circular cross-sections) of .20 in. (5.08 MM) or greater, and must provide acceptable torsional rigidity during operation
4. Slats:
 - b. The slats shall be special flexible or tempered aluminum alloy, width 1 in. (25.00 MM)

plus/minus 0.003 in. (0.0762 MM). Slat thickness shall be a minimum of 0.0072 in. (0.1829 MM) before painting and a minimum of 0.0082 in. (0.083 MM) after painting. Slat ends shall have rounded corners with a 1/8 in. (93.175 MM) to 3/16 in. (4.7625 MM) radius.

- c. Slat ends shall have baked colorfast enamel coating of sufficient hardness to resist surface abrasion for the expected life of the blind.

5. Tapes and Tape Spacing:

- a. One-inch blinds shall have braided ladders of polyester yarn supporting slats. Their horizontal components or rungs to consist of two threads interbraided with the verticals. Maximum allowable ladder spacing to be 20.0 MM
- b. Maximum spacing for 1 in. blinds shall be 24 in. (914.4 MM) from center of tape, with a maximum of 6 1/2 in. (165.1 MM) from rout hole to the end of the slat on each end of the slat. The number of tapes for various blind widths shall be as shown below:

<u>Blind Width</u>	<u>No. of Tapes</u>
1. 0 in. – 36 in. (0.0mm – 914.4 MM)	2
2. Over 36 in. – 60 in. (914.4 MM – 1,524 MM)	3
3. Over 60 in. – 84 in. (1,524 MM – 2,133.6 MM)	4
4. Over 84 in. – 108 in. (2,133.6 MM – 2,743.2 MM)	5
5. Over 108 in. – 132 in. (2,743.2 MM – 3,352.8 MM)	6

6. Cords:

- a. Cord for 1 in. (25.4 MM) blinds to be braided polyester fiber, minimum of 1.4 MM diameter with or without polyester or rayon core and a minimum breaking strength of 130 lbs.
- b. Cord Locks: A proper number of crash-proof cord locks shall be provided. The cord lock shall have the ability to lock the slats at desired heights upon release of the cord.

7. Stringing:

- a. Blinds shall be strung in such a way that the pounds of pull force (required to raise the last 6 in. (152.4 MM) to a fully open position when measured with an extension scale) shall not be greater than the result computed in accordance with the following formula:

$$\text{Lbs. Pull Force} = 45 \times \text{blind width (inches)} \times \text{blind length (inches)}$$

(Data based on specification that maximum force to lift a 120 in.x 120 in. blind is 45 lbs)

8. Accessories:

- a. Blinds shall have properly attached good quality tassels and equalizers. A minimum of two screws or bolts per bracket (except hold down brackets) shall be provided. Hold down brackets for blinds shall be provided if requested by Owner.
- b. All door blinds shall have hold down brackets.

9. Zinc Plating:

- a. Where zinc-plating is required it may be applied by either the hot dip or electrodeposited process. If hot dip, 0.60 oz/sq. ft. of coated surface shall be applied as per federal specification QQ-S775D, Type I, Class A or B. If electrodeposited, 0.065 mil thickness on coated surfaces shall be applied as per federal specification QQ-Z-325, Type I, Class.

C. EXECUTION

1. If installation by the contractor is called for in the invitation for bids, the following requirements shall apply.
2. Blinds in excess of 60 inches (1,524 MM) width or 45 sq. ft. (4.18 Sq. M) in area shall have intermediate supports which shall not be over 48 inches apart at any point.
3. When possible, blinds shall be installed between jambs with head member against soffit. Clearance between slat ends and jambs shall be 1/16 in. (1.588 MM) to 1/4 in. on each side

of blind. Bottom rail with no clips, staples, or tape in contact with the sill at underside, bottom rail to be 1/4 in. (6.35 MM) maximum above sill on level slat position.

4. All blinds installed in windows with air conditioner units shall have cut-outs to appropriately fit around the unit. No bunching of slats on the top of the unit or unsightly gaps on either side of the unit shall be allowed.
5. All blinds shall be marked or labeled inside the headrail with the contractor's name, date of assembly, and date or month and year of shipment. If installation is made by the contractor, the date of installation shall be substituted for date of shipment.

12 24 13 ROLLER WINDOW SHADES

A. GENERAL

1. Submittals: Submit product data, shop drawings, and details for roller shades, including samples of proposed shade materials and available colors.
2. Fire-Test-Response Characteristics: Passes NFPA 701-99 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.
3. Shadecloth Anti-Microbial Characteristics: 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC 9644, and ATCC9645
4. Shadecloth to be PVC-free.
5. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1.

B. PRODUCTS

1. Provide products equal to MechoSystems "Classic Mecho/5" roller shade system with room darkening shade material.
2. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
3. Electric Operation: Large, or difficult-to-reach windows will required remote electric operation
4. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shade bands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shade bands for service.
5. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
6. Shade band Material: Confirm with Owner the exact type of shade material necessary for each type of space.
7. Accessories: Provide front fascia, endcap covers, and side/bottom channels (where full room darkening is required).

C. EXECUTION

1. Verify adjacent construction is suitable and of correct dimensions for installation of roller shades.
2. Install brackets and roller shades level, plumb, and aligned with adjacent units, in compliance with manufacturer's literature.
3. Test shades to confirm proper operation.
4. Clean all surfaces prior to Substantial Completion.

12 30 00 LAMINATE-CLAD CASEWORK

A. GENERAL

1. Related Documents: Drawings and general provisions of Contract, including General and Special Conditions and Division 1 - Specification sections, apply to work of this section.
2. Scope of Work: The work includes fabrication and installation of fixed modular laminate clad casework and components, fixed countertops, backsplashes, etc. furnished by the same supplier, as shown on drawings, schedules, and specified herein
3. Related Work Specified Elsewhere:
 - a. Sinks and service fixtures, service and waste lines and all connections, vents, electrical service fixtures, hoods and ducting within or adjacent to casework, or otherwise required. (See Plumbing Division 22, Mechanical Division 23, and Electrical Division 26).
 - b. Rubber Base. (See Finishes Division 9).
 - c. General Contractor to supply appliances and blocking within walls where indicated.
 - d. General millwork, trim, and /or custom cabinetry unless specifically noted on plans as included in this section.
4. Quality Assurance: Manufacturer shall provide a published catalogue with all pre-engineered components illustrated and described. Manufacturer to have been in business a minimum of five (5) years, and have experience providing casework systems for similar types of projects. The manufacturer must produce evidence of financial stability, bonding capacity, and adequate facilities and personnel required to produce work of this scope.
5. Submittals:
 - a. Samples:
 1. Manufacturer to provide standard decorative laminates for exposed and semi-exposed surfaces for architect's selection. Samples of edge materials and hardware shall be available.
 2. Architect may request full-size samples for evaluation prior to approval. Architect/owner may keep the sample until the job is complete to ensure compliance with specifications.
 - b. Shop Drawings:
 1. Manufacturer to provide production drawings for casework systems and countertops. Drawings should be to scale indicating location of all architectural features: wall type, doors, and windows.
 2. To coordinate production drawings with other work involved, casework manufacturer to provide shops drawings for all trades involved in installation of casework.
6. Product Handling:
 - a. Deliver completed laminate clad casework and countertops only after wet operations in building are completed. Materials to be stored in a ventilated place, protected from the weather, with relative humidity range as required by manufacturer.
 - b. Protect finished surfaces from soiling and damage during handling and installation with a protective covering.
7. Job Conditions: Manufacturer or vendor must advise contractor of requirements for maintaining heating, cooling, and ventilation in installation areas to maintain optimum moisture content. (See Product Handling).
8. Warranty: All materials and workmanship covered by this section shall carry a 3-year warranty from date of substantial completion. This warranty is a warranty of replacement and repair only, whereby the manufacturer will correct defects in material and or workmanship

without charge. It does not warrant any products that have been abused, exposed to excessive loads or left in unconditioned air after occupancy.

9. AWI Quality Certification Program: The owner or architect shall have the option to require AWI certification for the manufacturer of casework at the manufacturer's expense.

B. PRODUCTS

1. Substitutions: Casework Manufacturers listed below are pre-qualified as of March 6, 2000. All other vendors must be pre-approved ten (10) days prior to bid day in whatever manner the architect chooses to conduct a pre-approval process, and MUST meet all Wake County requirements used to establish this manufacturer's list.
 - a. LSI Corporation of America, Inc.
 - b. TMI
 - c. Interior Wood Specialists
2. Definitions and Materials: Listed are definitions and materials commonly used in defining decorative laminate clad casework. Refer to "Fabrication" section for those items selected for use on this project.
 - a. Definitions: Identification of casework components by surface visibility.
 1. Open Interiors: Any open storage unit without solid door or drawer fronts and units with full glass insert doors and/or acrylic doors.
 2. Closed Interiors: Any closed storage unit behind solid door or drawer fronts, sliding solid doors.
 3. Exposed Ends: Any storage unit exterior side surface that is visible after installation.
 4. Other Exposed Surfaces: Faces of doors and drawers when closed tops of cabinets less than 72" above finished floor.
 5. Semi-Exposed Surfaces: Interior surfaces which are visible, bottoms of wall cabinets and tops of cabinets 72" or more above finished floor.
 6. Concealed Surfaces: Any surface not visible after installation.
 - b. Core Materials:
 1. Particleboard: Medium density 45-50 pound industrial grade particleboard of fir or pine meeting or exceeding ANSI A 208.1-2016, M-3 requirements. Thicknesses used are 1/4", 1/2", 3/4", and 1".
 2. Hardboard: Prefinished hardboard is 1/4" thickness meeting or exceeding commercial standards CS-251.
 - c. Decorative Laminates:
 1. High-pressure decorative laminate GP28 (.028), NEMA Test LD-3-2005.
 2. High-pressure decorative laminate GP50 (.050), NEMA Test LD-3-2005.
 3. High-pressure cabinet liner CL20 (.020), NEMA Test LD-3-2005.
 4. Thermally Fused Melamine laminate tested to meet NEMA Test LD-3-2005.
 5. High-pressure backer BK20 (.020).
 - d. Edging Materials/Colors:
 1. 3mm PVC banding, machine applied with waterproof hot melt adhesive with external edges and outside corners of door and drawer fronts, and countertops, machine profiled to 1/8" radius for safety.
 2. PVC banding shall be available in standard colors. All selections color matched to Wilsonart, Nevemar, Formica and Pionite laminates of the same name.
 3. Barbed T-edging or laminate self-edge on cabinet components is not allowed.
 - e. Glazing:

1. Full sliding glass doors shall be 1/4" tempered glass.
 2. Glass insert doors - hinged or sliding wall cabinets shall be 1/8" D.S. Glass.
 3. Glass insert doors - hinged or sliding tall or base cabinets shall be 1/4" tempered safety glass. Sliding doors mounted in aluminum track.
 4. Provide extruded rigid PVC to hold and trim glass inserts in framed doors.
3. Specialty Items:
- a. Metal Parts:
 1. Countertop support brackets, undercounter support frames, legs and miscellaneous metal parts shall be furniture steel, welded, degreased, cleaned, treated and epoxy powder painted.
 2. Structural assembly is to provide for mounting of closure panels, removable access panels, and field connection of services within.
 - b. Tote Trays:
 1. Shall be heavy-duty vacuum-formed polypropylene plastic with full top rim, pull, and equipped with a label holder.
 2. Tote tray/supply cabinets equipped with injection molded polycarbonate; continuous side rail support glide. Color to blend with selected interior finish. Each side rail support glide shall have integral support pins to interface 32mm (approximately 1-1/4" @) pre-drilled holes, making the supports readily adjustable
4. Cabinet Hardware:
- a. Hinges: Shall be five knuckle, institutional grade, 2 3/4" @ overlay type with hospital tip. Steel shall be minimum .095" @ thick and have minimum of nine (9) edge and leaf fastenings. Hinges shall pass ANSI-BHMA standard A156.9, Grade 1 requirement for both vertical and horizontal set and sag (pair of hinges will hold minimum of 310 pounds); copy of test result shall be provided upon request. Casework manufacturer shall use specifically engineered screws for attachment of hinges; wood screws shall not be permitted. Doors 48" @ and over in height shall have three (3) hinges per door. Provide magnetic door catch with minimum seven- (7) pound pull, attached with screws and slotted for adjustment. Finish to be brushed chrome.
 - b. Pulls: Door and drawer front pull shall be metal wire style, 96mm spacing on fasteners. Pull design shall be compatible with Americans with Disability Act (ADA), Federal Register Volume 56, No. 144, specifically paragraph 4.27.4. Finish to be brushed chrome.
 - c. Drawer slides:
 1. Slides for standard use and kneespace drawers shall be Blum Style No. BS230M with epoxy finish. Slides shall be 3/4" extension. Slides will have a 100-pound load rating at 3/4" extension and a built-in, positive stop both directions, with self-closing feature. Slides shall have a lifetime warranty as offered by the slide manufacturer.
 2. File drawer slides shall be full extension. Slides shall have a lifetime warranty as offered by the slide manufacturer.
 3. Pencil drawers shall be equipped with Blum No. 320 for undercounter or support frame mounting. Slides shall be 3/4" extension.
 - d. Adjustable Shelf Supports: Shall be injection molded polycarbonate, clear color to blend with selected interior finish, friction fit into cabinet end panels and vertical dividers, readily adjustable on 32mm (approximately 1-1/4") centers. Each shelf support shall have two (2)

integral support pins, 5mm diameter, to interface pre-drilled holes, and to prevent accidental rotation of support. The supports shall be automatically adaptable to 3/4" or 1" thick shelving and shall provide non-tip feature. Supports are designed to readily permit field adjustment of shelf. Structural load testing shall show loading to 1,040 pounds (260 pounds per support).

- e. Locks:
 - 1. Doors and drawers as shown on drawings shall be National Lock #M4-7054C, removable core, disc tumbler, cam style lock with strike. Two (2) keys to be provided with each lock. Key number shall be stamped on core and key
 - 2. Chain bolts shall be 3" long, shall have a 18" pull and an angle strike to secure inactive door on cabinets over 72" in height. Elbow catches shall be used on inactive doors up to and including 72" in height.
 - 3. All locks in individual rooms to be keyed alike. Manufacturer to provide two (2) master keys.
 - f. Sliding Door Track: Door track for glass, wood, and marker board sliding doors shall be anodized, double channel aluminum.
 - g. Coat Rods: Shall be 1-1/4" diameter, 14-gauge chrome plated steel installed in captive mounting hardware.
 - h. Hanging File Suspension Rails: All file drawers shall include a pair of 14-gauge steel hanging file suspension rails, epoxy coated. File followers, or other split bottom hardware is not acceptable.
 - i. Mirrors: Shall be 1/4" thick polished mirror plate glass.
 - j. Undercounter Support Frame: Welded steel countertop support frames shall be provided at all kneespaces where indicated on drawings. Frames shall be available in 3" increments to clear span 24" to 60" width. Frames shall readily accept pencil and kneespace drawers, and shall be designed to interface with undercounter support brackets.
5. Fabrication: Fabricate casework to dimensions, profiles, and details as shown.
- a. Cabinet Body Construction:
 - 1. Tops and bottoms shall be joined to cabinet ends and internal cabinet components, such as fixed horizontals, rails and verticals, using no more than 10mm or less than 8 mm diameter industrial grade hardwood dowels. Dowels to be laterally fluted with chamfered ends securely glued and clamped in place under pressure during assembly to secure joints and cabinet squareness. Use minimum of six (6) dowels at each joint for 24" deep cabinets and minimum of four (4) dowels at each joint for 12" deep cabinets.
 - 2. Unless specifically indicated, core shall be 3/4" thick particleboard. Edging and surface finishes as indicated herein. (See below).
 - 3. Unit backs shall be 1/4" thick prefinished hardboard or 1/2" thermoset melamine particleboard inset, color matched to cabinet interior. Exposed back on fixed or movable cabinets to be 3/4" particleboard, color matched to cabinet interior, exterior surface GP28 laminate as selected.
 - 4. All fixed undercounter and tall units shall have a separate plywood base. This base should be 96mm or approximately 4" high.
 - 5. All undercounter units, except sink base units, shall have full sub-top. Sink base units shall be provided with open top, front welded steel/epoxy painted sink rail, full width at top front edge, concealed behind face rail/doors. Unit shall have split back removable access panels. Bottom panel to be faced with CL20 high-

- pressure cabinet liner on both sides, color matched with interior color.
6. All end panels and vertical dividers, except sink base units, shall be prepared to receive adjustable shelf hardware at 32mm (approximately 1-1/4") centers. Door hinges, drawer slides and pull-out shelves shall mount on line boring to maintain vertical alignment of components and provide for future relocation of doors, drawers, shelves and/or pull-out shelves.
 7. All exposed and semi exposed edges of basic cabinet components are factory edged with PVC banding, machine applied with waterproof hot melt adhesive. Edging shall be 3mm PVC. Ten colors preferred, but not required.
 8. Adjustable shelf core shall be 3/4" thick particleboard up to 30" wide, 1" thick particleboard over 30" wide.
 - a. Front edge shall have factory applied 3mm PVC, color to match shelf color
 - b. Any shelving over 30"W shall have a mid-shelf support or steel shelf stiffener
 9. Interior Finish, Units with Open Interiors: Sides, top, bottom, horizontal, and vertical members, and adjustable shelving faced with thermally fused melamine laminate with matching prefinished back.
 10. Interior Finish, Units with Closed Interiors: Sides, top, bottom, horizontal, and vertical members, and adjustable shelving faced with thermally fused melamine laminate, from manufacturers standard color options, with matching prefinished back.
 11. Exposed ends shall be faced with high-pressure decorative laminate GP28 (.028) color from casework manufacturer's full range offering of at least 120 colors.
 12. Wall unit bottom shall be faced with thermally fused melamine laminate.
 13. Wall and tall unit tops top surface will be laminated with thermally fused melamine.
 14. Balanced construction of all laminated panels is mandatory. Unfinished core stock surfaces, even on concealed surfaces (excluding edges), will not be permitted. No exceptions.
- b. Drawers:
1. Sides, back and sub front shall be particleboard, 1/2" thick, laminated with thermally fused melamine. The back and sub front are doweled and glued into the sides. Dowels to be fluted, with chamfered ends and a minimum diameter of 8mm. Top edge is banded with 1mm PVC edging in a matching color.
 2. Drawer bottom shall be particleboard, 1/2" thick, laminated with thermally fused melamine. The bottom panel shall be screwed directly to the front edge of the drawer box. Bottoms constructed of minimum 1/4" tempered hardboard, melamine surfaced to match drawer sides, inset and glued to four sides is also acceptable
 3. Paper storage drawers are constructed similarly except retaining hood shall be included at the rear of each drawer.
 4. Painted finishes on drawer sides will not be permitted.
 5. Drawers shall have no more than 1" dead space from back of drawer to back of cabinet.
- c. Door/Drawer Fronts:
1. Core for all doors and applied drawer fronts shall be 3/4" thick particleboard. All edges shall be finished as indicated herein.
 2. Double doors shall be used on all cabinets in excess of 24" wide.
 3. Exterior faces shall be laminated with high-pressure decorative laminate GP28, color as selected. Interior face shall be high-pressure cabinet liner CL20
 4. All edges shall be finished with 3mm PVC available in standard offerings from manufacturer. A minimum of 50 solid colors available. External edges and

outside corners shall be machine profiled to 1/8" radius.

- d. Decorative Laminate Countertops: All nominal 1" thick laminate clad countertops shown on drawings shall be constructed with 1" particleboard core laminated top face with GP50 (.050) high- pressure decorative laminate, with BK20 backer or GP28 laminate underside for balanced construction. Provide tight joint fasteners where needed. All exposed edges, including edges of backsplash where used, shall have 3mm PVC banding, machine applied with waterproof hot melt adhesive. Exposed edges and corners shall be machine profiled to 1/8" radius for safety. All tops in wet areas to have MR board or plywood cores.
6. Specification Summarization:
 - a) Hinges: 5 Knuckle reveal
 - b) Door/drawer edge: 3mm PVC
 - c) Body Edge: 3mm PVC, match interior of cabinet.
 - d) Pulls: Metal wire, 96mm, epoxy coated
 - e) Drawer Slides: Blum 230M with epoxy finish 100-lb. load. Full extension for file drawers. All other drawers shall have 3/4 extension.
 - f) Interior Finish: Unit with open interior, thermofused melamine
 - g) Closed Finish: Unit with closed interior, thermally fused melamine
 - h) Exposed Ends: GP28 laminate
 - i) Wall Unit Bottom: melamine available in dove gray, frosty white or light beige color.
 - j) Shelf Edge: 3mm PVC front edge to match interior.
 - k) Toe Base: Separate Plywood Base
 - l) Locks: National disc tumblerlocks.
 - m) Tops: 1" @ particleboard core with GP50 laminate and 3mm edgebanding
 - n) Any tops in wet areas to receive MR Board or Plywood cores.
 - o) Cubbie Hooks: Chrome plated steel.
 - p) Balanced construction of all laminated panels is mandatory.

C. EXECUTION

1. Inspection: The installer must examine the job site and the conditions under which the work under this section is to be performed, and notify the contractor in writing of unsatisfactory conditions. Do not proceed with work under this section until unsatisfactory conditions have been corrected in a manner acceptable to the installer.
2. Preparation: Condition casework to average prevailing humidity conditions in installation areas prior to installing
3. Installation:
 - a. Install casework with factory-trained supervision authorized by manufacturer. Qualifications shall be submitted during the submittal phase. Erect casework; plumb, level, true and straight with no distortions. Shim as required. Where laminate clad casework abuts other finished work, scribe and cut to accurate fit
 - b. Adjust casework and hardware so that doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer. Use filler as necessary for ease of operation.
 - c. Caulk top, bottom and edges of all back splashes with clear silicon caulk.
4. Cleaning and Protection:
 - a. Repair or remove and replace defective work as directed upon completion of installation.
 - b. Clean plastic surfaces, repair minor damage per plastic laminate manufacturer's recommendations. Replace other damaged parts or units.
 - c. Vendor to advise contractor about procedures and precautions to protect casework and tops from damage by other trades until acceptance of the work by the owner.
 - d. Remove all trash and construction waste.

12 61 00 FIXED AUDITORIUM SEATING

A. GENERAL

1. Fixed auditorium seating shall have upholstered seat and back and be floor-mounted, with self-lifting seats, in accordance with the Education Specifications and the building program for each specific project. Per detailed direction from WCPSS and LEGs, approximately 60 seats shall be provided with tablet arms, which provide stable writing surfaces, and can be folded to unobtrusive storage when not needed
2. Provide manufacturer's warranty covering material and workmanship for a period of one years from the date of final acceptance.

B. PRODUCTS

1. Basis-of Design: Irwin Seating Company #90.12.56.4TA Citation (19" width), with concealed LED aisle lighting. Lighting shall meet the required egress lighting levels.
2. Materials:
 - a. Structural Support: Primary structural material shall be steel, die-formed and assembled by means of MIG welding processes. Exposed steel shall be ground smooth to prevent injury.
 - b. Wood: Plywood, exposed or concealed, shall be hardwood, with inner plies of Class 3 or better, exposed plies of Class 1. Particle board core shall be resin-bonded wood particles, 5/8" minimum thickness, 45 lb./cubic feet density.
 - c. Plastics: Injection-molded plastic shall be one-piece, high-impact resistant, 25% glass-filled polypropylene, with built-in ultra-violet light inhibitors to retard fading, and anti-static compounds to resist dirt attraction. Plastic laminates shall be .030" minimum thickness, composed of a core of phenolic-impregnated craft paper, a decorative surface sheet and an overlay sheet containing melamine. Plastic laminates shall meet or exceed standards established by N.E.M.A.
 - d. Padding Material: Seat and back padding shall be polyurethane foam complying with the flammability requirements outlined in the California Technical Information Bulletin #117, Resilient Cellular Materials, Section A & D, dated February 1975, when tested in accordance with Federal Test Method Standard 191, Method 5903.2.
 - e. Fabric: 100% Nylon seats and backs. Minimum weight 17.5 oz. per lineal yard (14.4 oz. unbacked), minimum of 13 ends and 13 picks per inch. Fabric shall exhibit superior color fastness, light fastness, tear strength, and break strength and shall be exceptionally resistant to staining, chemicals, and abrasion. Fabric shall meet Class 1 flammability requirements of the U.S. Department of Commerce Commercial Standard 191-53 per Bulletin #117 (California Code). Material and colors shall be approved by WCPSS in the submittal process prior to fabrication.
 - f. Flammability: All materials shall comply with applicable flame spread ratings, and other criteria per N.C. Building Code and BIFMA Voluntary Upholstered Furniture Flammability Standard X5.7-1991.
3. Finishes:
 - a. Metal Parts: All exposed metal parts shall be powder coated with a thermosetting powder coat finish. Finish shall be applied by electrostatic means to a thickness of 2.0 – 2.5 mils, and shall provide a durable coating having a 2H pencil hardness.
 - b. Wood Parts: All exposed wood surfaces shall be stained to specified color and coated with lacquer of sufficient film depth to afford industrial quality wear resistance.

- c. Plastics: Colors shall be selected from manufacturer's standard colorrange

C. EXECUTION

1. Method of Installation: Chairs shall be attached to floor by means of an approved style of wedge-type, zinc-plated expansion anchors installed per manufacturer's directions. Expansion anchor bolts shall be 1/4" diameter, 2 1/4" minimum length. Provide minimum two bolts per seat standard.
2. Cleaning: All seating shall be cleaned and ready for use at the completion of installation. Cleaning shall be in accordance with manufacturer's instructions.
3. **Coordination between auditorium designer and electrical engineer shall be made to confirm approved lighting levels by AHJ.**

12 66 00 TELESCOPING STANDS

A. GENERAL

1. Structural Performance: Shall comply with NFPA 102, and N.C. Building Code.
2. Accessibility Standards: Comply with applicable provisions of N.C. Building Code and ADA.
3. Electrical components shall be listed and labeled per NFPA 70.
4. Telescoping Stands Standard: Comply with ICC 300.
5. Submittals: Contractor to include plans, sections, attachment details, and finish samples for components that have exposed finishes. Include diagrams for power, signal, and control wiring.

B. PRODUCTS

1. Components: Bleacher seats shall be 10-inches deep, contoured seat surface and shall be molded polyethylene plastic. Risers shall be sheet steel with painted finish, and fully closed plywood footrests. Decking shall be Group 1, exterior glued, 5/8-inch plywood. Provide stands with aisles with location and widths as shown on the drawings; aisle shall have intermediate steps as required. Bleachers shall be wall attached type.
2. Row Configuration: Fabricate rows with 24 inches spacing and 11-5/8-inch rise
3. Accessibility: Provide cutout space for wheelchair accessible seating at first tier locations, with tiers adjacent to cutouts equipped with front rails as required by ICC 300.
4. Understructure: Structural steel members shall be of size, spacing and form required to support design loads. Provide manufacturer's standard non-marring, soft, rubber face wheel assembly under each support column.
5. Operation: Manufacturer's standard electrically-operated system that permits opening and closing of adjacent rows, allow individual and collective rows to be locked open for use, and close with vertical faces of upper skirts in the same vertical plane.
6. Power: ½ HP, 208 VAC, 3-Phase (110 VAC, 1-Phase), coordinate with building electrical system. Provide manufacturer's standard integral power operation by a series of electric motor driven units mounted under the first rows that apply tractive force to the floor. Provide open and closed limit switches that automatically stop the integral power system when the bleachers reach the fully open or closed positions.
7. Accessories: Provide non-slip aisle treads, end and gap closure panels, intermediate aisle steps, transitional top step, removable aisle handrails, and front railings. Provide Scorer's Table, 8-feet long by 15- inches width; with electrical connection for power and scoreboard at the front face of the first bleacher row.
8. Lettering: Provide mechanically fastened lettering/numbering for bleacher seating.

C. EXECUTION

1. Precautions: Examine areas where telescoping bleachers are to be installed, for compliance with manufacturer's installation tolerances.
2. Installation: Install bleachers to comply with manufacturer's installation instructions and the approved shop drawings. Provide accessories indicated, including all anchors, fasteners, inserts, and other items required for installing and attaching units to adjoining construction.
3. Adjusting and Cleaning: Lubricate, test and adjust telescoping bleacher units to operate easily and to comply with manufacturer's specifications. Clean all exposed and semi-exposed surfaces. Touch-up shop applied finishes to restore damaged surfaces.
4. Demonstration: Engage a factory-authorized service representative to demonstrate and train

Owner's maintenance personnel in the operation and maintenance of telescoping bleachers.

DIVISION 13 – SPECIAL CONSTRUCTION

13 34 13 GREENHOUSES

A. GENERAL

1. Provide complete gable-roof greenhouse system with components including galvanized frame system, clips, closures, fasteners, glazing accessories, etc. as described below.

B. PRODUCTS

1. Basis of Design: Instructor Greenhouse 2848S as manufactured by Jaderloon Company, Inc., or approved equal.
2. General Requirements:
 - a. Size: 24 feet by 48 feet.
 - b. Sidewall Height: 8 feet.
 - c. Wall/Roof Panels: 8mm thinwall, flame-retardant polycarbonate.
 - d. Cover System: Black woven 55% shade cloth.
 - e. Doors: Hinged single doors, 36" by 84", aluminum frame construction with thinwall polycarbonate panel. Doors shall be prepped to have panic hardware from interior per Wake County Fire Marshal.
3. Cooling and Ventilation:
 - a. One (1) two-speed exhaust fan.
 - b. One (1) single speed exhaust fan.
 - c. One (1) 2' by 18' rack and pinion Vent; thermostat and manual operation.
 - d. One (1) 2' by 18' evaporative cooler.
 - e. One (1) motorized gable shutter.
4. Controls: One (1) Wadsworth STEP 50A mini-step controller.
5. Water Requirements: Water supply to the greenhouse will be designed for a maximum usage of 25 gallons per minute.
6. Accessories:
 - a. Ten (10) 6 ft. by 10ft. free-standing benches.
 - b. Irrigation system, including 8 zone time clock.
 - c. Propagation bed.
 - d. Hanging basket rails.
 - e. Electrical Power Panel: Size complying with NEC requirements for all equipment indicated herein, including but not limited to lights, heaters, fans, shutters, vents, etc.

C. EXECUTION

1. Erection shall be performed after all concrete work in the vicinity has been completed and cleaned.
2. Greenhouse installer shall provide and install electrical power panel for single-point connection from owner's electrical system.
3. Furnish and install all electrical wiring from the panel to each piece of equipment listed herein; including all wiring terminations. The building electrical subcontractor will supply power to the electrical panel.

13 34 16 EXTERIOR GRANDSTANDS AND BLEACHERS

A. GENERAL

1. **Structural Performance:** Components shall be designed to meet N. C. Building Code, and the following minimum loads: 100 psf live load, 120 plf seat and tread plank live load, 24 plf seat plank lateral sway load, and 10 plf seat plank perpendicular sway load. Guardrails shall be designed to withstand 100 plf vertical and 50 plf horizontal loads.

B. PRODUCTS

1. **Understructure:** Galvanized structural steel members shall be of size, spacing and form required to support design loads.
2. **Configuration:** Rise per row, 10-inches; depth per row, 30-inches. Aisles shall be 34-inches minimum width. Design shall meet required distance between seat and footboard as required by code.
3. **Accessibility:** Provide accessible seating at both the first row and last row of seating as required by code.
4. **Components:** Aluminum bench seat, 2 by 10. Tread planks, extruded aluminum.
5. **Accessories:** Provide non-slip aisle treads, intermediate aisle steps, transitional top step, removable aisle handrails, and front railings. Provide Scorer's Table, 8-feet long by 15-inches width; with electrical connection for power and scoreboard at the front face of the first bleacher row.

C. EXECUTION

1. **Precautions:** Examine areas where telescoping bleachers are to be installed, for compliance with manufacturer's installation tolerances.
2. **Installation:** Install bleachers to comply with manufacturer's installation instructions and the approved shop drawings. Provide accessories indicated, including all anchors, fasteners, inserts, and other items required for installing and attaching units to adjoining construction.
3. **Adjusting and Cleaning:** Clean all exposed and semi-exposed surfaces. Touch-up shop applied finishes to restore damaged surfaces.
4. Area under outdoor bleachers and grandstands should be crushed stone in lieu of concrete.

DIVISION 14 – CONVEYING SYSTEMS

14 24 00 HYDRAULIC ELEVATORS

A. GENERAL

1. Qualification – “Non-Proprietary Equipment Affidavit” shall be submitted with equipment submittals. Refer to Appendix A for 14 24 00 Attachment A.
2. Manufacturer shall be reputable company with a minimum of 20 years’ experience in elevator system construction.
3. Comply with ICC A117.1 and ADA accessibility requirements.

B. PRODUCTS

1. General Requirements:
 - a. Equipment: Passenger elevator, hydraulic single stage holeless, or single acting, under the car, hydraulic plunger. (Telescopic, Inverted jacks, or machine room-less elevators are not acceptable)
 - b. Capacity (Minimum): 4500 pounds.
 - c. Speed: 125 FPM.
 - d. Car Platform Style (Minimum): Hospital Style; Width 60 inches. Depth 94 inches.
 - e. Operation: Selective-Collective Automatic.
 - f. Opening Size (Minimum): 42” X 84”
 - g. Power supply: Coordinate with building electrical system.
2. Machine Room Equipment:
 - a. Power Unit:
 1. Electro-Hydraulic.
 2. Self-contained: all components inside tank.
 3. Motor: submersible type, especially designed for hydraulic elevator duty, with built in thermal contact to signal over-heat condition.
 4. Pump: Positive displacement type.
 5. Oil control unit: Single unit valve assembly with low-pressure switch.
 6. Provide sound isolation between motor frame and tank, isolation pads under power unit, and silencer device built into power unit.
 - b. Motor Starter: Solid-state elevator starter; overload contacts.
 - c. Controller:
 1. Microprocessor type that meets all current applicable codes - Equipment and component systems shall not employ any proprietary designs that could hamper and/or otherwise prohibit subsequent maintenance, repairs, or adjustments by all qualified contractors. Manufacturers of apparatus shall provide parts replacement on open market to all maintenance providers for equipment and component systems for as long as said parts are available to ensure apparatus or systems remain maintainable regardless of who may be selected for future service.
 2. Provide complete parts manuals for all major and minor components parts shall be provided prior to final acceptance.
 3. Prior to final acceptance, a complete set of as-built, “adjustor-level” wiring diagrams shall be provided to the Owner along with any nomenclature documents
 4. Prior to final acceptance of the completed elevator system, the Contractor shall deliver to the Owner any specialized tool(s) that may be required to perform

diagnostic evaluations, adjustments and/or programmable software changes to any unit of microprocessor-based elevator control equipment installed by the Contractor. Any such tools shall become the property of the Owner.

5. If any diagnostic tools provided to the Owner require periodic re-calibration and/or re-initialization, the Contractor shall perform such tasks on a timely basis at no additional charge to the Owner for as long as the elevator control system is in operation, regardless of who is maintaining the system. If the tools cannot be re-calibrated on site, provide "loaner" tools at no charge to ensure that the system always remains serviceable.
 6. Contractor shall deliver to the Owner, printed "adjuster-level" help instructions for the proper use of any tool that may be necessary to perform diagnostic evaluations, adjustments and/or programmable software changes on any unit of the microprocessor-based elevator control equipment installed by the Contractor. Accompanying these instructions shall be any and all access codes, passwords, nomenclature, or other proprietary information that is necessary to interface the tool with the microprocessor control equipment.
 7. Manufacturer shall at all times promptly notify Owner of any safety bulletins affecting said microprocessor-based control systems of which Owner or Owner's agent should take possession.
 8. Other Functions to be included: Reverse phase relay, UL Label on controller, Independent Service operation, Firefighters service phase I & II, Hoistway access switches at top and bottom landings.
 9. Approved Controller Manufacturers:
 - a. Motion Controlled Engineering (MCE)
 - b. Galaxy Controls
 - c. Virginia Controls
 - d. Smartrise
3. Signal Fixtures:
- a. Car Operating Panel:
 1. Illuminated vandal-resistant push buttons.
 2. Position indicator.
 3. Door open/Door close push buttons.
 4. Keyed stop switch.
 5. Keyed car light and fan switch.
 6. Keyed independent service key switch.
 7. Alarm bell push button.
 8. Telephone incorporated in COP.
 9. Emergency light and bell.
 10. Directional arrows and gong.
 11. Floor passing gong.
 12. #4 Satin Stainless Steel cover
 - b. Hall Operating Stations:
 1. Illuminated vandal resistant push buttons.
 2. Hall position indicator at the main landing.
 3. #4 Satin Stainless Steel cover.

4. Hoistway Entrances:
 - a. Frames:
 1. Bolted construction
 2. Tactile Handicap jamb plates
 3. Finish and material as selected by Design Consultant.
 - b. Door Panels: Adjustable door gibs; finish and material as selected by Design Consultant.
 - c. Aluminum sills.
 - d. U.L. – labelled doors and entrances.
 - e. Fascia, toe guards, struts, and dust covers as required by code.
5. Door Operation:
 - a. Programmable and adjustable parameters for door operation without the use of any programming tool or software.
 - b. Infrared safety detector on each door.
 - c. Door nudging.
6. Cab Enclosures:
 - a. Finishes and materials as selected by the Design Consultant, compatible with the building color scheme, as reviewed and approved by the Owner.
 - b. Handrails 3/8 X 2 #4 Stainless Steel on three sides.
 - c. Exhaust fan two speed with aluminum grill.
 - d. Pads and hooks on the side and rear walls.
 - e. Cab shall be prewired for an IP-based camera.

C. EXECUTION

1. Installation:
 - a. General:
 1. Install each elevator in accordance with accepted manufacturer's directions and ASME A17.1 and all applicable codes.
 2. Install machine room equipment with clearance complying with ASME A17.1.
 3. Install items so that they may be removed by portable hoists or other means for ease of maintenance.
 - b. Guide Rails: Install and align rails vertically within tolerance of 1/32".
 - c. Entrances: Install and align within tolerance of 1/32".
 - d. Power Unit: Fill system with biodegradable hydraulic oil approved for use with the valve manufacturer. Oil shall be plant-based or vegetable-based, non-toxic and readily biodegradable.
 - e. Jack Unit: Install plumb and true.
 - f. Jack Hole (Use this section only for in-ground holed)
 1. Sink jack hole of sufficient size and depth and line with approved protective casing.
 2. After installing jack, backfill with clean sand to a level necessary to maintain rigidity
2. Field Quality Control:
 - a. Provide all personnel, equipment and instruments required for inspection and testing.
 - b. Have acceptance inspection required by local authority performed by enforcing agency.
 - c. In addition to inspections and tests required by local or state authority, perform all applicable inspections and tests required by Section 8.10, ASME A17.1.

3. Adjust and Clean:
 - a. Adjustments:
 1. Adjust all equipment to operate to within accepted design tolerances.
 2. Adjust all leveling devices so car stops within plus or minus 1/4" of finished floor.
 3. Lubricate all equipment in accordance with accepted manufacturer's instructions.
 - b. Painting:
 1. Paint all exposed metal work, furnished for installation, except wearing surfaces, with high grade rust preventative paint
 2. Touch up factory applied paint surfaces as required
 3. Paint the machine room floor and pit.
 - c. Clean-up:
 1. Remove from hoistway surfaces all loose materials and filing resulting from work.
 2. Clean machine room floor of dirt, oil and grease.
 3. Remove crating and packing materials from premises.
4. Guarantee: Elevator Contractor shall guarantee that the materials and workmanship of the apparatus installed by them under this specification are new and first-class in every respect, and that they will make good any defects not due to ordinary wear and tear or improper use of car, which develop within one year from date of acceptance for all parts and for five years for the jack packing(s) of the jack cylinder(s).
5. Maintenance: Elevator Contractor shall provide twelve (12) months full contract service beginning at the date of Final Acceptance by Owner of each elevator. Service is to be provided on a monthly basis during regular working hours of regular working days except that emergency minor adjustment callback service shall be available at no additional cost 24 hours a day, 7 days a week.
6. Temporary Service: The elevator shall not be used for temporary service or for any other purposes prior to completion and acceptance by the Owner.
7. End-User Demonstration:
 - a. A factory-authorized service representative shall perform a minimum of 8 hours training to the Owner's building and maintenance staff. Proper use, operation, and fire service test shall be demonstrated at this time.
 - b. The Contractor shall make a final check of the elevator operation with the Owner's maintenance personnel present. The Contractor shall ensure that the Owner has all necessary keys, manual, etc. as required in the specifications.

14 24 13 PLATFORM LIFTS

A. GENERAL

1. Platform Lifts shall comply with ASME A18.1 and ADA. Platform lifts shall not be attendant operated, and shall provide unassisted entry and exit from the lift.

B. PRODUCTS

1. Provide platform lift equal to Genie Model AWP-20S.

C. EXECUTION

1. Coordinate power requirements with available building utilities.
2. Confirm adjacent construction and floor levelness is suitable for installation.
3. Install platform lift in compliance with manufacturer's instructions.

DIVISION 21 – FIRE SUPPRESSION SYSTEMS

21 00 00 FIRE SUPPRESSION REQUIREMENTS

A. GENERAL

1. The following Design Criteria are general items that shall apply to the design of all Fire Suppressions Systems.
2. All contract documents shall be performance specification documents unless authority having jurisdiction requires full design documents for issuance of permits.

B. DESIGN REQUIREMENTS

1. In any building where future expansion is definitely planned, as conveyed by the WCPSS, the Engineer shall provide adequate additional capacity and connection points in the Fire Suppression Systems as directed by the WCPSS. The additional capacity shall be clearly noted on the front sheet of the drawings.
2. Show on drawings and specify that all water piping shall be located a minimum of 10 ft. from electrical switchboards and panel boards.
3. All points for future connections shall also be clearly shown and labeled on the drawings.
4. Do not locate pumps, motors, or other equipment requiring routine maintenance overhead.
5. Provide protection for exposed sprinkler heads in areas subject to being hit by flying objects such as gyms and multipurpose rooms. Protective devices must meet all applicable NFPA requirements.
6. Any sprinkler head in ceilings nine (9) feet or less should be a concealed head.
7. Engineer should call out extended coverage sprinkler heads as allowed by Code.
8. Engineer shall not locate noisy outdoor equipment (i.e. pumps) in locations that will result in complaints from adjacent property owners.
9. Provide protection for exposed sprinkler heads at elevation of 7'-6" A.F.F. and lower.
10. Provide chrome escutcheon rings at all exposed ceiling and wall pipe penetrations.
11. Wall piping penetrations shall have piping sleeve through wall and be sealed.

C. SPECIFICATIONS

1. Show list of acceptable manufacturers for all items of equipment specified. Refer to this document or if uncertain, consult with the WCPSS.
2. Specify that all belt driven equipment shall be provided with a new belt at final completion and a new spare belt to be turned over to the Maintenance Department.
3. Specify that all warranties shall commence from the date of Substantial Completion, not from the start-up date of the equipment.

DIVISION 22 – PLUMBING SYSTEMS

22 00 00 PLUMBING BASIS OF DESIGN

A. GENERAL

1. CD/DVD Recording Note: The entire underground sanitary waste and storm drainage piping systems shall be videoed and recorded by the Contractor on an audible CD/DVD to ensure that the Owner knows the location of the piping being viewed. The recorded CD/DVD shall be provided to the Engineer of Record and the WCPSS Project Manager three (3) weeks prior to Substantial Completion inspection. The Substantial Completion inspection cannot occur until the video has been reviewed and all the underground waste piping system has been approved by the Engineer of Record. Designer shall provide the note above on drawings and in specifications.
2. Potable water piping shall not be routed above electrical switchboards, panel boards, and load side equipment (i.e. Variable Frequency Drives and like motor controllers)
3. Exterior wall hydrants: Provide exterior wall hydrants every 100ft around building for landscaping purposes.
4. Provide anti-siphon freezeless type exterior wall hydrants.
5. Interior Hose Bibbs: Provide interior hose bibbs at maximum 100ft apart on mezzanines for maintenance procedures.
6. Do not locate pumps, motors, or other equipment requiring routine maintenance overhead.
7. The Building Automation System (BAS) shall monitor all gas, water and electrical use in the building. Meters shall have LON and/or BACNET capability.
 - a) Gas meter shall have a set of pulse contacts provided by PSNC Energy (attached to the actual gas meter). Plumbing Engineer shall contact PSNC Energy during the design phase and request a pulse meter. The BAS Controls Contractor will connect the gas meter pulse contacts to the BAS System.
 - b) Electric meter shall have a set of pulse contacts provided by Duke Energy/Progress or the local Electrical Cooperative (mounted at the transformer or CT cabinet). Electrical Engineer shall contact electrical utility during the design phase and request a pulse meter. The BAS Controls Contractor will connect the electric meter pulse contacts to the BAS System.
 - c) Domestic water shall be measured by an insertion-type dual turbine flow meter (Onicon F-1200 series or equal) at the main domestic water entrance. Please note this is not a connection to the meter provided by the local water utility. Meter will be furnished by the BAS Controls Contractor and installed by the Plumbing Contractor. BAS Controls Contractor will connect the water meter to the BAS System.
8. All water consuming devices shall be the water saving type.
9. Provide positive freeze protection on all water lines subject to freezing conditions.
10. Provide chrome plated escutcheon rings at all exposed ceiling and wall penetrations.
11. Provide plaster type P-traps for all art room sinks.
12. Provide floor drain with deep seal P-trap and trap primer at science emergency eyewash/shower stations. All other floor drains locations can utilize hose bibbs for priming of p-traps.
13. Provide roof drains and plumbing piping shall be a minimum of eight (8) feet from roof edge or perimeter to comply with WCPSS and OSHA fall protection requirements.
14. Provide chrome escutcheon rings at all exposed ceiling and wall pipe penetrations.
15. Wall piping penetrations shall have piping sleeve through wall and be sealed.

16. Specify maximum noise levels for each type of equipment specified. Note: Do not located noisy equipment near noise sensitive areas of building. Equipment decibel levels inside building shall not exceed 50 dB.
17. Provide grease interceptor on discharge waste piping from all Kitchens. Size grease interceptor according to the local public utility requirements.

22 05 10 PLUMBING VALVES

A. GENERAL

1. Use one valve manufacturer throughout project design and construction.
2. Provide isolation valves in cold water and hot water piping so that water can be shut off to each classroom wing, administration area, group toilets and science classrooms.
3. Provide a ball valve in branch piping to all exterior hose bibbs. Where suitable, locate hose bibbs adjacent to exterior mechanical rooms, dropping branch piping exposed in mechanical room and locating ball valve a maximum of 6 ft. above finish floor.
4. Provide check valves in domestic hot and cold water supply piping to mop sinks to prevent cross flow when chemical mixing stations are connected.
5. Provide key operated solenoid water isolation valves as follows:
 - a) For each science lab classroom.
 - b) Science prep rooms shall not have solenoid isolation valves.
 - c) Do not allow fork type keys to be used.
 - d) Provide one key switch to be labeled "WATER" to control both cold and hot water. The key switch will clearly identify the "ON" and "OFF" positions. Located near exit door. ISOMET panels are not desired.
 - e) Label to be engraved plastic laminate.

B. EQUIPMENT

1. Where insulation is required, provide extended valve stems.
2. Approved manufacturers are Apollo, Nibco, and approved equal.
3. Domestic hot water and cold water ball valves: 2 in. and smaller - class 125, 200 WOG cast bronze, two-piece construction, lead free, full-port, soldered ends, and stainless steel trim. 2-1/2 in. and larger - class 125 iron body.
4. Compressed air ball valves: 400 WOG, two-piece construction, full size port.
5. Natural gas valves: 2 in. and smaller, class 125, 200 WOG cast bronze, two-piece construction full-port, threaded ends, 2-1/2 in. and larger, 175 WOG lubricated plug type, semi steel body, flanged ends.
6. Globe valves (bypass only): 2 in. and smaller, class 125 cast bronze solder ends, 2-1/2 in. and larger, class 125 iron body, flanged ends.
7. Isolation Valves: Shut-off valves shall be installed at all take-offs from mains to each mechanical equipment room, each building wing, and each building floor. Shut-off valves shall be located in corridor wherever possible. Shut-off valves shall be installed on the cold and hot water supply piping to all fixtures to allow for removal and repair.
8. Balancing Valves: Provide balancing valves on domestic hot water recirculation systems. Shall be install along with check valve to eliminate backflow of water.
9. Pressure Regulating Valve: Provide for all installations on water service entry inside main mechanical room. Include strainer, bypass and pressure gauge on inlet and outlet at each installation.
10. Swing check valves: 2 in. and smaller, class 125 cast bronze, threaded ends, 2-1/2 in. and larger, class 125, cast iron body, flanged ends.
11. Solenoid valves: Normally closed and electrically held in open position.

22 05 20 PLUMBING SUPPORTS AND ANCHORS

A. GENERAL

1. Use one valve manufacturer throughout project design and construction.
2. Coordinate any seismic requirements, if present, on each individual project.

B. EQUIPMENT

1. Horizontal piping hangers - insulated piping shall have steel hanger around insulation with rigid insulation above shield. Use galvanized or zinc plated, adjustable steel clevis hangers.
2. Vertical piping clamps - size to fit bare pipe, copper plated for copper piping.
3. Building attachments - use beam clamp with retaining strap or concrete inserts.
4. Use trapeze hangers where possible to rack piping together.
5. Do not support piping from bar joist bridging and/or roof deck.
6. Support all piping so as to prevent excessive movement.

22 05 50 PLUMBING IDENTIFICATION

A. GENERAL

1. Use same identification throughout project design and construction.
2. PIPING IDENTIFICATION:
 - a) Concealed piping above accessible ceilings with O.D., including insulation, less than 6": Pre-tensioned type pipe markers (ASME A13.1) or stenciled with black letters and black flow arrows.
 - b) Concealed piping above accessible ceilings with O.D., including insulation, 6" and larger: Shaped pipe markers (ASME A13.1) or stenciled with black letters and black flow arrows.
 - c) Piping runs located above inaccessible ceilings do not require labeling.
 - d) Locate pipe markers and flow arrows as follows:
 - 1) Maximum of 10ft and closer if congested.
 - 2) Near each valve
 - 3) Near each branch take off.
 - 4) Near equipment.
 - 5) Near origination and termination points
 - 6) Near where pipe passes through walls (both sides of wall)
 - 7) Near access doors
 - 8) On piping above inaccessible ceilings as it enters and immediately after it exits.
 - e) All exposed piping in air handling unit mechanical rooms shall be labeled the same as concealed piping above accessible ceilings.
 - f) All exposed-to-view piping in occupied spaces shall be painted to match the adjacent surfaces. Do not paint metal jackets.
 - g) All exposed piping in Boiler Room and Main Mechanical Room shall be painted to WCPSS standards as follows (provide black flow arrows):

1) Cold Water- Dark Blue	Sherwin Williams #SW6965	Pantone #282C
2) Hot Water – Light Red	Sherwin Williams #SW6868	Pantone #187CP
3) Hot Wtr Return–Light Red	Sherwin Williams #SW6868	Pantone #187CP
4) Gas - Yellow	Sherwin Williams #SW6911	Pantone #102C
 - h) Underground plastic pipe marker: 6 in. wide x 4 mils thick multi-ply tape, solid aluminum foil core between two (2) layers of plastic tape. Provide in all locations where underground plastic piping is utilized.
3. VALVE IDENTIFICATION:
 - a) 19 gauge polished brass, 2" diameter, valve tags. Provide on all valves utilized in system. Contractor to furnish valve schedule mounted behind glass in a frame located in main mechanical room.
 - b) Valve Location Ceiling Markers: 1/2 in. dia. self-adhesive color coded circle. See Appendix A – 22 05 50-Attachment A for information on ceiling grid labels.
 - c) Provide at all valve locations either on ceiling grid or access panel.
4. EQUIPMENT IDENTIFICATION:
 - a) Engraved plastic-laminate sign: 1/16 in. thick, fastened with self-tapping stainless steel screws.
 - 1) Lettering sizes: Minimum 1/4" for name of unit where viewing distance is less than 2 ft., 1/2" for distances up to 6 ft, proportionately larger lettering for greater distances. Provide secondary lettering 2/3 to 3/4 of size of principal lettering.

22 07 00 PLUMBING INSULATION

A. GENERAL

1. Flame/smoke ratings: flame-spread index of 25 or less and smoke-developed index of 50 or less, as tested by ASTM E84 (NFPA 255) method.
2. Formaldehyde Free.
3. Insulate all domestic water piping with the following minimum insulation thickness:
 - a) Domestic Cold Water, All Pipe Sizes: 1-inch
 - b) Domestic Hot Water & Hot Water Return, Pipe Sizes ½" – 1 ½": 1-inch
 - c) Domestic Hot Water & Hot Water Return, Pipe Sizes 2" and larger: 2-inch
4. Insulate roof leader horizontal piping with 1-inch thick insulation to include roof drain pan, vertical piping from roof drain, and horizontal piping above ceiling. Insulate vertical piping in exposed locations.
5. Insulation all horizontal sanitary waste piping from floor drains receiving cooling coil condensate with 1 inch thick insulation to prevent sweating.
6. Provide sheet metal saddle at all pipe hangers.
7. Provide rigid insulation at pipe hangers for all insulated piping 2 in. and larger
8. Provide insulation continuously through wall and floor penetrations.
9. Provide 20 gauge galvanized metal jackets on all exposed, insulated, exterior piping. Prime metal jacket with paint grip finish.
10. Provide PVC jacket on all exposed piping in kitchen and associated areas.
11. Provide canvas jacket on all exposed piping in mechanical rooms and interior finished areas. Insulation canvas jacket shall be prepped for painting.
12. Provide pre-fabricated PVC elbows for all changes in direction in piping.

B. MATERIAL

1. Fiberglass insulation: ASTM C 547 Class I with Type I all service jacket.
2. Exposed insulation – 8 oz. canvas rosin sized cloth jacket.
3. PVC Jacket: 20-mil thick.
4. Fittings: one-piece pre-molded 20-mil thick, PVC fitting covers.
5. Exterior insulation: Polyisocyanurate cellular foam insulation, 65psi compressive strength. (Trymer 3000 series or equal)

22 11 00 PLUMBING DOMESTIC WATER PIPING

A. GENERAL

1. Section covers domestic cold and hot water piping within building to a point 5ft. outside of building.
2. All future connections, if necessary, shall be clearly indicated with the capacity (GPM) that is available for future at each connection point.
3. The Building Automation System (BAS) shall monitor all water use in the building. Meters shall have LON and/or BACNET capability.
 - a) Domestic water shall be measured by an insertion-type dual turbine flow meter (Onicon F-1200 series or equal) at the main domestic water entrance. Please note this is not a connection to the meter provided by the local water utility. Meter will be furnished by the BAS Controls Contractor and installed by the Plumbing Contractor. BAS Controls Contractor will connect the water meter to the BAS System.

B. PRIVATE WATER SUPPLY

1. Well (6 in. minimum) will be located and bored by WCPSS.
2. Plumbing contractor shall provide submersible pump, hydro-pneumatic storage tank, chlorinator, and filters.
3. Pump house by general contractor.
4. All power required by electrical contractor.
5. No meters required.

C. MATERIAL

1. Domestic Water Systems (Above Ground): Domestic water systems shall be one of the following:
 - a) ASTM B 88 "Type L", water tube, drawn temper copper with soldered joints.
 - b) ASTM B 88 "Type L", water tube, drawn temper copper with Press-fit joints.
 - 1) Manufacturers:
 - a. Apollo
 - b. Pro-Press
 - c. Approved equal
2. Domestic Cold Water Systems (Below Ground): Domestic water system shall be the following:
 - a) ASTM B 88 "Type K", water tube, annealed temper copper with silver-soldered joints.
3. Domestic Hot Water and Hot Water Recirculation Systems (Below Ground): Domestic hot water and domestic hot water recirculation system shall be one of the following:
 - a) Pre-Insulated Piping: Cased copper carrier piping with polyurethane foam insulation and HDPE jacket rated for up to 250 deg F. Carrier piping shall be Type L copper, ASTM B88, with silver-soldered joints. Insulation shall be closed cell foam with minimum 2-inches thick. Jacket shall be seamless HDPE. Perma-Pipe XTRU-Therm or pre-approved equal.

D. INSTALLATION REQUIREMENTS

1. Clearances: All water piping shall be located a minimum of 10ft. from electrical switchboards and panel boards.

2. Piping Support: Piping shall be supported in accordance with in ASME Handbook. Do not support piping from bar joist bridging.
3. Piping Expansion: Specify and show on plans expansion loops for all domestic water piping straight runs over 200 feet in length.
4. Freeze Protection: Provide positive freeze protection for all water systems subject to freezing conditions such as air-cooled outdoor chillers, cooling towers, outdoor piping (above ground) etc. Refer to heat trace cable installation detail in Appendix C.
5. Relief Valves:
 - a) All relief valves shall have a union near valve to allow for future relief valve replacement.
 - b) Hot water relief valves must be piped to location to minimize danger to personnel or students upon relief. Hot water relief valves should be piped to exterior or to funnel-type floor drains located near the equipment.
6. Trap Primer Valves: Emergency Face/Eyewash station floor drain locations only.
 - a) Valves shall be automatic and activate with a 10psig pressure drop between 30 and 150psig.
 - b) Trap primer valve shall be ASSE 1018 certified.
 - c) Design of valve location placement shall be closely evaluated where system allows frequent water flow/pressure drop to allow for trap primer valve to operate.
7. Thermometers: Provide on inlet and outlet of each water heater and on outlet of domestic hot water recirculation pump. No alcohol or mercury thermometers shall be installed in domestic water piping system.
8. Pressure Gauges: Provide on inlet and outlet of each backflow preventer, on inlet and outlet of each pressure reducing valve, on inlet and outlet of domestic water pressure booster pump (if required), and on inlet and outlet of domestic hot water recirculation pump.
9. Make-Up Water Stations: All water make-up assemblies shall be provided with a reduced pressure zone backflow preventer.
10. Strainers: Show wye strainers in inlet piping to domestic water service backflow preventer, whenever backflow preventer is located inside footprint of building.
11. Backflow Preventer: equipment shall be provided as follows:
 - a) Type: Reduced Pressure Zone Assembly with strainer and pressure gauge.
 - b) Backflow preventer can be located inside or outside the building. Verify with Authority Having Jurisdiction about requirement for location. When located inside, mount unit between 12in. and 60in. above finished floor. Refer to Section 33 10 00-C for backflow preventer installation requirements if located outside.
 - c) Relief drain shall be piped to nearest floor drain or to daylight on exterior wall. Verify with Authority Having Jurisdiction about floor drain size requirements and for exterior wall daylight termination requirements.
12. Pipe Testing: Domestic water piping shall be tested per the NC Plumbing Code.

22 13 00 PLUMBING SOIL, WASTE, AND VENT PIPING

A. GENERAL

1. Section covers soil, waste, and vent piping within building to a point 5ft. outside of building.
2. CD/DVD Recording Note: The entire underground sanitary waste piping system shall be videoed and recorded by the Contractor on an audible CD/DVD to ensure that the Owner knows the location of the piping being viewed. The recorded CD/DVD shall be provided to the Engineer of Record and the WCPSS Project Manager three (3) weeks prior to Substantial Completion inspection. The Substantial Completion inspection cannot occur until the video has been reviewed and all the underground waste piping system has been approved by the Engineer of Record. Designer shall provide the note above on drawings and in specifications.
3. Install underground drainage mains with the laser beam alignment system.
4. Install all V.T.R. a minimum of 15ft. from fresh air intake.
5. Provide piping with proper flame/smoke rating in return air plenums or wrap with insulation to provide proper protection.
6. Depress floor drains below room perimeter minimum of 1/2 in.
7. Route waste piping from science classrooms to point of use acid dilution tank and tie into sanitary sewer. Acid waste piping shall be utilized upstream of dilution trap/tank. PVC piping shall be utilized downstream of dilution trap/tank. Coordination shall be performed with Architect to allow for proper installation.
8. Do not provide cleanouts in carpet or gym floors.
9. Provide piping sleeves through walls and floors. Sleeves shall be schedule 40 black steel.
10. Where hose bibbs are utilized as trap primers (mechanical rooms, etc.), in-line trap seal device shall be specified.
 - a) Approved Manufacturer: Trap Guard, Sureseal or WCPSS approved equal.
11. Specify oil smart sump pumps where hydraulic elevators are utilized.
12. Provide a minimum of 6" sanitary sewer piping to serve group toilet restrooms with three (3) or more water closets.
13. In case of bad soil conditions, alternate material shall be considered for below slab waste piping.
14. All soil, waste, and vent piping shall be smoke tested by the Contractor. Test shall be witnessed by WCPSS maintenance.
15. All emergency eyewash drains shall be connected directly to sanitary sewer system and are not allowed to drain onto floor surface.

B. MATERIAL/EQUIPMENT

1. Sanitary Waste/Vent (Below Ground): Below ground sanitary waste/vent systems shall match the following:
 - a) Basis of Design: ASTM C 2665 Schedule 40 PVC with plastic, non-pressure piping, solvent-cement joints.
 - b) Alternate (With Prior Owner Approval): ASTM A 74, service class, hub and spigot cast iron pipe with ASTM C 564, rubber gasket fittings.
 - 1) Utilize cast iron piping in projects with unsuitable soil conditions.
2. Grease Waste/Vent (Below Ground): Below ground grease waste/vent systems shall match the following:

- a) Basis of Design: ASTM C 2665 Schedule 40 PVC with plastic, non-pressure piping, solvent-cement joints. WCPSS does not typically have dishwashers, tilt kettles, etc.; therefore, PVC waste piping can handle the temperatures discharged into the sanitary waste system.
- 3. Sanitary Waste/Vent (Above Ground): Above ground sanitary waste/vent systems shall match the following:
 - a) Sanitary Waste/Vent Piping above ground: ASTM C 2665 Schedule 40 PVC plastic, non-pressure piping, solvent-cement joints. Insulate as required when installed in return air plenums.
- 4. Acid Waste/Vent: Acid waste/vent systems shall be the following:
 - a) Basis of Design: Acid resistant polypropylene pipe, schedule 40, with mechanical fittings. Acid waste piping will only be located below sinks from sink tailpiece to acid dilution trap. No central acid neutralization tank is required.
- 5. Floor cleanouts:
 - a) Shall have cast brass or bronze plug flush with floor.
 - b) Exposed rim type with recess to receive 1/8 in. thick resilient floor finish.
 - c) Exposed flush type, standard non-slip scored or abrasive finish.
- 6. Wall cleanouts:
 - a) Shall have cast iron body with cast-bronze cleanout plug, stainless steel cover.
- 7. Grade cleanouts:
 - a) Shall have cast brass plug with recessed slot in fitting or in caulked cast iron ferrule.
 - b) Set in 24 in. x 24 in. x 8 in. thick concrete pad flush with grade
 - c) Set in concrete "donut".
- 8. Floor drains:
 - a) Provide floor drains in all gang toilet areas. Floor drains are not desired in single toilets.
 - b) Provide floor drains in all mechanical rooms.
 - c) Provide general use floor drains in kitchen area.
 - d) Provide floor drains at emergency shower/eyewashes located in Science Rooms. Emergency eyewash shall be connected directly to the sanitary sewer system and not drain onto the floor surface.
 - e) Provide floor drains in any other area needed specific to the project.
 - f) Provide deep seal p-traps at all floor drains.
 - g) Provide trap primer at floor drains located at emergency shower/eyewash in Science Rooms. All others areas can utilize hose bibbs for priming.
 - h) Provide square strainers in all areas with floor tile to allow tile to be cut around strainer. Provide round strainers in all other areas.

22 14 00 PLUMBING STORM DRAINAGE PIPING

A. GENERAL

1. Section covers storm drainage piping within building to a point 5ft. outside of building.
2. CD/DVD Recording Note: The entire underground storm drainage piping system shall be videoed and recorded by the Contractor on an audible CD/DVD to ensure that the Owner knows the location of the piping being viewed. The recorded CD/DVD shall be provided to the Engineer of Record and the WCPSS Project Manager three (3) weeks prior to Substantial Completion inspection. The Substantial Completion inspection cannot occur until the video has been reviewed and all the underground waste piping system has been approved by the Engineer of Record. Designer shall provide the note above on drawings and in specifications.
3. Install underground drainage mains with the laser beam alignment system.
4. Roof drains shall be furnished and located by Plumbing Contractor and installed by Roofing Contractor.
5. Roof drains and piping shall be provided with a minimum of 8 ft from the roof edge or perimeter to comply with WCPSS and OSHA fall protection requirements.
6. Scuppers for the overflow drainage system is preferred. If overflow room drains are utilized, please coordinate with WCPSS on secondary roof drain piping discharge locations.
7. In case of bad soil conditions, alternate material shall be considered for below slab waste piping.

B. MATERIAL

1. Storm Drainage (Below Ground): Refer to Section 22 13 00 – B.1. Sanitary Waste/Vent (Below ground) for approved materials.
2. Storm Drainage (Above Ground): Refer to Section 22 13 00 – B.3. Sanitary Waste/Vent (Above ground) for approved materials.
3. Roof Drains: Cast iron bowls and cast iron strainer.
4. Floor cleanouts: Refer to Section 22 13 00 – B.5. Floor Cleanouts for approved materials.
5. Wall cleanouts: Refer to Section 22 13 00 – B.6. Wall Cleanouts for approved materials.
6. Grade cleanouts: Refer to Section 22 13 00 – B.7. Grade Cleanouts for approved materials.

22 20 00 NATURAL GAS SYSTEM

A. GENERAL

1. Engineer and Contractor shall coordinate with the PSNC Energy and have high pressure gas line routed to gas meter. WCPSS will pay any cost incurred. Delivery pressure shall be minimum 2 psi. Plumbing contractor shall connect to load side of meter and extend inside building.
2. PSNC Contact for WCPSS:
Mike Kasopsky
PSNC Energy
2451 SCHIEFFELIN Road
Apex, North Carolina 27502
Office Phone: (919) 367-2728
Mobile Phone: (919) 819-9894
Email: kasomike@psnc.com
3. The Building Automation System (BAS) shall monitor all gas use in the building. Meters shall have LON and/or BACNET capability.
 - a) Gas meter shall have a set of pulse contacts provided by PSNC Energy (attached to the actual gas meter). Plumbing Engineer shall contact PSNC Energy during the design phase and request a pulse meter. The BAS Controls Contractor will connect the gas meter pulse contacts to the BAS System.

B. PRODUCTS

1. Provide main gas valve above ground prior to entrance to building. Use ball valves on all gas lines inside the building.
2. Piping – Black steel pipe schedule 40 ASTM A 120.
3. Fittings – malleable - iron threaded fittings, Class 150.
4. Joints – threaded joints for 2 in. and smaller, welded joints for 2-1/2 in. and larger.

C. EXECUTION:

1. Gas piping may be installed above accessible (lay-in) ceiling. Do not locate gas piping under floor slab and inside solid partitions including CMU. Provide accessible chases for concealed gas piping. I.E. floor trench. Route gas piping exposed where possible. If gas piping must be located underground, piping material shall be protected against corrosion {either materials that cannot corrode (preferred) or cathodically protected}
2. Gas meter should be located to be accessible to gas utility trucks (gas utility truck can back up to within 20 feet of gas meter)
3. Provide gas shut off valves at each piece of equipment. Use full port valve with gauge tapping.
4. Final connections to equipment shall be made with flexible connectors.
5. Provide 6 in. dirt leg at each vertical rise and prior to each equipment connection.
6. Contractor shall be required to paint all exposed exterior and mechanical room gas piping with one primer coat and (2) two coats of oil based paint. Gas piping shall be painted yellow. See Plumbing Identification for details.
7. All gas piping shall be tested at a test pressure of 100-psi minimum for a period of not less than (8) eight hours. Test to be conducted using a chart recorder. Chart size to be 8 in., range to be 0 to 150-psi with a 24 hour recording time. Pressure measuring elements to be

heat-treated to prevent hysteresis-related inaccuracies. Engineer to witness all tests.
Contractor to turn over chart in close-out documents to Owner.

22 30 00 WATER HEATERS

A. GENERAL

1. Connect water heaters to Building Automation System (BAS) for on/off control. Water heater itself shall control discharge temperature. Point of use water heaters used in remote applications do not have to be connected to the BAS.
2. Connect circulating pumps to Building Automation System (BAS).
3. Use separate flue for gas water heaters.
4. Use separate fuel oil lines from fuel oil tank for water heater.
5. Use centrally located water heater to serve entire building domestic hot water system whenever possible. Additional water heaters located throughout the building are acceptable in larger school buildings.
6. Use gas water heaters for kitchen and gym areas.
7. Use small tank type electric water heaters for remote uses.
8. Do not use instantaneous water heaters.
9. Specify ASME expansion tanks for water heater larger than 80 gallons.
10. Storage tank water temperature shall be 140 deg. F. minimum.
11. Specify thermostatic mixing valves to provide 120 deg. F hot water temperature from water heater that serves kitchen with 140 deg. F. water. At public hand washing facilities, provide temperature limiting devices that conforms to ASSE 1010 or CSA B125.3.
12. Provide recirculation system for domestic hot water. Provide separate hot water circulation loops for 140 deg. F. supply water for kitchen area and 120 deg. F. water for remainder of building.
13. Water Storage Tanks: All water storage tanks shall be glass, stainless steel or cement lined. Any water storage tank over 200 gallons shall have a man-way for maintenance access.
14. Condensing water heater shall be specified with optional condensate neutralization kit.

B. EQUIPMENT

1. Gas Water Heater: Heater shall be one of two types:
 - a) Circulating, Non-condensing or condensing, 85% thermal efficiency minimum, sealed combustion, commercial, copper fin heat exchanger with separate glass or cementlined storage tank.
 - b) Condensing, 95% thermal efficiency minimum, sealed combustion, commercial, storage type with integral copper fin heat exchanger coil and modulating gas burner with separate storage tank.
2. Electric Water Heater: Commercial, storage type, glass lined.
3. Expansion Tanks: Diaphragm expansion tank, sized appropriately for system.

22 40 00 PLUMBING FIXTURES

A. GENERAL

1. Specify all vandal-proof options for all fixtures used by students. This includes handle screws, aerators, and shower heads.
2. Specify separate stops for all fixtures unless integral stops.
3. Specify chase for multiple lavatory installations (minimum 6 in. clear). A walk-in plumbing chase shall not be specified at group toilets.
4. Specify plaster p-trap for all art room sinks. Selection of plaster trap shall be coordinated with sink layout for best maintenance option.
5. Provide both hot and cold water to all sink/lavatory faucets.
6. All water consuming devices shall be water saving type.
7. Specify shock arrestors for all solenoid operated equipment, including water closets, urinals, washer box connections, and ice maker connections.
 - a) Shock arrestor shall be maintenance free similar to Jay R Smith model 5000 series.
 - b) Access panels shall not be provided when maintenance free shock arrestor is provided.
8. For all sinks, lavatories, and water coolers, specify chrome plated semi-cast 17 gauge brass p-traps, equal to McGuire Model #8912C and #8902C.

B. KITCHEN

1. Floor Sink:
 - a) Specify 12 in. x 12 in. x 10 in. deep
 - b) Cast iron with white enameled finish or stainless steel floor sink with 1/2 grate.
 - c) Floor sinks shall be located directly under sink for indirect waste for prep sinks, pot sinks, and steamer.
2. Specify 7 in. round recessed strainer floor drain for indirect waste from ice machine.
3. Specify stainless steel hand sink basins with wrist blade handle faucet.
4. Specify wash down system with hose reel and mount 12 in. above finish floor.
5. Specify floor drain under wash down station.
6. Provide adequate quantity of general area floor drains to kitchen so entire floor can be hosed down.
7. Use factory fabricated utility raceway provided by Mechanical contractor to serve equipment under hood.
 - a) Provide flexible hoses to serve equipment. Length of hoses shall be adjusted or shortened top prevent hoses from lying on floor.
 - b) Provide 3/4 in. cold water rough-in for utility raceway (for future use) regardless of kitchen equipment currently planned to be located underneath of kitchen hood.
8. Kitchen equipment shall utilize natural gas where available. Do not use LP gas.
9. Hood manufacturer shall furnish solenoid gas shut-off valve to Plumbing contractor for installation.
10. Supply 140 deg. F. to prep and pot sinks, can wash and mop receptor.
11. Use freeze-proof mixing faucet for can wash

- a) American Standard or WCPSS approved equal
- 12. Use non-clog floor drain for can wash.
- 13. Use manual hose reel in kitchen area for wash down.
- 14. Use copper pipe for prep and pot sink continuous waste.
- 15. Use check valves for cold water and hot water kitchen supply where needed to prevent cross flow.
- 16. Use Wake County Health Department water heater sizing chart to check for adequate kitchen hot water.
- 17. All final connections to kitchen equipment **shall** be done by Plumbing Contractor except items connected to utility raceway.
- 18. Plumbing Contractor shall install faucets for prep and pot sinks. Faucets shall be furnished by the Kitchen Equipment Contractor.
- 19. Plumbing Contractor shall install all items such as solenoid valves, thermometers, vacuum breakers, etc. furnished by the Kitchen Equipment Contractor.
- 20. Provide water filter and vacuum breaker assembly at kitchen icemaker connection and steamer connection.

C. FIXTURES

- 1. Water Closets: American Standard, Kohler, Sloan, or WCPSS approved equal.
 - a) Vitreous china, floor mounted, elongated, 1.6GPF, Flush Valve Top Spud.
 - b) Flush valve: Diaphragm style by Sloan, Zurn, or WCPSS approved equal.
 - 1) Provide with solid ring supports.
 - c) Toilet Seats: Church Model 9500NSSC or WCPSS approved equal.
 - 1) Institutional grade water closet seats with self-sustaining check hinges.
- 2. Urinal: American Standard, Kohler, Sloan, or WCPSS approved equal.
 - a) Vitreous china, wall mounted, 1.0GPF or maximum allowed by code, washout type.
 - b) Flush valve: Diaphragm style by Sloan, Zurn, or WCPSS approved equal. Provide with solid ring supports.
- 3. Lavatories: American Standard, Kohler, Sloan, or WCPSS approved equal.
 - a) Fixtures shall be 20 in. x 18 in. with 4 in. centers for faucet installation.
 - b) Student Use Areas: White enameled cast iron, wall mount, wall carrier
 - 1) Pre-K Faucets: Cast brass, chrome plated, sensor operated, 120v with plug-in transformer.
 - 2) Faucets all other student areas: Cast brass, chrome plated, mechanical metered.
 - c) Staff Use Areas: Vitreous China, wall mounted, wall carrier
 - 1) Faucets: Cast brass, chrome plated, single lever
- 4. Sinks: Elkay, Just Manufacturing, or WCPSS approved equal.
 - a) 18 Gauge stainless steel, drop-in.
 - b) Specify single bowl basins for classrooms and workrooms.
 - c) Specify double bowl basins for Teacher's Lounges and Exceptional Children's Areas.
- 5. Mop Basins/Sinks:

- a) Terazzo basin, floor mount, 36"x36" rectangular, stainless steel side wall panels and caps.
 - b) Provide isolation valves and check valves in branch piping serving mop sink. Valves shall be located in custodial closet.
 - c) Specify mop hanger, hose , and hose bracket
6. Interior Hose Bibb:
- a) Finished areas (group toilets, kitchen, etc.): Woodford Model B24, Josam, Zurnor WCPSS approved equal.
 - 1) Provide key operated chrome plated box type hose bibb flush with wall.
 - b) Exposed areas (mechanical rooms, etc.): Woodford Model 24, Josam, Zurn or WCPSS approved equal.
 - 1) Provide key operated chrome plated hose bibb.
 - c) Provide hose bibbs on Mezzanines a maximum of 100ft apart for maintenance procedures.
7. Exterior Wall Hydrant: Woodford Model B65, Josam, Zurn or WCPSS approved equal.
- a) Provide key operated box type automatic draining non-freeze wall hydrant.
 - b) Provide at maximum of 150ft in between hydrants.
8. Drinking Fountains/Water Coolers:
- a) Water Coolers: Elkay, Halsey Taylor, Oasis, or approved equal.
 - 1) Wall mounted, wheel chair type, electric, with electric push button controls on front colored vinyl, covered steel skirt, and flexible safety bubbler spout.
 - b) Drinking Fountains: Haws or WCPSS approved equal.
 - 1) Wall mounted, composite solid surface material.
 - 2) Use for K-1 classroom and 6-12 locker rooms.
 - c) Provide bottle fillers on prominent locations throughout the school. Coordinate with WCPSS Planners to determine specific locations throughout the school.
9. Showers:
- a) Shower Valve Unit: Specify valve and shower head as follows:
 - 1) Valve shall be concealed, chrome plated finish, single-handle, pressure-balance with hot and cold water indicators, anti-scalding, and check stops
 - 2) Shower head shall be 1.5GPM, vandal resistant, fixed position
 - 3) For ADA applications, specify shower head, diverter valve, 30" grab bar, and hand-held shower head.
10. Emergency Eyewash Unit: Guardian, Bradley, or WCPSS approved equal. Wall mounted, eye/face wash unit with plastic bowl. Eyewash shall be connected directly to sanitary sewer system and not drain onto floor surface.
11. Emergency Eye/Facewash Shower Combination Unit: Guardian, Bradley, or WCPSS approved equal. Combination shower/eye-face wash unit with plastic shower head and plastic bowl. Eyewash shall be connected directly to sanitary sewer and not drain onto floor surface.
12. Washer Box: Guy Gray or WCPSS approved equal

- a) Residential washing machine: Specify metal washer box with cold and hot water supply, shock arrestors, waste/vent, and finish trim.
 - b) Commercial washing machine: Specify cold and hot water supply valves with hose connections and floor drain located in trench drain. Trench drain shall be provided for washing machine waste water dump.
13. Refrigerator Ice Maker Box: Guy Gray or WCPSS approved equal
- a) Refrigerator Ice Maker: Specify metal box with cold water supply, shock arrestor, and finish trim.
 - b) Provide at all refrigerator locations.

DIVISION 23 - MECHANICAL SYSTEMS

23 01 00 HVAC BASIS OF DESIGN

A. LIFE CYCLE COST ANALYSIS

1. LCCA Calculations: HVAC system types and major components shall meet the requirements of these design standards, unless otherwise requested by WCPSS. When meeting these requirements, an LCCA is not required. The scope of LCCA requirements should be determined at the start of each project with WCPSS for deviations from the design standards.

B. OCCUPANCY SCHEDULES

1. HVAC systems shall be designed with capacity to operate over a year-round calendar regardless of the school's initially planned usage.
2. HVAC systems shall be modeled for the following hours of operation when required for LCCA calculations: 7:00 AM to 4:00 PM.

C. WEATHER CRITERIA

1. Weather Data: Design calculations shall be based on current ASHRAE published weather data.
 - a) Heating: 23.6 F (ASHRAE 99%)
 - b) Cooling: 92.4 Fdb / 75.2 Fwb (ASHRAE 1%)
 - c) Dehumidification: 81.5 Fdb / 130.2 grains/lb (ASHRAE 1%)

D. SPACE TEMPERATURE AND HUMIDITY CRITERIA

1. Indoor Space Set Points:
 - a) Typical: 68F (heating) / 75F (cooling) / 60% RH maximum
 - b) Kitchens: 68F (heating) / 75F (cooling) / 60% RH maximum
 - c) Locker Rooms: 68F (heating) / 75F (cooling) / 60% RH maximum
 - d) Electrical / Data Rooms: 60F (heating) / 80F (cooling) / 60% RH maximum
 - e) Mechanical Rooms: 60F (heating)

E. HYDRONIC OPERATING TEMPERATURES

1. Heating Water Systems:
 - a) Condensing Style Boilers: LWT = 140F / EWT = 110F with reset of 120F.
 - b) Non-Condensing Style Boilers: For replacements or partial renovations only, match existing LWT and EWT.
2. Chilled Water Systems: LWT = 44F / EWT = 58F
3. Cooling Towers: LWT = 85F / EWT = 95F
4. Water-Source Heat Pumps:
 - a) Cooling: EWT = 80F / LWT = 94F
 - b) Heating: ETW = 65F / LWT = 57F

F. SIZING CALCULATION CRITERIA

1. Safety Factors: Use the following safety factors when calculating the heating and cooling systems loads:
 - a) Heating: 10%

- b) Cooling: 0%
- 2. Diversity: Use diversity or not as listed in determining the equipment sizes:
 - a) Chillers: Yes
 - b) Boilers: No
 - c) Pumps: No
 - d) Air Handling Units: No.

G. NOISE CRITERIA

- 1. Local Noise Ordinances: Outdoor equipment location, screening and noise attenuation shall be evaluated to prevent noise complaints from neighboring properties. Refer to local ordinances for noise restrictions.
- 2. Space Noise Criteria: Spaces shall be designed for listed NC-levels as measured using an A-weighted filter at the center of the unoccupied space. Please refer to ASHRAE Fundamentals "Noise and Vibration Control" for additional information.
 - a) Instructional Spaces: NC-level 35
 - b) Auditoriums: NC-level 15-20
- 3. Mechanical Equipment: Mechanical equipment inside buildings shall not exceed 50 dBA.

H. ACCESS AND SERVICABILITY REQUIREMENTS

- 1. Maintenance Clearances: Indicate required minimum clearances for major equipment.
- 2. Overhead Equipment: Do not install mechanical equipment, such as pumps and fans that require routine maintenance overhead, except for equipment with fractional horsepower motors where this requirement is not practical.
 - a) When air handling units are approved to be suspended from structure in special situations (ie renovations of gymnasiums and auditoriums) fixed maintenance access shall be provided. Maintenance shall not require a boom, lift or extension ladder.
- 3. Outdoor Equipment: Outdoor equipment such as chillers, cooling towers and condensing units shall be enclosed by a fence or screen wall. Gates shall be large enough to remove equipment. Area inside enclosure shall have concrete pad sloped for proper drainage. Fence posts shall be located within the perimeter of the pad.
 - a) Access to mezzanine mechanical rooms shall be stairwell (not a ships ladder) leading up to the mezzanine mechanical room with a minimum width of 4 ft. Design insulated walls around the mezzanine mechanical rooms with a waterproof membrane and floor drains in the floor. Provide hoist where necessary to install and service equipment. Coordinate this between Architect/Engineer.
 - b) Avoid the use of roof mounted exhaust fans on steep-sloped roofs. Engineer to design around direct drive in-line exhaust fans mounted above the ceiling for buildings with steep-sloped roofs. The use of roof mounted direct drive exhaust fans is preferred for low-sloped roofs. Permanent means of roof access will need to be provided to access any equipment located on the roof. Locate all roof mounted equipment a minimum of 15'-0" from the edge of the roof.
- 4. Balancing Dampers and Valves: Indicate location of all supply, return, exhaust, and outside air system dampers and all hydronic system branch isolation valves and balancing valves on plans.
 - a) Specify all damper operators, control and service valves to be installed such that they can be serviced by personnel standing on the floor of the Mechanical Room.

- b) Specify all damper operators, manual volume dampers, control valves, isolation valves, and VAV boxes to be mounted no more than 2 feet above ceiling to allow maintenance personnel to reach from step ladder.
- 5. All air handling equipment, pumps, motors, valves etc., shall be mounted in areas easily accessible for routine maintenance. Provide 3 ft. clearance, minimum, around equipment for access to motors, compressors, bearings, controls, filters, valves, etc. Provide filter change space and coil pull space. AHU design shall allow for coil cleaning from both sides of coil, do not stack coils back-to-back with no access in between coils. The access doors should be ones that do not require maintenance personnel to use tools to open. Locate relative equipment together, i.e. in the same room and on the same floor. Do not layout equipment rooms such that equipment, piping and/or duct work must be removed to perform maintenance. Do not locate equipment overhead.
- 6. On renovations projects, where terminal units and/or piping is to be installed exposed in classrooms, media centers, cafeterias, kitchens, administrative areas or other finished areas of the building, a detailed isometric scaled typical detail shall be shown of the equipment and/or piping and the walls, ceiling and floor of the room. Exposed equipment in finished spaces not allowed in new construction.

I. SAFETY REQUIREMENTS

- 1. No open-flame heaters, open-coil electric heaters, or spark-producing electric components shall be used in potentially hazardous spaces such as spray painting, gasoline storage, dust or explosive vapors.

23 02 00 HVAC SYSTEM TYPES

A. GENERAL

1. New Construction and Major Renovations: The building HVAC systems shall be consistent with this design standard. If special circumstances require it, other system types must be approved by WCPSS prior to design. Life cycle cost analysis shall be performed when considering other systems.
2. Equipment Replacements: One-for-one equipment replacements might require deviations from this design standard. All deviations shall be approved by WCPSS prior to design. Certain components listed in the standard that are not a part of the preferred system types are listed for these situations.
3. Temperature Control Zones: WCPSS shall approve temperature control zoning concepts prior to the Design Development Phase.
4. Return Air Plenum: A return air plenum is preferred by WCPSS when possible.

B. VAV CENTRAL AIR SYSTEMS - SINGLE ZONE

1. Large spaces shall be served by single-zone 4-pipe air handling systems with variable speed fans. The fans shall vary their speed between minimum and maximum values based on zone temperature set points. Single-zone units shall be designed to provide active dehumidification control.
 - a) Outdoor air handling units and rooftop packaged units shall not be used unless pre-approved by WCPSS.

C. VAV CENTRAL AIR SYSTEMS - MULTIPLE ZONES

1. Multiple space areas shall be served by multiple-zone 4-pipe air handling systems with variable speed fans. The fans shall vary their speed between minimum and maximum values based on supply air duct pressure set points. Each temperature control zone shall have a terminal unit with a heating water reheat coil.
 - a) Outdoor air handling units and rooftop packaged units shall not be used unless pre-approved by WCPSS.

D. PUMPING SYSTEM CONFIGURATIONS

1. Heating and Chilled Water Systems: Heating and chilled water piping systems shall utilize a primary-secondary pumping configuration.
 - a) Primary loops for heating water systems shall have one (1) constant-speed pump dedicated to each boiler.
 - b) Primary loops for chilled water systems shall have one (1) constant-speed pump for each chiller. When multiple chillers are used, they should be piped so that WCPSS can manually assign either pump to either chiller. Each chiller shall have tees and valves to allow a temporary chiller to be installed without draining down the system piping. Temporary chiller piping connections shall be in the horizontal plane.
 - c) Elementary School Secondary loops shall have:
 - 1) Two (2) pumps sized at 100% capacity for active / standby operation.
 - d) Middle School & High School Secondary loops shall have either:
 - 1) Two (2) pumps sized at 100% capacity for active / standby operation.
 - 2) Three (3) pumps sized at 50% capacity for parallel active / single standby operation.

23 03 00 HVAC SYSTEMS FOR SPECIALTY SPACES

A. ADMINISTRATION SUITES

1. The Administration Suite Bus Dispatching, & AFM Offices should each have a dedicated air handling unit that can operate when the remainder of the school is unoccupied. The heating and cooling plant should be analyzed to consider the system operation when supporting low loads. For example, will there be enough load on the chiller to keep it operational? If not, utilize Dx equipment to serve these areas.

B. KITCHEN VENTILATION SYSTEMS

1. Kitchens and Cafeterias: Kitchen/Cafeteria shall have a dedicated air handling unit. Required ventilation for the cafeteria shall be used as make-up air for the kitchen; a dedicated kitchen hood make-up air unit is not allowed.
2. Kitchen Hood Exhaust Fans: Rooftop upblast fan with grease trap on a flat roof directly above the kitchen is preferred. Wall-mounted fans should be avoided and may only be used if pre-approved by WCPSS.
3. Air Distribution: Maintain 6-foot between supply air diffusers and the kitchen hoods.
4. Utility Distribution Chases: Provide a utility distribution chase to serve the kitchen equipment located under the hood. Utility distribution chases shall be provided by the same manufacturer as the kitchen hood.
5. Fly Fans: Exterior entrances to kitchens shall be equipped with a fly fan with automatic switch geared to opening and closing of door.
6. Cooler and Freezer Condensers: Outdoor condensers shall be located on a concrete pad. Condensers shall not be located on the roof. Maintain manufacturer recommended spacing for proper ventilation.

C. GYMNASIUMS AND LOCKER ROOMS

1. Locker Rooms: Locker rooms shall utilize a 100% OA unit with energy recovery. Refer to Section 23 62 00 for more information about energy recovery units, including type of energy recovery allowed.
2. Gymnasiums: Each gym shall have a dedicated single zone VAV central air system.

D. LABORATORY EXHAUST SYSTEMS

1. Fume Hoods: Fume hoods shall have a dedicated exhaust system that is manually switched when the hood is in operation. The fan does not need to be controlled or monitored by the BAS.
2. Prep Rooms: Each prep room shall have a dedicated exhaust system that operates continuously. The fan does not need to be controlled or monitored by the BAS.
3. Emergency Exhaust System: Emergency exhaust air system shall have a dedicated exhaust fan per science classroom controlled by a manually-activated twist timer located by the exit door of the classroom. ISOMET panel is not desired. The exhaust rate shall meet the requirements of the NC DPI "School Science Facility Planner" (6 air changes per hour). Rooftop fan(s) on a flat roof above the science classroom(s) are preferred. Make-up air shall be supplied from the central air system whenever practical. When the ceiling plenum is used for return air, transfer air openings shall be equipped with a damper to help prevent the spread of odors and ensure that the exhaust air is pulled from the room.

E. KILN ROOMS

1. Kiln Dedicated Exhaust: Each kiln shall have a dedicated exhaust system that is connected directly to the kiln, ducted directly to the exterior, and manually switched when the kiln is in

operation. The fan does not need to be controlled or monitored by the BAS. Please refer to the Skutt Environment 2 system, <https://skutt.com/ceramic-kilns/kiln-accessories/venting/>

2. Kiln Room General Exhaust: Each kiln room shall have a separate exhaust system that is thermostatically controlled, minimum 500cfm. The fan does not need to be controlled or monitored by the BAS.

F. AUTO AND WOOD SHOPS

1. Dust Collection Systems: All wood shops shall be equipped with a manually operated dust collection system.
2. Auto Shop System: All auto shops shall be provided with exhaust for fumes.
3. HVAC Door Monitor: Switch at each roll-up door shall disable space HVAC system when the door is open.

G. DATA ROOMS

1. Main Distribution Frame (MDF) Rooms: DX ductless mini-split systems shall be used for each MDF room. The indoor unit shall have a dedicated outdoor condensing unit, multiple indoor units served by a single outdoor unit is not acceptable. Outdoor condensing unit shall be ground mounted, not on roof.
2. Intermediate Distribution Frame (IDF) Closets: Cabinet exhaust fans shall be used for each IDF room. Air shall be re-circulated from an adjacent cooled space.
3. Temperature Controls: Each room shall have a digital, hard-wired, wall-mounted space temperature sensor. Monitoring and alarming by the BAS is not required.

H. ELEVATOR EQUIPMENT ROOMS

1. Elevator Equipment Rooms: DX ductless mini-split systems shall be used for each elevator equipment room. The indoor unit shall have a dedicated outdoor condensing unit, multiple indoor units served by a single outdoor unit is not acceptable. Outdoor condensing unit shall be ground mounted, not on roof.
2. Temperature Controls: Each room shall have a digital, hard-wired, wall-mounted space temperature sensor. Monitoring and alarming by the BAS is not required.

I. MECHANICAL EQUIPMENT ROOMS

1. Gas-fired equipment shall not be installed in the same space as air handling equipment.
2. Spaces with gas-fired equipment shall be equipped with carbon monoxide sensors and alarms.

J. ELECTRICAL EQUIPMENT ROOMS

1. Do not route hydronic piping through electrical equipment rooms. Avoid routing hydronic piping near or over electrical equipment. In special circumstances where complete isolation is impractical, meet the requirements of NEC 110.26.E.
2. Electrical rooms with transformers shall be provided with general exhaust sized appropriately for the transformer sizes within the room. Exhaust fan shall be thermostatically controlled. Monitoring and alarming by the BAS is not required.

K. UTILITY AND STORAGE SPACES

1. All spaces with exterior entrances, such as outdoor storage, lawn storage, etc., shall have electric unit heaters with integral thermostats. Monitoring and alarming by the BAS is not required.

L. STAIRWELLS

1. Stairwells with sprinkler piping shall be equipped with surface mounted, electric, architectural, wall heaters with integral thermostat. Located on bottom floor with exterior exit and on every other floor as needed.

23 04 00 HVAC CONSTRUCTION REQUIREMENTS

A. DUCT CLEANING

1. All supply, return, and outdoor air ductwork shall be protected during construction while awaiting install and after installation so as to protect any contamination from entering the ductwork. Inspect all ductwork upon final installation and clean as needed to provide like new condition.
2. Duct Cleanliness: Required adherence is the SMACNA Duct Cleanliness for New Construction Guidelines. Advanced cleanliness level required.
3. Duct Cleaning: NADCA General Specifications for the Cleaning and Restoration of Commercial Heating, Ventilating, and Air Conditioning Systems shall be the required cleaning standard.
4. Non-compliance of the Duct Cleanliness requirements shall require removal and/or replacement of the affected ductwork.

B. PIPING PRESSURE AND LEAKAGE TESTING

1. Pipe Flushing: All piping systems shall be thoroughly flushed out before placing in operation. This is especially critical for all hydronic systems.
 - a) Hydronic systems shall be connected so as to by-pass the unit coils before flushing begins and then flushed and the filters cleaned out at least three (3) times before the units are connected to the system and placed in operation.
 - b) All cooling towers shall be completely cleaned and flushed after all systems are in operation and the site work has been completed. (Engineer to be present).
2. Pipe Testing: Subject hydronic piping system to hydrostatic test pressure of 1.5 times the system's maximum working pressure but not less than 100 psig. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. After hydrostatic test pressure has been applied for at least 15 minutes, examine piping, joints, and connections for leakage. Eliminate leaks and repeat hydrostatic test until there are no leaks for a continuous 2 hours minimum.

C. DUCT LEAKAGE TESTING

1. Medium Pressure Duct: 100% of medium pressure duct, such as supply air duct between VAV AHU supply fans and VAV terminal box inlets, shall be leak tested.
2. Maximum Allowable Leakage: Test duct leakage per latest ASHRAE HVAC Systems and Equipment Handbook Chapter 19 with an average leakage rate for each duct system as specified in Table 3 for the leakage class specified.

D. TESTING, ADJUSTING, AND BALANCING

1. Certification: TAB Contractor shall be AABC or NEBB certified.
2. Verification: WCPSS, Engineer and Contractors shall field verify balanced equipment.
 - a) 100% of equipment when commissioning is included.
 - b) 10% of equipment when commissioning is not included.
 - c) Engineer of Record shall provide written approval of all TAB reports.

E. COMMISSIONING

1. Coordinate commissioning scope of work with WCPSS prior to the start of the project. When required, WCPSS or their representative will provide commissioning requirements for the contract documents and an Owner Project Requirements (OPR) report.

2. Engineer of Record shall provide a Basis of Design document supporting the OPR.

F. OPERATION OF HVAC SYSTEMS DURING CONSTRUCTION

1. All equipment shall have factory start-up performed to ensure all initial settings and safeties are properly setup to protect the equipment prior to operating equipment, temporary or permanent. Equipment should not be operated outside of normal operating ranges.
2. Air Handling Units: Do not operate AHU's for any reason, temporary or permanent, without WCPSS approval. Prior to operation the following shall be complete and verified:
 - a) Clean ductwork.
 - b) Clean filters in place.
 - c) Bearing lubricated.
 - d) Condensate drain piping properly installed with trap.
 - e) Piping inspected, leak tested, and insulated.
 - f) Belts aligned and tensioned.
 - g) Shipping braces removed.
 - h) Bearing set screws torqued.
 - i) Fan and VFD operation tested under observation.
 - j) Spaces served shall be free of construction contaminants (ie: dust in the air), and all dust making activities shall be complete.
 - k) Return air pathways – either ducted or plenum, shall be protected with some form of filter media.
3. Boilers: Do not operate boilers for any reason, temporary or permanent, without WCPSS approval or until they have been inspected by the NC Department of Labor. Prior to and during operation, the following shall be completed and verified:
 - a) The internal filter media shall be clean upon startup and monitored during construction.
 - b) Associated hydronic pumps are lubricated.
 - c) Safeties internal to the equipment shall be setup by a factory authorized startup technician.
4. Chillers: Do not operate chillers for any reason, temporary or permanent, without WCPSS approval or until they have been inspected by the NC Department of Labor. Prior to and during operation, the following shall be completed and verified:
 - a) Levels of refrigerant and oil have been factory verified and levels shall be inspected weekly.
 - b) Check moisture indicator and condenser coils for external trash and debris.
 - c) Associated hydronic pumps are lubricated.
 - d) Safeties internal to the equipment shall be setup by a factory authorized startup technician.

23 05 00 HVAC ELECTRICAL COMPONENTS

A. VARIABLE SPEED DRIVES

1. Variable Speed Drives: Danfoss, Honeywell, JCI, or pre-approved equal.
2. Drives shall be provided by the controls sub-contractor, except for drives that are included in a packaged piece of equipment.

B. MOTORS

1. All motors shall be NEMA Premium rated and labeled (90%+ efficiency).
2. All motors shall comply with NEMA MG 1.
3. Motors for fans and pumps shall be selected for the maximum brake-horsepower listed in the equipment schedules and no more than 85% of the nominal rated horsepower excluding the service factor.

C. ELECTRICAL COORDINATION

1. Electrical Connections: The electrical contractor shall provide all power wiring to each piece of mechanical equipment. The mechanical contractors shall be required to furnish all starters and disconnects and turn over to the electrical contractor for installation and also to make final connections from slack wire left by electrical contractor to each piece of equipment. Show detail on drawing to avoid confusion. Refer to Mechanical Detail in Appendix C.
2. Electrical Connections: All electrical connections shall be made in accordance with equipment manufacturer's recommendations and in accordance with NFPA 70. Install and ground equipment connections in accordance with the requirements of NFPA.
3. Surge Protection: All major items of mechanical and control equipment that employs solid-state electronic components shall be fully protected from electrical surges and lighting.

23 06 00 HVAC IDENTIFICATION

A. EQUIPMENT TAGS

1. Engineer shall specify engraved plastic laminated labels on all equipment. Engineer can discuss alternative types of labels with the Owner. Labels shall include equipment number, area(s) served, substantial completion date (S.C.), extended warranty period, number and size of filters and capacity. Substantial completion date to be on a separate label, so as to allow equipment labels to be installed prior to substantial completion. Label containing substantial completion date to be installed on equipment prior to final completion.

The following are examples of labeling to be used:

AHUs: AHU #1 (Building 100)
Filters: 2 @ 24 in. x 24 in. x 1 in.
Design Capacity: 10,000 CFM @ 1.0" ESP
Belt (2) A35

Boilers: Boiler #1 (Buildings 100 & 200)
Design Input: 1,000 MBH
Design Output: 900 MBH

Chillers: Chiller #1 (Buildings 100 & 200)
Design Capacity: 190 Tons

Fans: EF #1 (Toilets 110 & 112)
Design Capacity: 500 CFM @ 0.3" ESP

Terminal Units: VAV #101 (Classroom 101)
Design Capacity: 1,500 CFM

2. Contractor shall also be required to provide a permanent label on the exterior of each AHU. Submit a sample for approval by owner/architect/engineer.

B. VALVE TAGS

1. Brass, 19-gauge thick valve tags with 3/16" diameter top hole for fastener or chain, blank or pre-stamped lettering, and natural brass finish. Top line (system) lettering shall be 1/4" and bottom line (valve number) shall be 1/2". Provide brass or stainless steel beaded chain with locking links to attach tag to valve.

C. CEILING TAGS

1. Label each device or valve above the ceiling and label the ceiling grid below each. Indicate the type of device or valve and its associated service (e.g. "Shutoff Valve – HW", "VAV-21").
2. Provide custom printed labels for each device, either vinyl or polypropylene, suitable for indoor / outdoor applications. Use portable printer equal to Brady HandiMark Portable Industrial Labeling System.

3. Labels shall be no more than 1-inch in height. Lettering shall be minimum 18-point font. Lettering shall be black on white tape.
4. See Appendix A – 23 06 00-Attachment A for information on ceiling grid labels.
5. Provide a list of devices and valves labeled with the identical information in the O&M Manuals.
6. Submit samples of markings on three different devices for approval of the Owner and Engineer.

D. PIPING IDENTIFICATION

1. Concealed piping above accessible ceilings with O.D., including insulation, less than 6": Pre-tensioned type pipe markers (ASME A13.1) or stenciled with black letters and black flow arrows.
2. Concealed piping above accessible ceilings with O.D., including insulation, 6" and larger: Shaped pipe markers (ASME A13.1) or stenciled with black letters and black flow arrows.
3. Piping runs located above inaccessible ceilings do not require labeling.
4. Locate pipe markers and flow arrows as follows:
 - 1) Maximum of 10ft and closer if congested.
 - 2) Near each valve
 - 3) Near each branch take off.
 - 4) Near equipment.
 - 5) Near origination and termination points
 - 6) Near where pipe passes through walls (both sides of wall)
 - 7) Near access doors
 - 8) On piping above inaccessible ceilings as it enters and immediately after it exits.
5. All exposed piping in air handling unit mechanical rooms shall be labeled the same as concealed piping above accessible ceilings.
6. All exposed-to-view piping in occupied spaces shall be painted to match the adjacent surfaces. Do not paint metal jackets.
7. All exposed piping in Boiler Room and Main Mechanical Room shall be painted to WCPSS standards as follows (provide black flow arrows):

1) Chilled Water - Medium Blue	Sherwin Williams #SW6796	Pantone #288CP
2) Heating Water - Medium Red	Sherwin Williams #SW6868	Pantone #187CP
3) Dual Temp– Orange	Sherwin Williams #SW6884	Pantone #485C
4) Make-up Water-Dark Blue	Sherwin Williams #SW6965	Pantone #282C
5) Condenser Water-Green	Sherwin Williams #SW6927	Pantone #343C
6) Gas - Yellow	Sherwin Williams #SW6911	Pantone #102C
8. Underground plastic pipe marker: 6 in. wide x 4 mils thick multi-ply tape, solid aluminum foil core between two (2) layers of plastic tape. Provide in all locations where underground plastic piping is utilized.

23 07 00 HVAC INSULATION

A. PIPING INSULATION

1. Chilled Water Piping: Minimum 2-inches thick fiberglass insulation with vapor-proof jacket.
2. Heating Water Piping: Minimum 1-inch thick fiberglass insulation.
3. Domestic Hot and Cold Water Piping: Minimum 1-inch thick fiberglass insulation.
4. Cooling Condensate Drain Piping: Minimum 1-inch thick closed cell insulation with UV protection. Armstrong Armaflex II, or pre-approved equal by Owens Corning or Schuller.
5. Refrigerant Piping: Minimum 1.5-inch thick closed cell insulation with UV protection. Armstrong Armaflex II, or pre-approved equal by Owens Corning or Schuller.
 - a) Insulation shall be installed in strict accordance with manufacturer's recommendations.
 - b) Insulation shall be held in place with an adhesive approved by the insulation manufacturer and shall be provided with a vapor proof seal in accordance with manufacturer's recommendations.
 - c) Valves and fittings shall be insulated with miter-cut pieces of insulation.
 - d) All piping insulation exposed to atmospheric conditions shall be coated with two coats of manufacturer's recommended coating and two coats of solar reflective paint.
6. Hydronic Piping Jacketing: Indoor hydronic piping shall have painted canvas jacket on all exposed piping in occupied spaces and mechanical rooms. Pre-colored, according to the WCPSS system labeling requirements, 20-mil PVC jacket is also acceptable in occupied spaces and mechanical rooms. Outdoor hydronic piping shall have aluminum jacket. All piping supports shall have saddles and blocking. Exposed piping, hangers, saddles and supports shall be provided with primer coat for long term adhesion and be painted with minimum of 2 finish coats.
7. Installation: Piping shall not be insulated until it has been tested and accepted for leakage.

B. DUCT INSULATION

1. Insulate all ductwork, except exhaust ductwork, by wrapping with minimum 2 in. thick fiberglass insulation with vapor-proof jacket.

23 09 00 HVAC CONTROLS

A. BUILDING AUTOMATION SYSTEMS

1. Refer to Full specification section 23 09 00 Building Automation System
2. Refer to Standard CAD Details in Appendix C.

B. BAS SEQUENCES OF OPERATIONS

1. Refer to full specification section 23 09 93 BAS Sequence of Operations
2. Refer to Standard CAD Details in Appendix C.

23 21 00 HYDRONIC PUMPS AND PIPING

A. HYDRONIC PUMPS

1. Pump Types: Vertical in-line style pumps are preferred. Armstrong, Bell & Gossett, TACO or pre-approved equal.

B. HYDRONIC PIPING – ABOVE GRADE

1. Heating and Chilled Water Piping Systems: Heating and chilled water piping shall be Schedule 40 ASTM A53, Type ERW or S, Grade B steel with welded or screwed joints. Heating and chilled water piping 1-inch or smaller may also be Type L copper with soldered joints using 95-5 solder.
2. Condenser Water Piping Systems: Condenser water piping shall be Schedule 80 ASTM A53, Type ERW or S, Grade B steel with welded or screwed joints. Condenser water piping 1-inch or smaller may also be Type L copper with soldered joints using 95-5 solder.
3. Cooling Coil Condensate Drain Piping: Type L copper with soldered joints. PVC is not acceptable.

C. HYDRONIC PIPING – BELOW GRADE

1. Heating, Chilled and Condenser Water Piping Systems: PP-R or pre-insulated steel piping shall be specified for chilled water systems. PP-R or ductile-iron piping shall be specified for cooling tower condenser water systems. Pre-insulated steel piping shall be specified for heating water systems.
2. Polypropylene Piping: Polypropylene Random (PP-R) piping rated for 0 to 200 deg F with SDR 7.4 and 11.0 for sizes larger than 1-inch diameter. Aquatherm Blue Pipe or pre-approved equal. SDR 17.6 is not allowed. Polypropylene Random Copolymer Chrystalline Temperature (PPR-CT) is not considered equivalent to PP-R.

<u>Temperature</u>	<u>Max. Working Pressure</u>
50 F	325 psig
80 F	255 psig
100 F	210 psig
120 F	180 psig
140 F	150 psig
160 F	100 psig
180 F	62 psig
200 F	30 psig

3. Ductile Iron Piping: Ductile-iron pipe with standard pattern mechanical joint fittings and mechanical joints, EBAA MegaLug or pre-approved equal.
4. Pre-Insulated Piping: Cased steel carrier piping with polyurethane foam insulation and HDPE jacket rated for up to 250 deg F. Carrier piping shall be Schedule 40 ASTM A53, Type ERW or S, Grade B steel with welded joints. Insulation shall be closed cell foam with minimum 2-inches thick. Jacket shall be seamless HDPE. Perma-Pipe XTRU-Therm or pre-approved equal.

D. VALVES

1. Control Valves: Pressure-dependent.
2. Balancing Valves: Automatic. Balancing valves are not required on coils utilizing pressure-independent control valves.

E. PIPING SPECIALTIES

1. EXPANSION TANKS

- a) Manufacturers:
 - 1. Bell & Gossett.
 - 2. Taco.
 - 3. Adamson.
 - 4. Amtrol Inc.
 - 5. John Wood Co.
 - 6. Armstrong.
 - b) Compression Tanks: Closed, welded steel, tested and stamped in accordance with ASME SEC 8-D; cleaned, prime coated, and supplied with steel support saddles; with tapings for installation of accessories. Pressure rating of 125 psi.
 - c) Bladder Tanks: Factory-fabricated welded steel bladder-type expansion tank with taps for pressure gage, air charge fitting and drain fitting. Tanks shall be rated for 125 psig working pressure and 240 deg F maximum operating temperature and labeled according to ASME Boiler and pressure Vessel Code Section VIII, Division 1. Bladder shall be securely sealed into tank to separate air charge from system water to maintain required expansion capacity. Air-Charge Fittings shall be schrader valve, stainless steel with EPDM seats.
- 2. Gauge Glass Set: Brass compression stops, guard, and 3/4 inch red line glass, maximum 24 inches length, long enough to cover tank for 2 inches above bottom to 2 inches below top.
 - 3. Automatic Cold Water Fill Assembly: Pressure reducing valve, test cocks, strainer, vacuum breaker, and valved by-pass.
 - 4. Air Vents: Manual Type, short vertical sections of 2 inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.
 - 5. Combination Air Separators/Strainers:
 - a) Manufacturers:
 - 1. Bell & Gossett.
 - 2. Taco
 - 3. Amtrol Inc.
 - 4. John Wood Co.
 - 5. Armstrong.
 - b) Construction: Steel, tested and stamped in accordance with ASME SEC 8-D; for 125 psig operating pressure, with integral bronze strainer, tangential inlet and outlet connections, and internal stainless steel air collector tube.
 - 6. Strainers: size 2 inch and below:
 - a) Manufacturers:
 - 1. Mueller Steam Specialty Co.
 - 2. ITT Fluid Handling
 - 3. Grinnell Corp
 - 4. Stockham
 - 5. Hammond
 - 6. Milwaukee
 - b) Construction: screwed brass or iron body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.
 - 7. Strainers: size 2-1/2 inch to 4 inch:

- a) Manufacturers:
 - 1. Mueller Steam Specialty Co.
 - 2. ITT Fluid Handling
 - 3. Grinnell Corp
 - 4. Stockham
 - 5. Hammond
 - 6. Milwaukee
 - b) Construction: flanged iron body for 175 psig working pressure, Y pattern with 3/64 inch stainless steel perforated screen.
8. Strainers: size 5 inch and larger
- a) Manufacturers:
 - 1. Mueller Steam Specialty Co.
 - 2. ITT Fluid Handling
 - 3. Grinnell Corp
 - 4. Stockham
 - 5. Hammond
 - 6. Milwaukee
 - b) Construction: flanged iron body for 175 psig working pressure, basket pattern with 1/8 inch stainless steel perforated screen.
9. Pump Suction Fittings (Suction Diffusers)
- a) Manufacturers:
 - 1. Bell & Gossett
 - 2. Taco
 - 3. Armstrong.
 - 4. Amtrol Inc.
 - b) Construction: Angle pattern, cast-iron body, threaded for 2 inch and smaller, flanged for 2-1/2 inch and larger, rated for 175 psig working pressure, with inlet vanes, cylinder strainer with 3/16 inch diameter openings, disposable fine mesh strainer to fit over cylinder strainer, and permanent magnet located in flow stream and removable for cleaning.
 - c) Accessories: Adjustable foot support, blow-down tapping in bottom, gauge tapping in side.
10. Flow Control Valves
- a) Manufacturers:
 - 1. Griswold Controls Model FlowCon.
 - 2. Autoflow, Inc.
 - 3. Armstrong.
 - b) Construction: Forged brass body and stainless steel cartridge assembly with integral handle ball valve and two union ends. The body design shall allow for inspection or removal of cartridge without disturbing the piping connections. The valve shall come fully assembled and be permanently marked to show direction of flow, have a body tag to indicate flow rate and model number. Valve shall be rated at 300 psi and 250 deg F. Provide with two pressure/temperature taps.

11. Relief Valves:
 - a) Manufacturers:
 1. ITT Bell & Gossett.
 2. Armstrong.
 3. Watts Regulator.
 - b) Construction: Forged brass body and stainless steel cartridge assembly with integral handle ball valve and bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labeled.
12. Heat Tape:
 - a) Manufacturers:
 1. Chromalox
 2. Armstrong.
 3. Watts Regulator.
 - b) Construction: U.L. listed, 120 volt, 8 watts per foot, self-regulating rapid trace, with automatic thermostat. Provide with power connection kit for hardwired connection to junction box provided by Electrical Contractor. No plug type connections will be accepted. Provide pilot light kit, splice and end kits as necessary for proper installation.
13. Balancing Valves: Ball valves, butterfly valves, or calibrated balancing valves shall be installed as appropriate where balancing valves are indicated.
14. Pressure Reducing Valves: Diaphragm-Operated, Pressure-Reducing Valves: Bronze or brass body diaphragm-operated pressure reducing valves with PTFE disc, brass seat, EPT diaphragm, EPDM O-ring stem seals, low inlet pressure check valve, inlet strainer that is removable without system shutdown and non-corrosive valve seat and stem and ASME labeled. Valve size, capacity and operating pressure shall be selected to suit system. Operating pressure and capacity shall be factory-set and field adjustable.

F. GAUGES

1. Hydronic Thermometers: Light-Activated Thermometers: 6-inch plastic case with adjustable angle; LED digital display; aluminum stem of length suitable for application for thermowell installation; 1-1/4 inch connector with ASME B1.1 screw threads; and accuracy to plus or minus 1 deg C.
2. Pressure Gauges: Dial-Type, Oil-filled, cast aluminum case with 4-1/2 inch nominal diameter; non-reflective aluminum dial with permanently etched scale markings graduated in psi and kPa; bourbon tube pressure element assembly; brass pressure connection with NPS 1/4 or 1/2 inch ASME B1.20 pipe threads and bottom-outlet; mechanical movement with link pressure element and connection to pointer; glass window; stainless steel ring; dark colored metal pointer; and accuracy to plus or minus 1 percent of scale range.

G. WATER TREATMENT

1. Closed System Treatment: Use one shot chemical feeder for each closed loop pumping system.
2. Open System Treatment: Provide automatic chemical feed systems to all "open" systems such as cooling towers. Coordinate with WCPSS, along with the current water treatment systems contractor, concerning the system type, the water test, chemicals and water management program set-up.

H. INSTALLATION REQUIREMENTS

1. Piping Support: Piping shall be supported in accordance with in ASME Handbook. Do not support piping from bar joist bridging.
2. Piping Expansion: Specify and show on plans expansion loops for all hot water piping straight runs over 200 feet in length.
3. Isolation Valves: Shut-off valves shall be installed at all take-offs of hydronic mains to each mechanical equipment room, each building wing, and each building floor. Shut-off valves shall be installed on the supply and return side of all equipment to allow for removal and repair.
4. Control and Balancing Valves: Provide automatic flow control valves on all hydronic systems.
5. Freeze Protection: Provide positive freeze protection for all water systems subject to freezing conditions such as air-cooled outdoor chillers, cooling towers, outdoor piping (above ground) etc.
6. Relief Valves:
 - a) All relief valves shall have a union near valve to allow for future relief valve replacement.
 - b) Hot water relief valves, refrigerant relief devices, and steam pop-off safety valves must be piped to location to minimize danger to personnel or students upon relief. Hot water relief valves should be piped to exterior or to funnel-type floor drains located near the equipment.
7. Thermometers: Install thermometers indoors at the following:
 - a) Inlet/outlet of boilers
 - b) Inlet/outlet of Heat Exchangers (both Loop Side and Condenser Side)
 - c) Primary Chilled Water Piping entering mechanical room from air cooled chillers.
 - d) Secondary Chilled Water Piping leaving mechanical room.Do not install gauges or thermometers on Air Handling Units, Fan-Coil-Units, VAV Boxes, or outside at air cooled chillers
8. Thermometers and Pressure/Temperature Ports: Provide pressure / temperature ports (Pete's Plugs) at the inlet and outlet of hydronic equipment including:
 - a) Chillers
 - b) Boilers
 - c) Pumps
 - d) Air Handling Unit Coils
 - e) Water Source Heat Pumps
 - f) Fan Coil Units
 - g) Heat Exchangers (both Loop side and condenser side)
 - h) Energy Recovery Units (if applicable)
 - i) Differential Pressure Monitors
9. Central Plants: Provide additional bulb wells in central plant piping for electronic sensors. Coordinate with the Energy & Physical Plant for locations of additional wells. Show detail of wells on drawings.
10. Make-Up Water Stations: All water make-up assemblies shall be provided with a backflow preventer.
11. Provide chrome escutcheon rings at all exposed ceiling and wall pipe penetrations.
12. Specify all damper operators, control and service valves to be installed such that they can be serviced by personnel standing on the floor of the Mechanical Room.
13. Engineer shall require contractor to dimension actual location of all underground piping on as-built drawings. A minimum of two (2) dimensions from building reference points shall be provided and a bury depth indicated.

14. Heat Exchangers: Show by-pass piping for all heat exchangers.
15. Strainers: Show wye strainers in inlet piping to heat exchanger and cooling tower outlet (unless strainer is built-in basin).
16. Condensate Drain P-Traps: Install unions on both sides of p-traps.

23 23 00 REFRIGERANT PIPING

- A.** Piping shall be copper tubing, ASTM 88, Type L with soldered joints. No soft copper piping will be allowed. All external piping and fittings shall be products of the United States of America.
- B.** Line Test Pressure for Refrigerant:
 - 1. Suction Lines for Refrigerant R-134A: 115psig to 225psig
 - 2. Suction Lines for Refrigerant R-407CA: 230psig to 380psig
 - 3. Suction Lines for Refrigerant R-410A: 300psig to 535psig
- C.** Valves shall be forged brass or cast bronze.

23 31 00 AIR SYSTEMS

A. DUCTWORK

- a. Metal Ductwork: All metal ductwork shall be constructed in accordance with current SMACNA standards. Duct shall be galvanized sheet metal with zinc coating complying with ASTM A527, except for special applications (such as kitchen hood exhaust, chemical hood exhaust, and dust collection systems.) Exposed ductwork shall be mill-phosphatized for painting.
- b. Low-Pressure Duct: Rectangular.
- c. Medium and High-Pressure Duct: Round, Oval, or Rectangular.
- d. Flexible Ductwork: Flexible ducts shall be UL Class 1 insulated-type with foil outer finish. It may be used above lay-in ceiling systems. Support all flexible ducts a maximum of 5 ft. on center and at all changes in direction so as to prevent sagging and crimping from occurring. All flex duct shall have no less than one (1) duct hanger. Maximum length of flex duct should be 6'-0"
- e. Exposed Ductwork: Exposed ductwork to occupied spaces shall be spiral duct with paint-grip finish. Duct systems that are insulated shall be double-wall construction. WCPSS shall approve all uses of exposed duct. Fabric duct with inner hoops to retain shape at all times is acceptable in certain large area spaces. Coordinate with WCPSS on exact duct preference.
- f. Sealant: Seal all ductwork joints, seams and take-offs airtight with non-hardening mastic or liquid elastic sealant. Engineer to witness ducts have been sealed before ducts can be insulated.
- g. Installation: Do not support ductwork from bar joist bridging.

B. DIFFUSERS AND GRILLES

- a. Design and Selection: Diffusers and grilles shall be indicated for ceiling, wall, or duct-mounted installation for supply, return, exhaust and transfer air systems throughout the building. The diffusers shall be selected to provide even air distribution including adequate heat to the floor level.
 - i. Diffusers and grilles shall be factory-finished steel construction, except in moist and humid areas (such as kitchens, locker rooms, showers and training rooms) where they shall be factory-finished aluminum. Perforated supply air diffusers are not permitted, except for kitchen hood make-up air.
 - ii. Heavy-Duty Use: Grilles shall be heavy-duty type where subject to damage due to space use (such as gymnasiums and multi-purpose rooms) or because it is installed within 8 foot of the floor. They shall be all welded construction with 1/8 inch thick grille blades, 14 gauge blade mullions on 6in. centers with 18 gauge frame reinforced at the corners.

C. DAMPERS

- a. Manual Balancing Dampers: Balancing dampers shall be indicated for all ducted fan systems. Balancing dampers are not required at transfer ducts or at plenum return grilles.
 - i. Volume dampers in diffuser or grille necks are not acceptable, except as pre-approved by WCPSS.
 - ii. Radiation dampers in rated ceiling assemblies shall not be used as balancing dampers.
- b. Installation: Manual or automatic dampers shall not be installed above inaccessible ceilings. All dampers should be installed within a mechanical equipment room or

above lay-in ceiling tiles. Where this is not possible, provide ceiling access door or non-motorized remote damper actuator.

D. SOUND ATTENUATORS

- a. Sound attenuators shall be tapered dissipative type and sized appropriately for the specific application.

E. LOUVERS

- a. Coordination shall be performed with louver required opening and free area for all louvers provided.
- b. All louvers shall be drainable.

F. AIR FILTRATION

- a. Filter Types:
 - i. Central Air Distribution: Air handling units and packaged rooftop units shall have 2-inch deep MERV-8 pleated disposable air filters.
 - ii. Unitary Equipment: Unitary equipment, such as fan coil units and water-source heat pumps, that recirculates indoor air shall have an extended filter rack specified that holds 2-inch deep MERV-8 pleated disposable air filters.
- b. Filter Assemblies: Filters shall have factory-fabricated and installed filter access assemblies in each HVAC unit. Tools shall not be required to access and change filters on air handling units. Provide use hinged access doors with cam locks for air handling units.
- c. Filter List: Mechanical contractor shall submit, upon final walk-through, a summary of all HVAC equipment indicating filter size and numbers of filters (this shall also be part of the Operation & Maintenance manual). The following is an example of this information which is to be provided on all projects:

WAKE COUNTY PUBLIC SCHOOL SYSTEM

FILTER LIST FOR ENERGY AND PHYSICAL PLANT

SCHOOL NAME: _____

MECH. ROOM #: _____ FILTER SIZE: _____

AIR HANDLER #: _____ QUANTITY: _____

MECH. ROOM #: _____ FILTER SIZE: _____

AIR HANDLER #: _____ QUANTITY: _____

MECH. ROOM #: _____ FILTER SIZE: _____

AIR HANDLER #: _____ QUANTITY: _____

- d. Contractor shall install a new set of filters before final inspection and provide one spare set of filters for the entire project to the Owner.

23 32 00 TERMINAL UNITS

A. AIR TERMINALS

1. Terminal Unit Types: Single-duct terminal units shall have 120V/24V transformers, 277V power sources are not acceptable. Carnes, Nailor, Price, Titus, Metalaire, or pre-approved equal.
2. Installation: VAV boxes shall be installed between 18 and 24-inches above accessible ceilings to bottom of each box. They shall be installed no more than 12-feet above floor level unless accessible without a ladder from a maintenance platform.
 - a) Units serving classrooms should be located within the classroom, not in adjacent corridors.
 - b) Do not install above permanent casework.
 - c) Maintain proper clearance, no less than 24-inches, around terminal units and controller including the heating water piping. Do not install heating water piping above the electrical components. Do not install any piping or conduit below the control panel and coil that blocks access.
 - d) Hydronic valves/kits and coil control valve shall be installed in the same plane at the terminal unit, maintaining service clearances to the equipment as indicated.

23 42 00 KITCHEN HOODS

- A. Kitchen hood shall be ASTM A 666, Type 304 Stainless Steel with a minimum thickness of 0.03 inches.
- B. Kitchen hood shall have a configuration of exhaust only (no make-up air) and be a double-island canopy style. Make-Up air will be provided by the nearby AHU serving the Kitchen/Dining Area.
- C. Light Fixtures: shall be LED, UL Listed, Surface mounted fixtures and lamps with lenses sealed vaportight. Wiring shall be installed in stainless steel conduit on hood exterior. A min of 70 foot candles shall be provided on cooking surface below hood.
 - 1. Switches shall be mounted to UDS.
- D. Hood shall have a wet-chemical Fire Suppression System designed for automatic detection and release or manual release of fire suppression agent by hood operator.
 - 1. Piping, fusible links and release mechanism, tank containing the suppression agent, and controls shall be factory installed. Controls shall be in stainless steel control cabinet mounted on UDS.
 - 2. Furnish manual pull station for wall mounting adjacent to hood. Pull station shall be recessed mounted in wall. Coordinate conduit/box rough-in with Electrical Engineer.
 - 3. Liquid Extinguishing Agent: Non corrosive, low-PH liquid.
 - 4. Hood shall have an electric-operated, gas shutoff valve with clearly marked open and closed indicator for field installation.
 - 5. Fire suppression system controls shall be integrated with controls for fans, lights, and fuel supply and located in a single cabinet for each group of hoods immediately adjacent.
 - 6. Wiring shall have color-coded, numbered terminal blocks and grounding bar. Spare terminals for fire alarm, optional wiring to start fan with fire alarm, red pilot light to indicate fan operation, and control switches shall all be factory wired in control cabinet with relays or starters.
- E. Hood shall have a single UDS-mounting control cabinet
- F. Hood shall have Utility Distribution System (UDS).
 - 1. UDS shall have (2) risers, electrical on one side and plumbing on the other.
 - 2. UDS shall have a horizontal distribution raceway between the risers with separate electrical and plumbing enclosed and water tight compartments with access panels.
 - a) Bussbar systems: Electrical power shall be fed through the main circuit breaker to the bus bar system in the raceway. Each appliance shall be fed from the bus bar through individually sized circuit breakers located along the raceway.
 - 1) Individual circuit breakers shall be mounted on interchangeable plates for ease of service and relocation.
 - b) Plumbing Riser: Shall house manual (quarter turn) shutoff valves for each incoming main supply line located in the UDS. The plumbing manifolds shall be provided with stub-outs along the raceway for individual plumbing connections. Each stub-out shall be equipped with a manual (quarter turn) shut-off valve.
 - 1) UDS shall be provided with a natural gas and cold water supply.
 - c) UDS shall be designed for electrical expandability.
 - d) UDS shall be designed with an Emergency Kill Switch for single point shutdown of electrical power and natural gas.

23 44 00 DUST COLLECTION SYSTEMS

A. WOOD SHOPS

1. Each wood shop shall be equipped with a dust collection system. Size system appropriately according to number of stations and equipment included in program.
2. Dust collection shall consist of cartridge collector, silencer, pad mount fan, spark resistant motor – classification A, filters, explosion vent and hood, electrical control panel with VFD, 55-gallon drum for particle collection, 5-year warranty.
3. Manufacturers: Industrial Air Solutions or approved equal.

23 52 00 BOILERS

A. BOILERS

1. Boiler Type: High-efficiency condensing-style gas-fired water boilers with stainless steel fire-tube heat exchangers shall be used. Minimum 10:1 turndown required. Aerco (Benchmark series), Lochinvar (Crest series), Harsco/Patterson-Kelley (Sonic series), or pre-approved equal.
2. Requirements: Boilers and pressure vessels shall be ASME-labelled and installed in accordance with the American Society of Mechanical Engineers "ASME Boiler and Pressure Vessel Code." Equipment shall be ASME Code-stamped, AGA-labelled, or UL-labelled as and when applicable.
3. Fuel Sources: Natural gas shall be used in all cases where available. LP gas shall be used when natural gas is not available.
4. Combustion Controls: Combustion controls shall meet the requirements of improved Risk Mutual Insurance Corporation, IRM Spec. 205.
5. Safety Controls: Each heating water boiler shall have a low-water cut-off switch. Each steam boiler shall have low-water and extra low-water cut-off switches. Low-water cut-off switches shall be manually reset type.
6. Acid Neutralization: Provide acid neutralization tank option for each condensing style boiler.
7. Warranty: Condensing-style stainless steel fire-tube boilers shall have a parts and labor warranty for 10 years on the heat exchanger, 5 years on the control board, and 1 year for all other components from the date of substantial completion.
8. Location:
 - a) Gas-fired equipment shall not be installed in the same space as air handling equipment.
 - b) Outdoor boilers are prohibited.

B. VENT AND COMBUSTION AIR

1. Vent: Boiler vents or flues shall extend directly up and discharge above the roof. Sidewall discharges or configurations that require a booster fan are not acceptable unless approved by WCPSS. Vents for condensing-style boilers shall be factory-fabricated double-wall with Type 29-4C stainless steel inner wall and aluminized steel outer wall with an air gap. Vent shall be equipped with a condensate trap and neutralization tank.
2. Combustion Air: Combustion air shall be ducted directly to the boiler where practical. Duct shall be stainless steel duct, polypropylene or PVC/CPVC Schedule 80 pipe. Configurations that require a booster fan are not acceptable unless approved by WCPSS. Combustion air that cannot be directly ducted shall be supplied to the boiler room through dedicated louvers with motor-operated damper(s). Boiler rooms with condensing-style boilers and non-ducted combustion air shall be equipped with unit heaters.

23 62 00 PACKAGED HVAC UNITS

A. ROOFTOP UNITS

1. Roof Top Units are not preferred by WCPSS and pre-approval is required for use.

B. DEDICATED OUTSIDE AIR UNITS

1. Dedicated Outside Air Units (DOAS): DOAS units shall be packaged units or modular air handling units with energy recovery. The energy recovery system shall be factory-installed as part of the unit, not field fabricated and installed. Systems without moving parts, such as fixed plate air-to-air heat exchangers and heat pipe systems, are acceptable methods. Systems with moving parts, such as energy wheels and pumped glycol coils, are not acceptable. Manufacturers: Trane, Munters, Aeon, or approved equal.
2. Controls: If units are supplied with 3rd party pre-packaged controls, full factory control programming, start-up, integration, and trouble-shooting shall be supplied as part of the installation package.
3. Warranty: DOAS units shall have a parts and labor warranty for 5 years on the compressor and 1 year for all other components from the date of substantial completion.

C. WATER SOURCE HEAT PUMPS (USED FOR RENOVATION PROJECTS ONLY)

1. Water Source Heat Pumps (WSHP): WSHP's must have hot-gas reheat coils; therefore manufacturers that do not offer this feature will not be considered an equal regardless of which manufacturers are listed in the specifications. Trane, Florida Heat Pump (FHP), or pre-approved equal.
2. Controls: WSHP's shall be factory-wired for 24 Vac (not 24 Vdc) control interface. If units are supplied with 3rd party pre-packaged controls, full factory control programming, start-up, integration, and trouble-shooting shall be supplied as part of the installation package.
3. Warranty: WSHP's shall have a parts and labor warranty for 5 years on the compressor and 1 year for all other components from the date of substantial completion.

D. DUCTLESS MINI-SPLIT SYSTEMS

1. Ductless Mini-Split Systems (DMSS): Mitsubishi, LG, or pre-approved equal.
2. Ductless Mini-Split systems shall have the condensing unit located on the ground (not roof mounted). Designer should consider best possible integration with architectural features, but locate the condensing unit in an accessible area for maintenance and protected from access by non-maintenance personnel. Designer shall accommodate maximum length condensing unit can be from evaporator.

23 64 00 CHILLERS

A. CHILLERS

1. Chiller Type: Air-cooled packaged chillers shall be used whenever air-side economizers are implemented. "High-efficiency" models shall be used when available. Single chillers shall not exceed a nominal size of 400 tons. When two chillers are used, each shall be sized for 67% of the total capacity. Provide sound barrier screen walls and specify sound attenuation packages to meet noise ordinance requirements. Factory certified noise calculations shall be performed to ensure noise ordinances are met. Chiller piping shall include tees and isolation valves for connection of a temporary chiller. The temporary chiller connections shall be installed in the horizontal plane. Vertical connections shall not be used. Carrier, JCI/York, Trane, or pre-approved equal.
2. Warranty: Chillers shall have a parts and labor warranty for 5 years on the compressor and 1 year for all other components from the date of substantial completion.
3. Installation: Provide proper clearances around chiller, disconnect and control panel but not less than 48-inches. Provide proper clearance between chillers but not less than 48-inches.

23 65 00 COOLING TOWERS

A. COOLING TOWERS

1. Cooling Tower Type: Counter-flow induced-draft open-circuit cooling towers with fiberglass construction shall be used. Towers not equipped with a cold water basin shall include variable speed drives on the condenser water pumps. Reymsa, Tower Tech, or pre-approved equal.
2. Cooling Tower Sizing: Towers shall be selected based on 79 deg F wet bulb temperature.
3. Fans:
 - a) Fans shall be direct-drive, fixed pitch, heavy duty, fiberglass reinforced polyamide, axial flow. Fan and shaft shall be supported by heavy duty, re-lubricated ball bearings with special moisture-proof seals, grease packed, self-aligning and integral slinger rings. All bearings shall be designed for a minimum life of 40,000 hours.
 - b) Fan motor shall be totally enclosed air-over (TEAO) or totally enclosed fan-cooled (TEFC), 1800 rpm, reversible, squirrel cage, ball bearing type. Motor shall be furnished with special moisture protection on windings, shafts and bearings. A heavy gauge, hot-dip galvanized wire fan guard shall be provided over each fan cylinder.
4. Basin Heaters: Towers shall be equipped with an electric basin heaters sized to maintain 40 deg. F. basin water based on 10 deg. F. outdoor air temperature. Basin heater shall have built-in thermostatic and low water cut-off controls.
5. Make-Up Water: Towers shall have a water level control utilizing a large diameter plastic float with brass shut-off valve. Provide additional high capacity pressure reducing valve on make-up water supply.
6. Condenser Water Overflow and Drain Piping: The overflow/drain shall be piped full size to the storm drainage system or sewage system as code or municipal rules dictate.
7. Tower accessories shall include: 3 in. flush connection, exterior access ladder, stainless steel hand rail, stainless steel non-skid catwalk platform, and vibration switch.
8. The wet deck surface and integral drift eliminator shall be formed from Polyvinyl Chloride.
9. Installation:
 - a) The tower shall be installed on two (2) reinforced concrete piers with the suction outlet located above the centerline of the condenser water pump of sufficient height to provide proper NPSH to the pump.
 - b) Proper clearance shall be provided around the tower for proper air flow and service requirements.
 - c) Cooling Towers shall be completely flushed and cleaned before system is placed in operation and every (4) four weeks until all site work is completed.
10. Warranty: 15-year structure warranty, 7-year motor warranty.

23 73 00 AIR HANDLING UNITS

A. AIR HANDLING UNITS

1. Air Handling Unit Types: Units shall have double-wall post and panel construction with 18-ga minimum sheet metal casing and 2-inch R-13 foam-injected casing panels and doors and no through-metal casing thermal breaks factory-standard construction. Casing shall meet ASHRAE 111 Class 6 low-leak classification by achieving less than 1.0 percent leakage rate at 8-inches w.g. pressure. Casing panel deflection shall be rated for less than 0.005 inches at 8-inches pressure. Carrier, JCI/York, Trane, or pre-approved equal.
 - a) Use direct-drive fans whenever possible to reduce maintenance costs associated with belts and pulleys.
 - b) When fan arrays are used, a maximum of two (2) fans shall be controlled by a single variable speed drive.
 - c) Provide air handling units with integral fan vibration isolation.
 - d) Monitor fan status with current switch. Each fan shall be individually monitored for run status.
 - e) Avoid custom-built air handlers to reduce cost.
 - f) Air handlers shall be floor-mounted with adequate maintenance clearance. Units can be mounted on concrete housekeeping pad or solid concrete blocks. Provide 1/2" neoprene pads between air handler and housekeeping pad or concrete block.
 - g) Provide appropriate seismic supports, if needed.
2. Chilled Water Coils:
 - a) Size coils based on entering and leaving water temperatures that match the chilled water system, refer to Section 23 01 00. Coils shall maintain the desired temperature difference (delta-T) from 100% to 25% of full capacity.
 - b) Minimum tube velocity shall be 4 FPS.
 - c) Minimum 6-row and maximum 8-row coils.
 - d) Maximum 450 FPM face velocity.
 - e) Control valves shall be pressure-independent, 2-way, normally closed valves with valve and actuators rated for full possible pump head in the loop. 3-way valves shall be also be provided as needed to ensure water constantly circulates through the system.
3. Heating Water Coils:
 - a) Maximum 550 FPM face velocity.
4. Outside Air Dampers: OA dampers shall be rated for AMCA Standard Leakage Class 1, similar to Ruskin CD60.
5. Fan Belts: Contractor shall provide one (1) additional spare set of belts to the Owner for each fan. Tie spare belts to the fan housing inside the unit.
6. Mixing Box Section: Mixing boxes shall be factory-fabricated with internal motor-operated dampers for relief, return and outdoor air control. Outside air dampers shall fail closed with spring returns.
7. Control Dampers: Control dampers shall be opposed-blade type. Isolation dampers may be parallel-blade type.

23 82 00 FAN COIL UNITS

A. FAN COIL UNITS

1. Fan Coil Unit Types: 18-ga minimum sheet metal casing with coils and factory installed piping/control valves. Carrier, JCI/York, Trane, or pre-approved equal.

23 95 00 VAPOR MITIGATION SYSTEMS

A. GENERAL

1. The design is intended to facilitate the installation of the vapor mitigation system.
2. The system shall be designed by a Professional experienced in these systems.
3. The installation of vapor piping and mechanical equipment shall be inspected by the Professional responsible for the design.

B. GENERAL INSTALLATION REQUIREMENTS

1. The vapor mitigation system shall be done so as to coordinate with other building components especially those that require maintenance or clearance of any type. All mitigation system components shall be installed to facilitate servicing, maintenance and repair or replacement of other equipment components in or outside the building. Where mounting heights are not detailed or dimensioned given, system materials and equipment are to be installed to provide the maximum side clearance as is possible. The General Contractor must be contacted in cases where a conflict exists between these or other requirements and the drawings or specifications. All system, materials and equipment shall be installed level, plumb, parallel or perpendicular to other building systems and components unless otherwise specified. Field coordination of overhead pipe locations should be coordinated by the trades with final approval by the General Contractor, Architect, and Owner.
2. The Vapor Contractor shall take every possible precaution to avoid any damage to utilities located anywhere in the building or those located in or below the slab floor. The drawings indicating utility piping in or under slab should be examined and the installation contractor consulted prior to installation. This will avoid any sub slab elevation conflicts.
3. There shall be no placement of piping or conduit that would inhibit intended use of any areas. The Vapor Contractor should coordinate with the General Contractor as early in the process as possible.
4. The Vapor Contractor shall ensure that any foreign materials are not left or drawn into the vapor system piping or future blower which might at a later period interfere with or in any way impair the vapor system performance.
5. The entire system shall have UL or equivalent ratings for both individual components and the entire system as applicable.

C. SYSTEM MATERIALS

1. Vapor Vent Piping:
 - a) PVC Schedule 40 pipe and fittings (ASTM D 2665)
 - 1) Hollow core is not permissible.
 - b) PVC Cement primer shall comply with ASTM F 656
 - c) PVC Cement adhesive shall comply the ASTM D 2564
2. Piping Supports:
 - a) 4" Hanging Pipe Supports
 - b) Swivel ring or standard bolt type clevis
 - c) Adjustable band hanger
 - d) Drop in Anchors
 - e) ½" threaded rod
 - f) Assorted bolts, nuts, and washers
 - g) 4" Pipe secured to concrete floor or wall

- h) Slotted conduit channel
 - i) Conduit Clamps
 - j) Assorted Bolts, nuts, and washers
 - 1) Hilti is a suggested manufacturer of fastening products.
3. Sealing Materials
- a) Urethane sealant shall comply with Federal Specification TT-S-00230C, Subject to compliance with Contract requirements; the following manufacturers of urethane baulking sealants may be used:
 - 1) Pecora, Corp. (Dynatrol)
 - 2) Tremco, Inc. (Vulken or CR Lawerance)
 - b) Ventilation Fans:
 - 1) Fan Tech HP-220 vapor blower for 4" vent systems
 - a. 4" PVC to 4" Clay Tile rubber couplers 106-44
 - 2) Fan Tech FR-250 vapor blower for 6" vent systems
 - a. 6"x8" rubber couplers
 - 3) Fan and power connection shall be in accessible locations, preferably mechanical rooms, for serviceability. For existing conditions, when mechanical room will not allow fan and power connection access, locate fan and power connection/disconnect outside on the roof.

D. VAPOR BARRIER

- 1. A continuous 15 mil vapor barrier having at least the permeance, puncture resistance and tensile strength to meet or exceed ASTM 1745 shall be installed over the entire gravel bed. Stego Wrap 15-A is the recommended vapor barrier system. Seams, utility penetrations and perimeter walls shall be prepared and sealed using materials and methods supplied by the manufacturer. Seams shall have at least six inches of overlap and be joined with tape in a manor specified by the manufacturer. The vapor barrier shall not be punctured under any circumstances for any reason. The concrete batch plant shall be contacted in advance to ensure that the concrete delivered is of sufficient slump to ensure that there is not excess water to be drained off. The concrete shall be delivered by shoot or pump. Under no circumstances shall there be vehicle traffic over the vapor barrier. The construction manager shall coordinate these tasks with concrete contractor. The vapor barrier should be installed by a contractor experienced in installing adhesive system vapor barriers.

E. GRAVEL BED

- 1. All gravel beds shall be a minimum of nine inches in height, consisting of "AASHTO #57" – The American Association of State Highway and Transportation Officials grading system for stone that requires 90-100 percent of the stone to pass through a 1 " sieve, 25-60 percent must pass through ½" sieve and 0-10 percent must pass through a No. 4 sieve. The gravel bed should be installed by the Site Contractor.

F. UNDER SLAB COLLECTION PIPE

- 1. Perforated schedule 40 PVC pipe shall be in the center of the gravel bed with 2 inches of gravel below and above the pipe. Perforations should be at least two 5/8" diameter holes in the pipe, at 5 to 6 inch intervals. Each set of two holes are typically drilled 120 degrees apart from each other. Pipe shall be installed with one set of holes facing down to preventer accumulation of water. Where conveyance pipe travels through grade beams or thickened slabs, there shall be a pipe sleeve comprising of the next larger diameter pipe or foam knock out plugs. The space between the conveyance pipe and sleeve end opening must be sealed with a silicone or

urethane based sealant to prevent vacuum that is purposed for the slab area from being lost to another area and to manage the even distribution of vacuum to the compartmented slab

areas. This would eliminate the sleeves and associated sealing. At no point should the pipe be crushed or the soil gas conveyance properties compromised.

G. PIPE INSTALLATION

1. In order to achieve the vacuum field distribution and not disrupt building use objectives, the riser pipes are located in existing building chases and unoccupied areas. In some cases wall thickness may need to be increased to accommodate a 4" or 6" PVC pipe. The specific location of the riser pipe is delineated on the print and will be coordinated and agreed upon by the Vapor Contractor, the General Contractor, the Architect, and Owner prior to initiating installation. The riser piping shall be capped and labeled during the slab construction.
2. The vapor riser pipes shall be secured above the slab with a pipe clamp attached to the column, frame wall, block wall, or overhead truss. The vapor riser pipe will be sealed to the concrete with a bead of urethane based caulk.
3. All horizontal pipe runs between the roof vent and the suction hole shall be installed with 1 in. slope back to a suction hole for each ten (10) ft. of horizontal pipe run. The vertical pipe run shall be installed plumb. In no case shall the piping be installed so as to create a possible water trap in the piping. Under slab solid PVC pipe shall have one (1) in. diameter drain holes installed at four (4) ft. intervals. These drain holes shall face down to allow condensate to drain.
4. The PVC pipe will be supported at least every six (6) ft. of horizontal run and at least every ten (10) ft. of vertical run. All horizontal pipe runs will have a support with an appropriate device within two (2) ft. of each fitting and a maximum distance between supports of eight (8) ft. The ceiling supporting devices shall be a ½ in. all thread rod or clamps and strap to structural members capable of providing the necessary support. Conduit channel with pipe clamps can also be used to support pipe routed along the ceiling or walls. Pipe cannot be used to support pipe.
5. All support straps and anchors (if any) installed outdoors shall be either stainless steel or galvanized.
6. The Architect should confirm permissibility of PVC pipe, and enclosure specifications per use group. Enclosures, if required, should be coordinated with the Architect, Owner, and General Contractor
7. All roof penetrations must be coordinated with the General Contractor and Architect prior to performing the work. The Vapor Contractor or Roofing Contractor will make the penetration through the roof. No penetrations shall be made through the built up or custom contours that designed to channel the direction of water flow. The Roofing Contractor who provides the roof warranty shall perform the flashing related sealing work.
8. Roof penetrations have been planned to be thirty (30) ft. from air intakes and passive relief openings. At no time shall roof vent locations be within twenty (20) ft. of an air intake or passive relief vent. Vent pipes shall terminate at least fourteen (14) in. above the roof as measured from the highest point where the vent intersects the roof. Roof penetrations should be sufficiently toward the interior of the building or with in the parapet enclosure so the blower is not easily visible from the ground.

H. SEALING

1. Slab crack and Expansion joint sealing: Any visible expansion joints or slab cracks in areas where vapor piping is being installed that have a 1/16 inch or greater opening shall be sealed. Any cracks to be sealed will first be ground out and vacuumed to prepare them for installation of gun-grade urethane caulk sealant. Cracks or open expansion joints in the concrete floor

- shall be sealed by applying a bead of urethane caulk on top of the joint. The gun-grade caulk shall then be mechanically pressed down into the crack in order to maximize its seal. Any openings into the slab such as may occur around conduit pipe penetrations through the slab will be cleaned and sealed with gun-grade urethane caulk.
2. Expansion Joints: Any expansion strips in the concrete slab of the area being mitigated that are accessible shall be sealed with urethane caulking. Any accessible perimeter floor joints shall be sealed with gun-grade urethane caulking after the joint has been vacuumed.
 3. Pipe and Conduit Openings: All pipe and conduit openings shall be sealed.

I. SYSTEM LABELING

1. At least every twenty (20) ft. of exposed and concealed vapor vent pipe length shall have a label that reads "VAPOR SYSTEM, DO NOT ALTER" attached to the pipe. All labels must be readable from three (3) ft. away.

J. BLOWER WIRING

1. The breaker used for the vapor system should be a dedicated breaker. This prevents the blower from being shutoff when a portion of the panel is powered down for an unrelated function. The specified blowers draw approximately 1.7 amps each. The breaker shall be labeled "VAPOR FAN CIRCUIT, DO NOT TURN OFF".

K. BLOWERS

1. The specified blowers to activate the four (4) in. or six (6) in risers are Fan Tech model ~~HP220s~~ [RnXX series](#).

DIVISION 26 – ELECTRICAL SYSTEMS

26 05 00 ELECTRICAL WORK

A. GENERAL ELECTRICAL WORK

1. Engineer shall be required to incorporate the EPA “Energy Star” program requirements for all designs.
2. All electrical systems, main service equipment, and panelboards shall be designed with 25% minimum spare capacity, both physically and electrically, for future growth capabilities.
3. In larger facilities, such as Middle Schools and High Schools, two services (480V and 208V) shall be considered (separate transformers and switchboards). Coordinate with WCPSS and the power utility company at the site to determine if there are significant economic advantages for separate services utilizing two smaller transformers.
4. In any building where future expansion is definitely planned, as conveyed by WCPSS, the Engineer shall provide adequate capacity and connection points in the electrical systems as directed by the WCPSS. The additional capacity shall be clearly noted on the front of the electrical drawings.
5. Provide surge suppression on all security, intercom, Building Automation System (BAS), and fire alarm systems. Where wiring for these low voltage systems is run below grade to exterior devices or other buildings, provide surge protection at the point where the wiring leaves the building (and enters/re-enters the building where applicable).
6. All receptacles and switches shall be minimum 20-amp rated, heavy-duty, and specification grade.
 - a) In elementary schools provide tamper resistant receptacles per National Electrical Code (NEC) requirements for child-care facilities.
7. The engineer shall coordinate with power supplier and indicate and/or specify all requirements for:
 - a) Point of Service
 - b) Division of work (contractor and power company)
 - c) Fault Current: Over-current device(s) shall have interrupting capacity in excess of available fault current throughout system.
 - 1) Fault current study shall be performed and submitted to WCPSS (by engineer or switch gear vendor)
 - 2) Selective coordination
 - 3) Electronic breaker trip setting shall be provided to contractor
8. For all new construction and major renovation projects, the engineer shall specify that the contractor provide a fault current analysis, overcurrent/trip coordination, and arc flash report for the entire electrical distribution system based upon the actual installed equipment. For minor renovations a smaller scope (not the entire system) shall be required, coordinate with the electrical inspector what is required for the specific project scope.
 - a) Report Requirements: Contractor shall prepare a bound report including a system one-line model, fault current analysis, overcurrent setting/trip coordination, and arc flash study. All system modeling to be performed using SKM Power*Tools or ESA EasyPower electrical engineering software. All equipment depicted on electrical distribution riser diagram, as well as all motors 30 horsepower and larger, shall be included in system model. Fault contribution to system shall be based on available fault current on secondary of service transformer as provided by utility company. The fault current

analysis portion of the report shall include a print out from the software listing the available three-phase and single-phase fault current at each piece of equipment. The overcurrent setting coordination shall create a set of time-current curves depicting successive breakers and fuses for each unique distribution system branch. Coordination shall be to 0.06 seconds, unless the AHJ requires 0.01 seconds. Emergency systems shall be selectively coordinated per National Electric Code (NEC) requirements. The Contractor shall be responsible to fully coordinate all devices within the scope of work. The arc flash study portion of the report will list the incident energy and arc flash boundary for each piece of equipment in the electrical distribution system utilizing industry standard IEEE 1584 calculation methodology. The personal protective equipment category and associated clothing requirements in accordance with IEEE 1584 and NFPA 70E shall also be included. Included in the report shall be a summary narrative recommending adjustments, where practical, to overcurrent trip settings to reduce energy levels to within available protection ratings. NFPA 70E compliant adhesive arc flash warning labels depicting items above shall be provided and installed on equipment.

9. Receptacles (Convenience Outlets)

- a) Receptacles should be properly located throughout the building for cleaning equipment and other similar usages.
- b) Where required by the NEC (near sinks, in kitchens, bathrooms, etc.), receptacles shall be either GFCI type or on a GFCI protected circuit. Receptacles on a GFCI protected circuit shall be labeled as a "GFCI protected outlet".
 - 1) GFCI Receptacles for the following areas shall be on protected circuits only due to the receptacles not being easily accessible for reset.
 - i. Commercial Kitchen
 - ii. Electric Water Coolers
 - iii. Vending Machines
- c) Provide a duplex receptacle and work light in all crawl spaces, open chases and attic spaces.
- d) Provide weather proof labels installed on the outside and top of face plate or receptacles, (white with black letters).
 - 1) On exterior receptacles, label shall be inside weatherproof while-in-use cover.
 - 2) Grade level receptacle power boxes on football fields shall have French drains to allow water to drain, in lieu of filling the box.

10. For each science classroom provide the following:

- a) Provide one key switch to be labeled "WATER" to control both cold and hot water solenoid valves. The key switch will clearly identify the "ON" and "OFF" positions. [Locate near teacher's desk area.](#)
- b) Provide multi-pole contactor matched with number of circuits serving receptacles on casework and circuits serving solenoid valves.
- c) Provide mushroom push button for emergency cut-off - [a single emergency shut-off switch that will close valve's in the water source serving each particular lab/classroom \(except that serving safety showers and eye washes\) and interrupt all power not serving fume hoods, exhaust systems or lighting. Push button shall control multi- pole contactor. Key switches shall be installed downstream of contactor. Locate near teacher's desk area.](#)
- d) [Label for mushroom push button for emergency cut-off](#) to be engraved plastic laminate to read: "Emergency water/power off".
- e) Science prep rooms shall not have keyed switches or emergency push buttons.
- f) ISOMET panels are not desired.

26 05 13 WIRES AND CABLES

1. Materials:
 - a) Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
 - b) Aluminum compact stranded; No. 1 AWG (100amp) and larger only.
 - 1) Aluminum shall not be used where lugs are not rated for aluminum.
2. Feeders: Copper shall be used for feeders smaller than 100A. Aluminum shall be used for feeders 100A and larger.
3. Branch circuits: All branch circuits shall be copper.
4. Use conductors not smaller than 12 AWG for power and lighting circuits.
5. Use conductors not smaller than 22 AWG for control circuits.
6. Use 10 AWG conductors for 20-amp, 120 volt branch circuits longer than 100 feet.
7. Use 10 AWG conductors for 20-amp, 277 volt branch circuits longer than 230 feet.

26 05 26 GROUNDING AND BONDING

1. Install insulated equipment grounding conductors with all feeders and branch circuits. The raceway shall not be relied on for ground continuity.
2. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide a No. 3/0 AWG minimum insulated grounding conductor (Telecommunications Bonding Backbone, TBB) in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
 - a) MDF/Headend Room and IDF Rooms: Terminate Telecommunications Bonding Backbone on a grounding bus (Telecommunications Grounding Busbar, TGB).
 - b) Cabinets, Racks, and Ladder Tray: Extend minimum #10 grounding conductor from equipment to TGB.
 - c) All telecommunication grounding shall be performed in compliance with TIA/EIA 607 Standard – Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
3. Main Service
 - a) Metal Water Service Pipe Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 - b) Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.

26 05 33 CONDUIT

1. Materials:

- a) Conduit types shall be rigid galvanized steel (RGS), Intermediate Metal Conduit (IMC), PVC (schedule 40 or heavier), or Electro Metallic Tubing (EMT).
 - 1) Minimum Size: 3/4", smaller sizes are not acceptable.
 - 2) Fittings: Fittings shall be steel. Cast, pot metal, set-screw or crimp type fittings shall not be permitted.
 - 3) EMT Connectors shall be insulated throat. Plastic bushings may be used in lieu of insulated throat.
 - 4) EMT couplings shall be compression type.
- 5) Conduit Color Coding:
 - a. Concealed or Non-finished Spaces: Apply color coding to concealed raceway in all spaces and exposed raceway in non-finished areas.
 - b. In finished areas exposed conduits shall be painted to match the finishes in the space. Conduit shall be color banded at intervals not to exceed 10 feet. Utilize natural galvanized finish conduit for conduit that is to be painted and banded. Junction boxes covers shall be painted according to color coding below.
 - c. Finish: EMT shall have a factory applied finish, RGS conduit shall be field painted.
 - d. Color Coding:
 - Electrical Conduit (240 and 208 V): Natural galvanized finish
 - Electrical Conduit (480V): Black
 - Fire Alarm Raceway: Red.
 - Telecom & A/V Raceway: Natural galvanized finish.
 - Security System Raceway: Purple.
 - Emergency Feeder/Branch Circuit Raceway: Orange.
 - Stand-by Feeder/Branch Circuit Raceway: Green.
- b) Ceiling Grid Labels shall be provided at all locations as identified in Appendix A-26 05 33, Attachment A
- c) Additionally, Metal-clad (MC) Cable may be utilized under the following conditions:
 - 1) Final connections to lighting fixtures, no more than 6'
 - 2) MC cable is allowed inside walls, between wiring devices only, but not above ceilings or over 8' AFF where exposed.
- d) Additionally, Flexible Metal Conduit (FMC) may be utilized under the following conditions:
 - 1) Final Connection to ceiling mounted devices in lay-in tile ceilings.
- e) Cable Tray or wire baskets shall be provided above accessible ceilings for low voltage system wiring throughout the facility. Cable tray or wire basket shall be ran in corridor.
 - 1) When the low voltage pathway is required to be exposed in finished spaces, use solid tray or conduits.

2. Installation:

- a) Exterior/Underground conduit:
 - 1) PVC conduit shall be utilized for all underground feeders under concrete slabs and when turning up out of the slab inside walls to the first junction box.
 - 2) PVC conduit shall be utilized outside of the building slab. Main secondary power feeders shall be encased in 3 in. of concrete on all sizes.
 - 3) Rigid steel conduit or IMC: may be used for underground branch circuit wiring without concrete encasement.

- 4) All above grade conduits shall be RGS. PVC conduits shall transition to RGS prior to coming above grade.
- b) Interior Conduit:
 - 1) Concealed and exposed 8 ft. or more above finish floor: EMT shall be used inside walls, above ceilings, and exposed 8ft. or more above finish floor.
 - a. Exceptions: conduits ran vertically that connect directly to the top of equipment cabinets, panelboards, and switchgear shall be allowed to be EMT below 8'.
 - b. Note: EMT conduit used in concrete block walls filled with concrete shall be listed for that use (Additional corrosion protection).
 - 2) All branch and feeder circuits exposed less than 8ft. above finished floor: Conduits shall be in rigid steel conduit or IMC.
- c) Plastic bushings or insulated throat connectors shall be used in all conduit terminations.
- d) All electrical J-boxes shall be installed no less than 6" from the ceiling tile and within reach for accessibility.
3. Low Voltage Systems:
 - a) Conduit shall be used in walls, from the outlet or device to a point above an accessible ceiling. In accessible ceilings, conduit is not required for public address, intercom, or telecom wiring.
 - b) Provide plenum rated cable where necessary.
 - c) Provide bushings (grommets) on all conduit stub-ups prior to cable installation.
 - d) Spare conduits shall be labeled as such and include a bushing termination.

B. ELECTRICAL CONNECTIONS TO EQUIPMENT

1. Power wiring to all Plumbing or HVAC equipment shall be provided by the Electrical Contractor. The Plumbing or HVAC Contractors will be required to make final connections inside the equipment from slack wire left by Electrical Contractor for system check out. All disconnect switches, starters, and VFDs shall be supplied by the Plumbing or HVAC Contractors and turned over to the Electrical Contractor for mounting and wiring. All fuses and heaters shall be furnished by the Plumbing or HVAC Contractors. Show detailed drawing to avoid confusion. Refer to detail in Appendix C.
2. Provide dedicated 120 volt, 20 AMP circuits to all Building Automation System (BAS) panels, VAVs, damper operators, and other mechanical equipment locations requiring 120 volt control power. Provide junction box and on/off service switch directly over control panels.
 - a) BAS Panel locations shall be clearly indicated on mechanical and electrical plans. Coordinate location(s) with Mechanical Plans and provide power for all BAS panels.
3. Provide a dedicated 120 volt, 20 amp circuit to the following locations:
 - a) Fire Alarm Control Panel (FACP) and Notification Appliance Circuit (NAC) locations.
 - b) Security Panel location
 - c) Card Access Equipment location
 - d) Intercom equipment location
 - e) Bi-Directional Amplifier (BDA) Equipment location
 - f) Elevator Pit
 - g) Elevator Sump Pump
 - h) Elevator Equipment Room
 - i) Backflow Preventer Heated Enclosure on Site, if required.

4. Kiln – Typical electrical requirements:
 - a) Kiln: 208V, 3ph, 31.7 amps, and 11000 Watts
 - 1) Fuse or breaker size: 40 amps
 - 2) NEMA receptacle configuration 15-50
 - b) Provide a NEMA 1, 60A, 3P disconnect in kiln room. Disconnect shall be located adjacent to room entry door (within arm's reach).
 - c) Provide a dedicated 120V receptacle adjacent to kiln for kiln downdraft exhaust fan. Locate receptacle within 4'-0" of equipment.
 - d) Provide a high temperature heat detector in the kiln room. Connect to the fire alarm system.
5. Utility Meters: Electric meter shall have a set of pulse contacts provided by Duke Energy/Progress or the local Electrical Cooperative (mounted at the transformer or CT cabinet). Electrical contractor shall provide 1" conduit (1" below grade, 3/4" inside building) and pull string from meter contacts to main Mechanical Room (or the closest point of access to the Building Automation System network). Conduit material shall be as specified in Section 26 05 33 CONDUIT. Rigid Conduit shall be stubbed up at the meters and where exposed outside. Controls Contractor will connect pulse contacts to BAS. Electrical Engineer shall contact electrical utility during the design phase and request a pulse meter. The BAS Controls Contractor will connect the electric meter pulse contacts to the BAS System. The demand meter to be LON or BACnet compatible. See Pulse Relay Detail in Appendix C.

26 24 00 SWITCHBOARDS AND PANELBOARDS

A. SWITCHBOARDS AND PANELBOARDS

1. All switchboards and panelboards shall have copper bus with bolt-in breakers. All switchboards and panelboards shall be provided with main breakers, even for sub-panelboards that are served from another panelboard except where sub-panelboards are located in the same room as the panelboard serving them. Exception: In emergency distribution, the main breaker on sub-panels may be deleted if required for selective coordination.
 - a) Provide fault current, coordination, and arc flash per "General Electrical Work" paragraph above.
 - b) Breakers shall have electronic trip units as follows:
 - 1) Switchboards:
 - i. 100A or larger: Adjustable LSI pick-up and LS time delay settings
 - 2) Panelboards:
 - i. 400A or larger: Adjustable LSI pick-up and LS time delay settings
 - ii. 250A to 400A: Adjustable LI pick-up and L time delay settings
 - iii. 100A to 250A: Adjustable Instantaneous pick-up.
 - 3) Ground Fault Protection:
 - i. All main circuit breakers in service entrance equipment or free-standing structures shall have adjustable ground fault pickup and time delay settings in addition to overcurrent trip settings indicated above.
2. NEC required working clearances shall be required around all switchboards and panelboards. Show a clearance detail on drawings for clarification. Refer to detail in Appendix C.
 - a) Required working clearances shall be painted on the floor with a 4" yellow border.
3. Surge Protection: externally mounted, surge protective device (SPD). Connect SPD to breaker in distribution equipment for servicing. The SPD shall be rated on a per mode basis and have a rating of not less than 200kA for service. This rating shall apply per mode and all applicable modes L-N, L-G, N-G, and L-L as applicable. External SPD device shall be located immediately adjacent to equipment enclosure to minimize wiring distance. SPD equipment to have a five year warranty.
 - a) Provide an SPD at the following locations
 - 1) All Service Entrance Switchboards or Panelboards
 - 2) Panelboards larger than 400A
 - 3) Emergency Distribution Equipment
 - 4) Main Panel at separate buildings fed from other buildings on site.
4. Phase Loss:
 - a) Provide phase loss protection at main service entrance equipment.
5. Panelboards shall be surface mount in unfinished spaces and recessed in finished spaces.
 - a) For all recessed panelboards, provide (3)-three 3/4 in. spare conduits stubbed-up above accessible ceilings. When panel is in an area with hard ceilings conduits shall be stubbed to the nearest accessible above ceiling location.

6. Lighting panelboards shall only contain lighting circuits. All other loads such as receptacles. Mechanical/plumbing equipment, etc. shall be served from separate panelboard(s).
7. Provide typed or printed directories in all panelboards. Room names and numbers in directories shall match final signage used at the site. Handwritten directories are not allowed.
8. Provide laminated plastic identification labels on cover of all panelboards. Labels shall be mounted with screws or rivets.

26 30 00 GENERATORS

A. GENERAL

1. These requirements pertain to school facilities where generator is provided.
2. Generator shall be a packaged diesel engine set with the following:
 - a) Engine generator set
 - b) Base Mounted Fuel Tank
 - c) Battery charger/starting battery.
 - d) Remote monitoring panel.
 - e) Sound attenuated generator set enclosure.
3. Engine shall be liquid cooled with thermostatic temperature control and high coolant temperature shutdown.
4. Exhaust shall be located away from building at a distance to prevent air entrainment of the building air intake.
5. Equipment shall have capability of being monitored over IP address.
6. Provide a pathway to support a 2-wire shielded data cable between the MDF room and the Automatic Transfer Switch for connection and monitoring the generator status without connectivity to the BAS.
7. Generator status panel shall be located in the Administration area adjacent to the Fire Alarm Control Panel.
8. Automatic Transfer Switch shall be 3-pole. Do not break neutral.
9. Manufacturers: Caterpillar, Cummins, Kohler, Generac, or approved equal.
10. The following systems shall be served from the generator:
 - a) Fire Alarm System: Main Fire Alarm Control Panel shall have emergency power from the generator in addition to the NFPA required battery backup. Carbon Monoxide is performed through the fire alarm system; therefore, will be backed up as well.
 - b) Elevator / Area of Rescue / Chair Lift Phones: Phones shall be served from emergency power. Elevators and chair lifts themselves shall not be powered from the generator, only the phones.
 - c) Security:
 - 1) All card reader access.
 - 2) All cameras served from MDP
 - d) Emergency Lighting
 - e) Bi-Directional Antenna System
 - f) Fire Protection and/or domestic water booster pumps
 - g) Kitchen Coolers & Freezers
 - h) All building systems in the MDF room shall be served from the generator, including intercom and WCPSS network (VOIP-admin area only).
 - i) No emergency power required for radon system
 - j) No emergency power required for HVAC System

26 50 00 LIGHTING

A. GENERAL

1. These requirements pertain to all interior, exterior canopy, exterior pole lighting, and exterior building mounted lighting. Coordinate with WCPSS concerning the outdoor lighting requirements.
2. All lighting systems shall be designed based on WCPSS Guidelines.
 - a) Additionally, the sports field lighting systems (interior and exterior) shall meet the standards set by the North Carolina High School Athletic Association (NCHSAA).
3. Reference the "Energy Efficient Lighting Guidance Document for New Construction and Retrofits: The State of North Carolina" dated March 2016 to ensure best practices are implemented.
4. Lighting systems and controls shall meet the requirements of the North Carolina Energy Code.
5. Discuss lighting ideas and control strategies with WCPSS Energy Management and Physical Plant offices before design and layout of lighting systems.
6. All general illumination (interior and exterior) shall be provided by LED fixtures. Exterior Lighting shall conform to local lighting ordinances for the municipality the facility is in.
7. Lighting Inverters shall not be used for an emergency source.
8. Site Lighting:
 - a) Generally area lighting on site, such as for parking lots, is designed and provided (via a lease agreement) by the local power utility company or others and is not a requirement of the building work.
 - b) Engineer to send a set of plans to the local power utility company at the Design Development stage. In cases of conflict, lighting standards listed here shall defer to local lighting ordinances for the municipality the facility is in. Typically all area lights shall be LED "cobra-head" style on 30 foot fiberglass poles with 6' mounting arm. The average foot-candle levels shall be in the following range:
 - 1) High School Parking Areas: 1.4 -1.5 FC
 - 2) Middle School Parking Areas: 1.15 – 1.25 FC
 - 3) Elementary School Parking Areas: 0.9 – 1.0 FC
 - 4) HS, MS, and ES entrance roads: 0.65 – 0.75 FC
 - c) Local power company area lighting shall be shown on site plan prior to 100% C.D. submittal.
 - d) Conduit Sleeves: Electrical conduit sleeves shall be provided, as part of the building package. Provide conduit sleeves under paved areas and gutters (connecting non-paved areas) and from area lights located in paved areas to adjacent non-paved areas. Coordinate sleeve size and location with the local utility company.
 - e) Engineer shall review the local power company area lights and provide additional exterior building lighting (wall packs) and pedestrian scale poles lights as needed to insure that all exterior entrances are illuminated.
9. Do not locate ceiling-mounted light fixtures over stairwells. Use wall mounted light fixtures to light stairwells. Fixtures shall be no more than 10'-0" AFF.
10. Include an Add Alternate in the Contract Documents for ETC theatrical dimming, fixtures, and control boards.

11. Switches - All room switches should be placed near the entry door, preferably on the strike side of the entrance door to the area served. Switches shall be installed at 48" AFF to the top of the box.

B. FIXTURES

1. Designers are encouraged to limit the variety of fixture types throughout the building.
2. In classrooms, conference rooms, corridors, offices, workrooms, etc. use recessed, volumetric style, LED troffers for illumination.
3. In business labs, computer labs, and low-ceiling media centers, use indirect/direct, pendant, LED lighting for illumination.
4. In gyms, multi-purpose rooms, high corridors and high library ceilings, use direct, high-lumen, pendant LED fixtures for illumination. LED modules shall be lensed, and shielded from direct view.
5. For exterior corridors, walkways and on the building façade, use LED wall-pack or canopy fixtures. Where building mounted lights are insufficient, pedestrian scale LED pole fixtures shall be used to illuminate sidewalks not covered by the utility area lighting. Bollard type fixtures shall not be used.
6. LED fixture correlated color temperature (CCT) shall be:
 - a) Interior: 4000k
 - b) Exterior: 3500K, unless specified by local municipality lighting ordinances.
7. Incandescent, HID, or fluorescent lighting shall not be used except for stage or specialty lighting, where approved by WCPSS on a case-by-case basis. Engineer shall coordinate with WCPSS prior to using non-LED fixtures.

C. EXECUTION

1. Lighting shall be laid out so that long dimensions are parallel with primary wall.
2. Control and Switching Strategies:
 - a) Offices, Conference Rooms, and other administrative areas:
 - 1) Switching/Controls: Bi-level lighting, one-zone, with (2)-two pole wall box vacancy sensor. Lights will not turn on when occupant enters the room. Occupant must switch lights on. Sensor turns off lights 15 minutes after space is unoccupied.
 - b) Classroom and Science Room Lighting:
 - 1) Switching: Bi-level, Two-zone, with (2)-two double pole, double pole light switches. Bi-level is defined as up position=50%, middle=100%, and down=0%. For smaller rooms with only 2 rows of lighting, one (1) bi-level switch is adequate.
 - 2) Controls: Ceiling-mount vacancy sensor(s) shall be provided. Sensors (or power pack) shall have an auxiliary contact for connection to the BAS System. Lights will not turn on when occupant enters the room. Occupant must switch lights on. Sensor turns off lights 15 minutes after space is unoccupied.
 - c) Corridors, Open Areas, and Group Toilets:
 - 1) Switching: None shall be provided in these spaces.
 - 2) Controls: Lights shall be controlled by the HVAC Building Automation System (BAS) via the use of lighting contactors. Contactors shall be provided by Electrical Contractor. Location of all lighting contactors to be clearly identified on plans.
 - d) Gymnasiums, RLV (Media Center), Dining, Multi-purpose Rooms and other large assembly areas:

- 1) Switching: Multi-level lighting shall be provided to allow occupants to reduce the lighting levels to suit the task at hand. In RLV rooms, multiple switching zones shall be provided to allow varied use of the space (e.g. lighting off for presentation in one-area only).
- 2) Controls: Lights shall be controlled by the HVAC Building Automation System (BAS) via the use of lighting contactors. Location of all lighting contactors to be clearly identified on plans. Contactor shall be upstream of local switching and only be used to turn the lighting off when the security system is armed.
- e) Auditoriums (High School and Middle School):
 - 1) Switching: Switching shall be provided via the theatrical lighting system in the space. House lighting shall be split up into multiple zones (e.g. ceiling fixtures, wall sconces, aisle lighting, etc.)
 - 2) Controls: Controls shall be provided via the theatrical lighting system in the space
- f) Mechanical Rooms, Electrical Rooms, Janitor Closets:
 - 1) Switching and controls: Single zone, single level via a digital time switch. Timeswitch shall have visual and audible time-out warning.
- g) Storage Rooms, Single Toilets:
 - 1) Switching and controls: Single zone, single level via a single pole wall box occupancy sensor switch.
- h) Lighting Contactor Control: Building Automation System will turn interior lights off 10 minutes after the security system is "Armed". Building Automation System will turn interior lights on immediately when security system is "Disarmed" and remain on until system is "Armed" again. Building Automation System will turn interior lights on when system is "Alarmed".
3. Provide night lighting (24 hour operation) from security keypad(s) to main entrance only.
4. Exterior lighting shall be provided for building entrances, outdoor storage areas, loading docks, bus ports, covered walkways, exterior mechanical room doors and other outdoor areas where in the judgment of the engineer or WCPSS, lighting is required for night functions, security, or safety. The HVAC Building Automation System (BAS) shall control exterior lights separate from interior lights. Location of all lighting contactors to be clearly identified on plans.
 - a) Exterior Emergency Egress Lighting shall be provided at exit doors and along the path to the public-way. Upon loss of power, this lighting shall come on regardless of control status or time of day. Switching of emergency fixtures shall be done via an UL 924 listed device.
 - b) Exterior lighting shall be controlled on dedicated contactors, separate from interior lighting, to allow for flexibility in control. [Use separate contactors for perimeter lighting attached to building \(ie: canopy lights should be separate from scone lights\)](#)
5. Provide exterior lighting as required for present and future mobile classroom locations.
6. Illumination Levels: See Lighting Level Table 26500-A Attachment in Appendix A. The illumination levels shown in the attachment are recommended minimum maintained levels.
7. Lighting Calculations:
 - a) Shall be based on room surface reflectance for interior finishes selected by the architect, which in all cases shall not be less than the following for instructional areas. Ceiling Cavity - 80%, Walls - 50%, Floor Cavity - 20%.
 - b) Engineer shall furnish a copy of all lighting calculations to the Owner for review.
8. Spare Parts: Spare parts provided for attic stock as part of the specification shall be inventoried and given to the local maintenance. These parts shall not be used for warranty repairs.

D. EXIT SIGNS

1. Dual voltage (120/277), thermoplastic, LED exit signs (with Ni-cad battery when no generator is provided) shall be provided and installed by the electrical contractor. Exit signs have universal mounting capability (top, back or end) and a canopy included. Contractor shall be responsible for field conversion to double face where required (extra face plate furnished with exit sign). Contractor shall also be responsible for snap out directional chevron indicators.
 - a) Where a generator is used, the battery shall not be required. Exit signs shall be connected to an emergency circuit from the generator. Exit signs with batteries shall be connected to an unswitched conductor of the lighting circuit serving the space.

E. EMERGENCY LIGHTING

1. Schools/Facilities with an Emergency Generator: General illumination light fixtures shall be connected to the generator for emergency lighting in most spaces. Where occupant switching in a space is required the emergency fixtures shall be switched via a UL 924 listed device (e.g. large classrooms). When the security system is armed, all emergency fixtures in the building shall be switched off (via a UL 924 listed device) with the exception of the fixtures illuminating the path to the security keypad(s).
2. Battery Packs (when no generator is provided): Dual voltage (120/277), emergency lighting, LED battery pack fixtures with 6V maintenance-free lead-calcium battery shall be provided and installed by the electrical contractor. Fixture can be wall or ceiling mounted and should be wall mounted where possible to reduce abuse. Battery packs shall be connected to an unswitched conductor of the lighting circuit serving the space.
3. The following areas shall have emergency illumination at a minimum, whether having natural lighting or not:
 - a) Exits and exit access corridors.
 - b) Small and large assembly areas.
 - c) Areas occupied by over 50 persons.
 - d) Gymnasium dressing rooms
 - e) Band and choral rooms
 - f) Industrial arts, prevocational and shops
 - g) Administration
 - h) Kitchens
 - i) Group Toilets
 - j) Main Electrical Service disconnect location
 - k) Main Mechanical/Boiler Room
 - l) Mechanical Mezzanines
 - m) Mechanical Rooms
 - n) Emergency Power Equipment Location (e.g. generator, transfer switch)
 - 1) Battery Pack Only, cannot be served by the generator

F. LIGHTING SYSTEM SECURITY

1. All practical measures should be taken to provide protection for lighting fixtures and equipment.
2. Vandal-resistant materials shall be used for fixtures within reach of floors and all outdoor locations.
3. Mounting heights should be specified to afford protection, consistent with ease of maintenance.

4. Exit signs and directional signs related thereto should be wall-mounted where possible in lieu of ceiling-mounted, as ceiling-mounted signs are subject to a much greater degree of abuse. Signs must be visible from anywhere within the length of an exit access shall be provided.
5. Provide wire guards for exit and emergency lights in gymnasiums and multi-purpose rooms. Guards shall not be oversized and be designed for the specific fixture type it is guarding.

DIVISION 27 – TELECOMMUNICATIONS/SPECIAL SYSTEMS

27 00 00 TELEPHONE DATA SYSTEMS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. See Attachments 27 00 00-1A through 27 00 00-1E and 27 00 00-1G through 27 00 00-1K. And Attachments 27 00 01-1A through 27 00 01-1G for Telecommunications Distribution System specifications.
- B. Upon receiving bids, the design consultant shall provide two (2) sets of the construction documents along with a set of project manuals to the Wake County Public School System Technology Services Department.

1.2 OVERVIEW

- A. The Telecommunications System [(voice/data) (fiber/copper)] shall consist of the following components:
 - I. Main Telecommunications Distribution room, which contains the Main voice/data Distribution Frame (MDF) with voice/data cross-connects and interconnecting hardware.
 - II. Service Entrance Facilities (including conduits) for the Local Exchange Carrier/Service Provider (LEC/SP) demarcation.
 - III. Telecommunications sub closets with voice/data cross-connects including interconnecting hardware - such as Fiber Distribution Enclosures (FDE's) and Voice Distribution Cross-connect panels.
 - IV. Rebox
 - Rebox RE-4 can contain two (2) 48-port Cat6 patch panels. With a maximum of seventy two (72) cables terminated on patch panels.
(Do not use RE2's)
 - V. Voice/data backbone pathways including all required cables.
 - VI. Voice/data horizontal pathways including all required cables.
 - VII. Telecommunications (data/data) outlets (TCOs).
- B. The system shall have a contractor five (5) year warranty for materials and labor.
- C. No cable raceways shall be designed or installed more than ten (10) feet AFF.

1.3 INDUSTRY STANDARDS

A. The system shall in general comply with the following requirements:

- I. TIA/EIA-568-B.1 (Commercial Building Telecommunications Cabling Standard - Part 1: General Requirements- Refer to Current Release Available), TIA/EIA-568-B.2 (Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted Pair Cabling Components - Refer to Current Release Available), and TIA/EIA-568-B.3; (Commercial Building Telecommunications Cabling Standard - Part 3: Optical Fiber Cabling Components Standard – Refer to Current Release Available).
- II. TIA/EIA-569-A (Commercial Building Standards for Telecommunications Pathways and Spaces – Refer to Current Release Available).
- III. J-STD-607 (Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications - Refer to Current Release Available).
- IV. TIA/EIA-606 (Administrative Standard for Telecommunications Infrastructure - Refer to Current Release Available).
- V. TIA/EIA-526-14A (Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant - OFSTP - 14).
- VI. NEC Refer to Current Release Available, Article 800.

1.4 SYSTEM CONFIGURATION (The system shall be configured in a star topology in accordance with TIA/EIA-568-B.1.5.2.)

A. Main Telecommunications Distribution Room

- I. The MDF shall be located in this room and shall have the required number of AC-grade eight foot (8') by four foot (4') by three quarter inch ($\frac{3}{4}$ ") fire retardant plywood backboards (non-painted) mounted to the wall-framing members. This room will also have seven foot (7') four (4) post racks as per the 27-00-01 specifications. The LEC/SP shall provide service to the main telecommunications distribution room for both voice and wide area network (WAN) services. LEC/SP equipment shall be mounted on a dedicated section of the backboard. Central network electronic equipment shall be mounted in the racks. All fiber optic and copper terminating hardware shall be rack mounted. Main voice and data cross-connects shall be made at the MDF. Interconnection between the LAN and the WAN shall be made at the MDF. Two (2) dedicated 20-amp 120V electrical circuits with two (2) quad outlet receptacles each, two (2) dedicated 20-amp 208V electrical circuits with L6-20 receptacles and two (2) 30 amp 208V electrical circuits with L6-30 receptacles shall be located on the ladder rack raceway assembly above the rack within three feet (3') of the rack for the network equipment.

B. Telecommunications Sub closets

- I. Telecommunications sub closets shall be provided as required. All sub closets shall have the required number of AC-grade eight foot (8') by four foot (4') by three quarter inch ($\frac{3}{4}$ ") fire retardant plywood backboards mounted to the wall-framing members. All sub closets will have one seven foot (7') two (2) post rack with dual sided horizontal and vertical wire management designed for proposed 2 post rack equivalent to Panduit's "NetRunner" cable manager system. Telecommunications sub closets shall have all [(voice/data) (fiber/copper)] cross-connects and interconnecting hardware. All fiber optic and copper terminating hardware shall be rack mounted. FDEs must be bulkhead pass through only – no pull drawers allowed. One (1) dedicated 20-amp 120V electrical circuit with one (1) quad receptacle shall be installed on top of the rack

II. Services shall be provided for each type of area as outlined in the following sections. Other special type areas may arise on a particular project and will be addressed individually during the design process. Refer to Attachments 27 00 00-1A, 27 00 00-1B.

C. General Purpose Classrooms and Science Classrooms

- I. Classrooms shall contain a maximum of five (5) TCOs for data. Science classrooms shall contain a maximum of five (5) TCOs for data.
- II. Classrooms shall contain one (1) 1-port TCO for the teacher for data.
- III. Classrooms shall have one (1) Cat6 cable pulled above the ceiling grid to the center of the room as per current language in 27-00-01 Guideline, Section 3.4, Part "C" as pertaining to "Telecommunications Outlet (TCO)" specifications.
- IV. Classrooms shall have (1) Cat6 cable installed in TCO mounted above the Interactive Board location
- V. Classrooms shall have two 1-port TCOs containing (1) Cat6 cable on two of the room's walls directly across from each other.
- VI. All data ports shall be extended to the patch panel in the nearest telecommunications closet or Rebox.

D. Computer Labs and Business Labs with Computers

- I. Shall contain multiple TCOs for data as required by the school program. Each TCO shall have a four (4) pair Cat6 cable extended to the closest Technology closet.
 - a. Shall contain one (1) 1-port TCO for the teacher for data. The data port of the TCO shall be extended to the Rebox.
- II. Computer and Business Labs shall have one (1) Cat6 cable pulled above the ceiling grid to the center of the room as per current language in 27-00-01 Guideline, Section 3.4, Part "C" as pertaining to "Telecommunications Outlet (TCO)" specifications.
- III. Computer and Business Labs shall have (1) Cat6 cable installed in TCO mounted above the Interactive Board location. Data port of the TCO shall be extended to the patch panel in the nearest telecommunications closet.
- VI. General purpose classrooms and science classrooms shall have two 1-port TCOs containing (1) Cat6 cable on two of the room's walls directly across from each other.

E. Individual Modular Classrooms

- I. General purpose classrooms shall contain a maximum of five (5) TCOs for data. Science classrooms shall contain a maximum of five (5) TCOs for data.
- II. General purpose and science classrooms shall contain one (1) 1-port TCO for the teacher for data. The data port of the TCO shall be extended to the nearest communication closet.
- III. General purpose classrooms and science classrooms shall have one (1) Cat6 cable pulled above the ceiling grid to the center of the room as per current language in 27-00-01 Guideline, Section 3.4, Part "C" as pertaining to "Telecommunications Outlet (TCO)" specifications.
- IV. General purpose classrooms and science classrooms shall have one (1) Cat6 cable installed in TCO mounted above the mounted Interactive Board location. Data port of the TCO shall be extended to the patch panel in the nearest IDF closet.
- V. General purpose classrooms and science classrooms shall have two (2) 1-port TCOs containing one (1) Cat6 cable on two of the room's walls directly across from each other.
- VI. Individual modular classrooms shall be connected to the data network via two (2) strands of multimode fiber.

F. Modular Classroom Complexes

- I. Shall have a designated location for the installation of data equipment and all required accessories. The following are the minimal requirements to support a Modular Classroom Complex for data:
 - a. Shall have an open seven (7) foot floor rack with the appropriate number of copper and fiber patch panels to support the installed number of data connections along with security and fire equipment.
- II. Shall have a designated location in the main building within fifty feet (50') of the exterior wall so the outdoor rated cable (copper/fiber) can be converted to indoor rated cable with the required surge protection device as per the 27 00 01-2.7.E.
- III. Drops in designated computer labs should be terminated in nearest IDF closet.

G. Media Centers

- I. Shall contain the correct number of drops as specified in the WCPSS academic educational specifications. (This total does not include offices in the media center.)
- II. All data TCOs shall be extended back to and terminated in the MDF when those TCO are within two hundred ninety-five (295) feet.

H. Typical Outlets in Offices and Occupied Spaces

- I. Shall contain one (1) or more two (2) port TCOs for data. Data cables should be terminated at

the MDF where applicable or extended to the nearest IDF closet or Rebox. All offices should have at least two (2) data/data outlets. The NCWISE office should have three (3) data/data outlets.

I. Mechanical Rooms

- I. Shall contain one (1) two (2) port data/data outlets terminated in the nearest IDF closet. If mechanical room is to contain the network controlled energy management system, location of outlets to be determined by mechanical contractor on project.

J. Teacher Computer Workrooms

- I. This room should be designed for wireless connectivity – these rooms require two (2) data/data jacks. The wireless data copper drop will be located on a wall at a maximum height of ten (10') feet AFF that would radiate out to the workroom. This copper drop will go back to the nearest IDF closet.

- K. All Cat 6 data drops being utilized for use with the camera or security systems should be installed at a maximum height of ten (10') feet AFF and terminated in nearest IDF closet on separate patch panel from other network data cable drops. These cable drops should be installed per current language in 27-00-01 guideline, section 3.4, Part “C” as pertaining to “Telecommunications Outlet (TCO)” specifications. Cameras mounted to exterior poles shall use a product equivalent to Berk-Tek’s “One-Reach” POE extender system.

L. Elevator 2-way Communication

- I. A two-way communication system shall be provided at the elevator landing on each accessible floor that is one or more stories above or below the story of exit discharge complying with the latest NCBC Section 1009.8.

PART 2 - DESIGN CRITERIA

- 2.1 The Main Telecommunications Distribution room with the MDF should be ideally located near both the administrative area and the media center. All the MDF/IDF rooms' entrance doors must open into an indoor passage way – not to the outside!

- A. The room should be sized at 300 square feet to accommodate:

- I. The LEC/SP demarcation.
- II. Contractor provided seven feet (7') tall, nineteen-inch (19") four (4) post racks for:
 - a. Terminating all [(voice/data) (fiber/Cat6 copper)] backbone cables.
 - b. Local data station Cat6 cables.
 - c. WAN electronic equipment.
 - d. LAN electronic equipment.
 - e. Rack accessories including rack-mounted power strips, cable management hardware and any required cage nut and screws required to install patch panels or network equipment.

- f. Two (2) four (4) post racks for elementary and middle; three (3) for high schools.
- III. The public address system controller (refer to other section of Design Guidelines for system requirements).
- IV. The security system control panel (refer to other section of Design Guidelines for system requirements).
- V. The media distribution system (refer to other section of Design Guidelines for system requirements).
- VI. The energy management system Global Control Module (coordinate this with the mechanical engineer).
- VII. Ladder rack raceway shall be installed for overhead cabling installations.
- VIII. Provide multiple electrical outlets located throughout the room for convenience. Specify power strips with NEMA 5-20R receptacles for four (4) post racks.
- IX. Provide a dedicated exhaust fan (line voltage), thermostatically controlled to prevent heat build up for the main telecommunications distribution room (MDF). Make up air to the MDF room can be supplied either through a door louver or ductwork from an adjacent room in the building.
- X. The system shall be designed with surge protection on all copper distribution cables from building-to-building and all horizontal voice cables from building-to-modular classroom/complex.
- XI. Provide protection on both ends of cables where entering buildings. Protection shall comply with NEC Refer to Current Release Available, article 800.
- XII. MDF's or IDF's rooms shall have a drop ceiling.
- XIII. MDF should have a VCT floor and an approved baseboard.
- XIV. Provide a loud ringing phone bell in kitchen area for the Cafeteria Manager's office phone. The station cable for the loud ringing bell needs to be a home run data station cable drop terminated in the same Technology closet as the data station cable drops for the cafeteria manager's office. Cable drop should be terminated and labeled like any other network data station cable drop on the installed data station patch panel. Cable Drop should be mounted at eighty-four inches (84") AFF. Loud Ringing Bell installed should be a Algo Communication Products Model 8180 SIP Audio Alerter.
- XV. See Attachment 27 00 00-1K for grounding and bonding requirements for MDF/DEMARC rooms.
- XVI. Please provide the necessary quantity of station cable drops (per current CNS guidelines) for all Cafeteria Serving Line "POS" Cash Registers used in the cafeteria area. These cable drops need to be home run cable drops that run from the floor box at the serving line location, and terminated in the same Technology closet as the data station cable drops for the cafeteria manager's office. All current network cable distance restrictions and guidelines apply to these cable drops as to any other data station drop. Cable should be terminated and labeled like any other network data station cable drop on the installed data station patch panel.

2.2 Telecommunications sub closets should be strategically located in each major area of a building (i.e., each wing, each floor). The room should be sized at a minimum of 200 square feet. These sub closets may be incorporated as space in non-plenum mechanical and/or electrical rooms. Rebox's must be located in conditioned spaces.

2.3 DRAWING PLAN REQUIREMENTS

A. The drawings shall contain as a minimum the following:

I. All TCOs shall be shown on plans.

II. A schedule of all TCOs showing room numbers, number of ports, termination point (i.e. MDF, Telecommunications sub closet, RB room number), type of cabling, number of cables, and all individual outlet labeling information shall be shown on plans.

III. All RB's shall be shown on plans.

IV. All MDF's and Telecommunications sub closets shall be shown on plans.

a. Use enlarged plans where necessary for clarity.

V. A riser diagram showing the following:

a. The LEC/SP Demarcation.

b. The MDF.

c. Each Telecommunications sub closet.

d. All distribution/backbone cables showing a typical arrangement for each type of TCO, RB connection, complete with room numbers.

e. All cable sizes

VI. Details of racks and outlets.

VII. Show all labeling for fiber, voice, and data on the plans at the sixty percent (60%) CD Submittal Phase.

VIII. After the project is awarded, provide two (2) CD plan sets to the technology department which includes all plans, schedules and one (1) set of the project manual.

2.4 The TCOs for a typical classroom shall be designed to be stubbed up in the walls. The data station cable drop for the teacher must remain in the designed area for the teacher.

2.5 Use cable tray in all hallways to support cables. Installation of cable tray must not be designed or installed more than ten feet (10') AFF.

PART 3 - PRODUCTS

- 3.1 The telephone backboards shall be AC-grade eight feet (8') by four feet (4') by three quarter inch ($\frac{3}{4}$ ") fire retardant plywood (non-painted).
- 3.2 All copper TCOs shall be TIA/EIA-568B configuration and Cat6 compliant. TCOs designated as two (2) port data/data shall consist of two (2) eight (8) position modular jacks mounted in a single gang box.
- 3.3 All fiber optic connections shall be type SC.
- 3.4 Use floor mounted four (4) post racks for MDF.
- 3.5 All copper station cables shall be Cat6 compliant.
- 3.6 All copper backbone cables shall be Cat6 compliant when available for application.
- 3.7 All fiber optic cable shall be 50 micron, multimode type cable. Unless distance parameters dictate the use of a singlemode 50 micron fiber be installed.
- 3.8 The above cable types shall be general, riser, or plenum rated as required in accordance with the NEC and shall be UL and/or ETL listed.
- 3.9 Fiber distribution backbone cables shall be suitable for use (indoor, outdoor, distribution type, breakout type, etc.). Use of tight-buffered indoor/outdoor cable is preferred for exterior applications.
- 3.10 All copper cables shall be terminated on patch panels located in the four (4) post racks (at MDF), on patch panels located in the two (2) post racks (at IDF sub closets), or in a Rebox.
- 3.11 Patch panels shall be Cat6.
- 3.12 All fiber optic cables shall be terminated on fiber optic interconnection units located in cabinets at the MDF and terminated in FDE's at Telecommunications sub closets, or multimedia outlet boxes for RB's.
- 3.13 Surge protection for voice cables shall be Porta PIV-1525GT Multi-pair Protector Panels or approved equal.
- 3.14 All FDE enclosures must have hinged doors with no slide out drawers.

PART 4 - EXECUTION

- 4.1 Provide a minimum of one hundred twenty percent (120%) of the required strands for fiber optic and pairs for copper distribution cables.
- 4.2 For grounding and bonding refer to 27 00 00-1K.
- 4.3 Use raceway or conduit for cables installed within walls or other inaccessible spaces.
- 4.4 Use nylon bushings at top of conduit where stubbed into accessible ceiling spaces. Provide a minimum of two (2) service loops at stubbed conduits for copper cables.
- 4.5 Bridle rings with saddles are also acceptable for cable supports attached to building structure using acceptable methods. The "J" type hooks or bridal rings must be attached to down rods or the ceiling crossbeams. Do not use wire to support the "J" type hooks or the bridal ring.

- 4.6 Support all cables in accessible ceilings with cable tray or "J" type hooks (Cat6 rated) where cable tray is not available. Separate J-Hook pathways must be provided for all Technology related cabling and all other low voltage cabling installed. Velcro straps shall not be used.
- 4.7 Route all cables underground between buildings, using approved reflector tape. All fiber optic cable shall be routed in UL inner duct raceway everywhere. Maintain proper bending radius for fiber optic cables.
- 4.8 Copper distribution cables shall be punched down in a one (1) pair per port configuration. The cable shall be terminated on the WHT/BLU and BLU/WHT connectors at the Cat6 patch panels. This corresponds to pair #1. Install surge protection as required by the NEC. Refer to 27 00 01-2.7.E.
- 4.9 Specify labeling of all system components in accordance with Wake County Public School System - Technology Department and all applicable industry standards. All labeling shall be approved by the school system prior to installation.
- 4.10 Provide testing in accordance with industry standards and requirements as stated in 27 00 00-1.3.
- 4.11 A labeling schedule shall be provided to WCPSS at one hundred percent (100%) CD submittals with a drop summary of all data cables.

Example:

Number of Reboxes with six (6) strand fibers with number of copper cables.

Number of copper data cables to MDF.

Number of fibers to MDF.

END OF SECTION 27 00 00

27 41 10 ELEMENTARY SCHOOL SOUND SYSTEM

(For Multi-purpose Room Platform)

A. GENERAL

1. The sound system shall provide for the pick up, processing, amplification and distribution of live and prerecorded program material. Sound coverage of the audience area shall be by main speakers. One on each outside of the stage perimeter as well as fill in speakers beyond where the partition can be closed to separate the room.
2. An Assisted Listening System shall be provided to comply with NCBC Section 1108 Special Occupancies, Assistive Listening Systems.
3. The system shall consist of both wireless and wired microphones. Also, included there shall be two mixers, cd/cd writer, digital processors, equipment storage drawer, amplifiers, speakers, wall jacks, lockable wall rack with required spacing for equipment supplied, power conditioner, vented blanks, mic cables, monitor cables and all other cabling. All misc items shall be included for a complete operational system. All components shall be new and of the latest design. All items shall be professional grade. All equipment to be housed in one rack. Each piece of rack mounted equipment shall be separated by a 1.75" vented blank.
4. The specifications call for specific products (basis of design) to establish quality and performance criteria for this project. Other equipment will be considered that meet this criteria. Submit detailed cut sheets 10 days prior to bid date. Approval must be given before substitutions will be allowed. Along with all other submittal requirements the contractor must provide a list of at least 5 projects of similar design.
5. A qualified "System Contractor" shall install the sound system complete except for the conduit/raceway. "System Contractor" shall have 10 yrs of experience in the specific field of sound system installations of this kind. "System Contractor" shall submit single line drawings showing equipment locations and interconnections between all equipment supplied.
6. The system shall be installed using the latest technology and with good engineering practices. All cables shall be tested for opens, shorts and grounds prior to the hook-up of any cables to equipment. The system shall be balanced for optimum coverage for the room. Digital EQ shall be set and locked.

B. EQUIPMENT

1. **MIXER** (quantity of two)

The basis of design for MIXER is BOGEN VMIX, with 8 module bays capable of accepting advanced plug-in modules, with 2 bays capable of accepting signal-processing plug-in output modules. Each channel shall have its own independent volume control, and LED signal/clip indicator. The mixer shall have a master volume control, bass and treble controls, an 11-segment LED output level switch (-50, -10, and +4 dBu), circuit breaker with reset capability, one power indicator, a grounded unswitched AC convenience receptacle with a 500W maximum capacity provided for external equipment. The mixer shall be capable of being bridged and muted. The mixer shall be rack mountable (with RPK87 rack mount kit). The mixer shall come with a 3 year parts warranty. (2RU each)

2. **CD/CD RECORDER** (quantity of 1)

The basis of design for CD/CDWRITER is Tascam model CDRW750.

Features required are as follows:

Uses both professional grade and consumer grade CDs

CD-text reading and writing capability

Unbalanced RCA Analog I/O

SPDIF coax and optical digital I/O

Wireless remote

Repeat play
Digital gain adjustment
Head phone output

3. **EQUALIZER** (quantity of one)

The basis of design for DIGITAL EQUALIZER is SHURE DFR22.

The device shall have 2 analog inputs and 2 analog audio outputs. Phoenix (Euroblock) and XLR connectors shall be available on the back panel for each input and output. The inputs shall accept line level signals up to at least +24dBu. The outputs shall have a clipping level of at least +24dBu and shall provide analog pads for lowering the output clipping level to +12dBu and 6dBu. The frequency response of the device shall deviate no more than 1 dB from 20 Hz to 20 kHz. Analog-to-digital conversion and digital-to-analog conversion shall be performed at a resolution of 24-bit with a 48 kHz sampling rate. The overall dynamic range of the device from input to output shall be >110 dBa from 20 Hz to 20 kHz. The device shall have an internal auto-switching power supply capable of accepting an operating voltage from 100-240 VAC, 50/60 Hz. The unit shall be programmable. The front panel shall display an LED for each feedback filter. (1RU)

4. **ASSISTIVE LISTENING SYSTEM** (quantity: 1 Transmitter, Receivers shall be 4% of seating capacity)

Basis of design for Assistive Listening System is DRAKE ALT-1000 - Receivers DRAKE MR306.

The transmitter shall operate in the 72-76 MHz Auditory Assistance Band as approved by the FCC. The operating frequency and mode: "Stereo" or "Mono" shall be shown on an LCD display and be programmable by the front panel "up" and "down" buttons. The transmitter shall be FCC approved. The transmitter shall permit fitting of a 7" flexible antenna mounted through the top cover of the rack unit. The transmitter shall have XLR connections for balanced audio inputs and RCA Phono connectors for unbalanced audio inputs. There shall be a front panel control to adjust the audio input level with an LED (OVER) MODULATION indicator. There shall be a 1/4" stereo monitor jack with volume control. The transmitter shall be powered by an external AC line to 12 VDC power adapter. The transmitter shall be rack mountable. Provide number of receivers requested (1RU).

5. **WIRELESS MIC SYSTEMS** (quantity: four SLX 24 receivers, two SM-58 Transmitters, two WL185 Lapels)

Basis of Design for WIRELESS SYSTEMS is SHURE SLX24s with SM-58 handhelds and WL185

The wireless system shall operate in the UHF band between 698 MHz and 865 MHz, with the specific available frequency range being dependent on the user's location. Effective range of the system shall be 300 ft under optimal conditions. Each system shall allow selection of over 960 operating frequencies across 24 MHz of bandwidth in order to avoid RF interference. The process of synchronization shall be simple and instantaneous. Each transmitter shall be powered by two AA batteries. Transmitters shall have a power on-off/mute switch, as well as a timed, backlit LCD showing frequency group and channel, locked/unlocked status, and battery strength. The receiver shall have a multi-function display showing group, channel, frequency, transmitter battery, and locked/unlocked status. The system shall use diversity technology to improve reception, minimize signal dropouts, and achieve the best possible

signal-to-noise ratio. The receiver shall include an audio level meter and an infrared port for system synchronization. (1RU)

6. **ANTENNA COMBINER** (Quantity: one)

Basis of Design for ANTENNA COMBINER is SHURE MODEL UA844US.

The SHURE MODEL UA844US shall be a wide band four-way active antenna splitter and power distribution system with external power supply. The antenna system shall have the capability to be rack mounted.

7. **FRONT STAGE SPEAKERS** (quantity: two)

Basis of Design for FRONT STAGE SPEAKERS is APOGEE AFI4s.

The speakers shall have a 12" permanent magnet cone type driver treated with waterproofing compound that provides resistance to moisture enabling long-term stability of cone resonance and cone mass parameters. Driver also treated with Ferrofluid for greater power handling capability, low distortion, and control of short term impedance rise. Voice coil shall measure 1.75" and also be treated with Ferrofluid. There shall be two handles: one on the top and one on the bottom. These handles shall not contain any moving parts. Speaker grills shall be constructed of perforated steel. Plastic or polymer grilles will not be accepted. Cabinet construction shall be made of multi-ply hardwood. Each speaker shall have a maximum continuous rating of 200 watts at 8 ohms. All necessary mounting hardware to be included. Main speakers to be connected to CH 1 on main amp.

8. **FILL-IN SPEAKERS** (quantity: twelve)

Basis of Design for FILL-IN SPEAKERS is JBL CONTROL 26CTs

The FILL-IN SPEAKERS shall be of in-ceiling design, consisting of a 6.5" low frequency transducer, a coaxially-mounted 3/4" high frequency transducer and frequency dividing network installed in a ported enclosure. The low frequency voice coil shall be 1" in diameter and the coil former shall be of aluminum for maximum heat dissipation. Rated power shall be at least 75 watts continuous pink noise power. The high frequency transducer shall be horn-loaded to more evenly cover a minimum 110 degree polar conical area. The backcan shall be constructed of formed steel and the baffle of UL94V-0 fire rated medium impact polystyrene. An enclosed terminal box shall be included providing strain relief for use with either plenum-rated wire, 1/2" conduit or flexible conduit up to 7/8" outside diameter. The external wiring shall be accomplished via a removable lockable wiring connector with screw-down terminals to provide both secure wire terminations and prewiring capability before loudspeaker installation. An attachment loop shall be provided on the back panel for cabling to building structure as a secondary point of support. The system shall include a support backing plate to reinforce the ceiling material and tile support rails for use with standard ceiling tiles. The speakers shall have a 70.7 volt transformer with selectable taps.

9. **MONITOR SPEAKER** (quantity: one)

Basis of Design for MONITOR SPEAKER is APOGEE AFI - Point 5

The monitor speaker shall have one low frequency 5.25" permanent magnet cone type driver and one .5" Mylar tweeter. Connectors shall be of the spring type. The grill shall have a highly

durable, quality finish on perforated steel. Nominal impedance shall be 8 ohms with maximum power handling of 60W continuous/240W peak. Speaker shall be hung on inside of proscenium wall facing the stage. Speaker shall be connected to CH. 2 of the main amplifier. Music source only for input to this channel.

10. MAIN AMPLIFIER (quantity: one)

Basis of Design for MAIN AMPLIFIER is APOGEE CA-2000

The MAIN AMPLIFIER shall contain the latest in power MOSFET technology. All controls shall be located on the rear of the unit to avoid being tampered with. The air intake and air filter shall be located on the front panel for easy access when cleaning is required. The front end circuitry shall feature an advanced clip eliminator to reduce distortion. Speaker protection shall be provided by means of an ultra-fast crowbar unit. The amplifier shall be equipped with adjustable speed fans for quiet, efficient cooling and feature internally configurable AC mains for 120 VAC or 230 VAC. The MAIN AMPLIFIER shall have a rating of 180 watts @ 8 ohms. (2RU).

11. FILL-IN SPEAKER AMPLIFIER (quantity: one)

Basis of Design for FILL-IN AMPLIFIER is BOGEN C-60

The FILL-IN speaker amp shall have a power rating of 60 watts The amplifier shall provide one low-impedance balanced microphone input, one dedicated Hi-Z auxiliary input, and one dedicated telephone line input as well as a fourth input that is switch selectable to be either a microphone or auxiliary input. The microphone inputs shall be equipped with filters to protect against RF interference, independent volume controls for each input as well as TREBLE control. The amplifier shall contain a TEL volume control to adjust the telephone paging level and a VOX volume control to adjust the TEL input signal level trigger point for automatic muting of the AUX input. The amplifier shall provide output impedances of 4-(direct), 8, 16-ohm speaker systems as well as 25V and 70V constant voltage systems. Two high-impedance outputs shall be provided to drive a tape recorder or booster amplifier and, when used with an accessory transformer, to feed a 600-ohm telephone line. The amplifier shall contain a thermostat capable of resetting the power transformer to protect against heat build-up and short-circuited or overloaded connections. Include rack mounts for standard rack mounting. (2 RU)

12. WIRED MICROPHONES (quantity: two)

The basis of design for HANDHELD MICS is SHURE SM-58s.

The HANDHELD MICS shall be unidirectional with a frequency response from 50 to 15,000 Hz. Rated impedance shall be 150 ohms low impedance. The mic connection point shall be by a 3 pin XLR connector. The mic element shall be covered by a steel mesh grill.

13. LOCKABLE DRAWER (quantity: one)

Basis of Design for LOCKABLE DRAWER is LOWELL L18-193L

The drawer is 19"W for rackmount use. Drawer shall have panel space height of (2RU) and a maximum extension of 15.375". Construction shall be welded 16 gauge USA steel with ball

bearing slides and positive stops. Load capacity shall be 50 LBS. Finish shall be black powder epoxy.

14. POWER CONDITIONER (quantity: one)

Basis of Design for POWER CONDITIONER shall be a AVLEX PC-08

The POWER CONDITIONER shall have eight switched AC outlets. Also, the conditioner shall have two light modules with dimming capability, adjustable swivel and pull out positioning. The eight circuits shall be rated at 15 amps, equivalent to 1800 watts at 120 volts.

15. EQUIPMENT RACK (quantity: one)

Basis of Design for EQUIPMENT RACK is LOWELL L260 SERIES.

The EQUIPMENT RACK shall be fully welded 16 gauge US steel with vented side, a 14 gauge steel in place. Top entry and a 6" deep rear conduit plane for knockouts shall be provided. Bottom of rack shall have a full size opening. Back opening shall have lacing points provided. Rack space requirements will be determined by individual contractor.

16. FLOOR RACK DIAGRAM

ASSISTIVE LISTENING TRANSMITTER
POWER CONDITIONER
8 CHANNEL POWER VECTOR MIXER
8 CHANNEL POWER VECTOR MIXER
BLANK PANEL
CD/CD WRITER
BLANK PANEL
WIRELESS HANDHELD RECEIVERS
WIRELESS HANDHELD RECEIVERS
STORAGE DRAWER w/ LOCK
DIGITAL EQUALIZER
ANTENNA COMBINER
BLANK PANEL

AMPLIFIER 1 (MAIN)
BLANK PANEL
AMPLIFIER 2 (FILL-IN SPEAKER)
BLANK PANEL

17. MICROPHONE STANDS (quantity: two)

Basis of design for MICROPHONE STANDS is BOGEN SF4s

The MICROPHONE STANDS shall be full height professional grade with a low profile base black in color. The stands shall be constructed of 5/8" and 7/8" diameter heavy-duty welded cold rolled tubing with 5/8" - 27 male thread termination to accommodate standard microphone holders. Top and bottom lock-nut rings are included for versatile and secure positioning. The one-piece low silhouette cast iron base includes anti-tip stabilizers.

18. MICROPHONE PLATES (JACKS) (quantity: six)

Basis of Design for MICROPHONE PLATES is RAPCO SP1-DF

The MICROPHONE PLATES shall be single gang stainless steel with one female XLR jack mounted on plate. Three on the wall below the front edge of the stage evenly spaced across the width of the stage. One on the stage right wall, one on the stage-left wall, and one on the back wall of the stage. Floor pockets or floor mounted jacks will NOT be allowed.

19. MAIN SPEAKER CABLE

Basis of Design for MAIN SPEAKER CABLE is BELDEN 5000UE

The MAIN SPEAKER CABLE shall be a 12 AWG copper cable with two conductors. The cable must be UL listed and be made in USA. Cables installed in a plenum environment must be plenum rated; otherwise PVC jacket will be accepted. Each speaker shall have its own individual homerun.

20. MONITOR SPEAKER CABLE

Basis of Design for MONITOR SPEAKER CABLE is TAPPAN P40020.1

The MONITOR SPEAKER CABLE shall be an 18 AWG 7 - strand copper cable with two copper conductors. The cable must be UL listed and be made in USA. Cables installed in a plenum environment must be plenum rated; otherwise PVC jacket will be accepted.

21. FILL IN SPEAKER CABLE

Basis of Design for FILL IN SPEAKER CABLE is TAPPAN P40020.1

The FILL IN SPEAKER CABLE shall be a 18 AWG 7 - strand copper cable with two copper conductors. The cable must be UL listed and be made in USA. Cables installed in a plenum

environment must be plenum rated; otherwise PVC jacket will be accepted. FILL IN
SPEAKERS may be daisy chained.

22. MICROPHONE FIELD CABLE

Basis of Design for MICROPHONE CABLE is TAPPAN R20008.1

The MICROPHONE CABLE shall be a 22 AWG shielded 7 strand 1 pair copper cable. The cable must be UL listed and made in USA. Cables installed in a plenum environment shall be plenum rated, otherwise PVC will be accepted. All microphone cables to be individually homerun.

23. MICROPHONE PORTABLE CABLE (quantity: four)

The MICROPHONE PORTABLE CABLE shall have 22 AWG 7 strand center conductors. The conductors shall have a 95% low loss spiral wound shield with a black ultra-flexible rubber jacket. Cables shall be terminated with a three pin female XLR connector on one end and a three pin XLR male connector on the other end. 25' cables shall be included.

27 51 00 INTERCOM/CLOCKS/PUBLIC ADDRESS SYSTEMS

A. GENERAL

1. An administrative handset shall be provided in the Principal's office, at the Receptionist's desk, and at the Secretary's desk. [All Administrative offices shall have an intercom phone with an all-call feature and a ceiling speaker with volume control mounted on the wall.](#)
2. Both the secretary's station and the Reception desk should be capable of serving as the primary call-in position, with the Principal's office serving as the secondary position.
- ~~3. The system should be designed to allow for the handset serving as the primary position to be moved between the Reception desk and the Secretary's desk.~~
4. A 2-way recessed ceiling mounted speaker shall be provided at all instructional spaces.
5. In classrooms only, provide a wall mounted handset that is capable of calling all other handsets using a touch-tone pad. Locate this handset near the teachers work area and away from the door. When the handset is on hook the classroom speaker will be capable of carrying on a two-way conversation.
6. All other instructional spaces provide a call-button that will automatically call the central station upon activation. A microphone jack shall be provided at the bus and car loading areas under cover.
7. Exterior weatherproof speaker/horns shall be placed on the outside of the building adjacent to exterior play areas. Speaker/horns to be 15 watt paging-talk-back type with adjustable 25 volt tap transformer.
8. Speakers shall be provided in the ceilings of all common areas such as cafeterias, media centers, performing arts areas and corridors.
9. Provide a self-contained public address system in all multipurpose areas, auditoriums, cafeterias, and theaters.
10. The system console shall be placed in a storage room in the ~~administrative area.~~ [MDF Room.](#)
11. Public address systems shall be on a 24-hour clock.
12. System shall be programmable to allow for a number of different schedules as well as a number of different zones.
13. Provide sufficient spare capacity in the system for at least ten (10) additional call-in locations.
14. Install in accordance with manufacturer's instructions.
15. Intercom cabling shall be installed in conduit from outlet box to above accessible ceiling. Cable above ceiling shall be neatly routed and properly supported.
16. Terminate cables on 66 blocks with surge protectors.
17. Replace equipment, components, and wiring to eliminate audible noise, clicks, pops, or hum when system is in standby or operation.
18. The Contractor shall provide all necessary transient protection on the AC power feed and on all station lines leaving or entering the building.
19. The Contractor shall note in his system drawings, the type and location of these protection devices as well as all wiring information.
20. Provide on-site systems demonstration and instructions under provisions of Division 1. Allow minimum of 16 hours.
21. Conduct walking tour of project and briefly describe function, operation, and maintenance of each component.
22. Use submitted operation and maintenance manual as reference during demonstration and training.
23. All communication cable shall be supported in zinc plated steel bridal rings. Bridal rings to be a minimum of 2" in diameter and located a maximum of 10'-0" on center so as to prevent excess sagging from occurring.
24. The installation contractor shall have a minimum of five years of experience installing the products specified in this section and have an office located with-in a 50 mile radius to the site.

25. The communication system supplied shall be listed by Underwriter's Laboratories under UL Standard 1459. A copy of the UL listing card for the proposed system shall be included with the contractor's submittal.
26. Contractor shall furnish all service and maintenance of the intercom system for a period of one year from the date of Substantial Completion.

B. EQUIPMENT

1. Systems manufactured shall be by Telecor or Bogen or WCPSS approved equal are acceptable.
2. Wireless clocks shall be integrated with intercom/paging system.
3. System shall include 12" wireless analog clocks in all E-occupancy spaces and 16" wireless analog clocks in all A-occupancy (example: Gymnasium) spaces.
4. The intercom system shall be a direct connected, keyed system providing voice communication between any two (2) stations by dialing the user programmable two (2) to five (5) digit number associated with the station being called.
5. The intercom system shall use a microprocessor based global type central switching assembly with the ability to provide a minimum of eight (8) conversation paths with a system capacity of eight (8) master/administration stations and 240 individual station points.
6. The intercom system shall have a Telephone System Interface which includes eight (8) outside telephone lines per system. System should be similar to Bogen Multicom 2000, Model MCTC.
7. All items of equipment shall be designed by the manufacturer to function as a complete system and shall be accomplished by the manufacturer's complete service notes and drawings detailing all interconnections.
8. All batteries, clocks, repeaters (if needed), head-end equipment shall be provided and installed by the PA/Intercom contractor as a complete and operational system.
9. Specify 19 in. welded/assembled floor standing equipment rack with two piece chrome finish panels and blank panels for all rack mounting spaces.
10. Provide four (4) input microphones or auxiliary inputs plus a built in console for microphone call/emergency call announcements. Used for programming and intercom/all call console.
11. SPEAKER CONTROL ASSEMBLY WITH PROGRAM DISTRIBUTION: provides relays for speakers. Used in conjunction with switch bank.
12. INTERCOM AMPLIFIER: provides hands free communication between any telephone and speaker.
13. BASIC POWER AMPLIFIER: Provide separate amplifiers for time tone/page program.
14. ROOM POSITION SWITCH PANELS
15. MASTER CLOCK: programmable for event schedule and tone generator for signaling over speakers. Master clock shall be integral with system with eight (8) schedules and 256 events with programmable tone (with a minimum duration of eight (8) seconds) for class change bells.
16. MASTER ADMINISTRATION INTERCOM STATION:
 - a) Desk mounted master/administration intercom unit with jack at 18 in. above finish floor.
 - b) Nominal size: 7-3/4 in. x 7-1/4 in. x 4-1/4 in.
 - c) Handset: standard molded plastic telephone handset with 5 ft. long permanently coiled cord.
 - d) Minimum Controls and Indicators:
 - 1) Twelve button key pad
 - 2) Twelve character LCD display
 - 3) Audible signal for incoming calls
 - 4) Hands-free communication
 - 5) Speaker disconnect by lifting handset
 - 6) Mark each control and indicator with legible and permanent nameplates.

17. INTERCOM UNITS:
- a) Surface wall mounted unit at 54 in. above finish floor.
 - b) Nominal Size: 8.8 in. x 3.2 in. x 3.7 in.
 - c) Tamper Resistant
 - d) Standard Beige
 - e) Handset: Standard molded plastic telephone handset with 5ft long permanently coiled cord.
18. CONTROLS:
- a) Standard twelve button keypad
 - b) Audible Signal for incoming call
 - c) Speaker disconnect by lifting handset
19. Exterior intercom stations shall be installed in flush mounted lockable steel cabinet.
20. SPEAKER: Classroom/hallway: 8 in. loudspeaker unit with 25 volt multi tap transformer and 5 oz. Magnet.
21. Provide adjustable attenuator at administrative locations. Show location of volume control on plans.
22. BACK BOX AND BAFFLE: Square two (2) piece ceiling baffle or equal for mounting speaker unit, baffle shall have concealed speaker mounting studs. Utilize in all areas, classrooms, hallways, etc. Unit shall be flush mounted and be finished in white epoxy paint.
23. Square recessed backbox (Flush Mounted).
24. INTERCOM CABLING: Cable shielding and size shall be fully compatible with intercom system manufacturer's recommendations.
25. PUNCH-DOWN BLOCKS: Provide 66-block and stand-off wall brackets mounted on 4 ft. x 4 ft. x 3/4 in. painted plywood board, for all intercom terminations at head-end equipment. [All wiring and head-end terminations shall be in order: speaker, phone; speaker, phone, etc. Wire for speaker shall be red/black. Wire for phone shall be green/white.](#)
26. Provide protectors on all intercom cabling. ITW LINX #UP25-39 or equal.
- a) 39 VDC solid state
 - b) Reaction time of 2-5 nanoseconds
- c) 66-block mounting.
27. [Provide additional phones for attic stock:](#)
- [ES: add 5 phones](#)
 - [MS: add 5 phones](#)
 - [HS: add 19 phones](#)

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY SYSTEMS

28 10 00 SECURITY SYSTEMS/ACCESS CONTROL

A. GENERAL

1. All equipment specified herein shall be provided by the Contractor under the base bid. All equipment required for the operation of the Intrusion Detection System, Access Control Components, and Door Hardware for Access Control shall be furnished by the Contractor.
2. WCPSS Security will not provide any equipment related to new Construction or Renovations.
3. All equipment will be by the Electrical Contractor and their Sub Contractors.
4. Install and program in accordance with manufacturer's instructions.
5. Contractor to coordinate with WCPSS and the WCPSS S2 Global Contractor for proper programming of the S2 System and connection to the WCPSS S2 Global system.
6. Obtain account codes, phone numbers, and zone instructions from WCPSS securityshop prior to programming.
7. Use Plenum rated 4 conductors 22-4 minimum size for data, and signaling circuits.
8. Use Plenum rated 2 conductors 18-2 to power motion detectors from power supplies.
9. Control panels shall be surface mounted 5' above finished floor (60" AFF). Keypads shall mounted 4' above finished floor (48" AFF) to top of box.
10. All conductors entering in to control panel or instrument boxes will be concealed in $\frac{3}{4}$ " or 1" conduits. Conduits will be accessible to ceiling voids. Provide two $\frac{3}{4}$ " or two 1" conduits at panel for all conductors entering the panel. No exposed conductors will be permitted at the panel or at any instrument boxes where field wiring "ie" power supplies, transformers, ezm's, and other devices terminate into an instrument box.
11. All keypads and EZM modules shall be homeruns to main panel. No splices in data loops will be accepted. Acceptable practice to loop from KP to KP or from EZM to EZM; IE daisy chain loop is an acceptable practice, but no splice in the daisy chain loops.
12. EZM expansion models are no longer permitted to be mounted in accessible ceilings. EZM modules will be mounted in Mier Instrument Boxes 11"x 14"x 4" with Louvers or functionally equivalent. Provide a minimum of (1 or 2) $\frac{3}{4}$ " or 1" conduits for conductors entering instrument boxes. Conduits are to be stubbed to accessible ceiling spaces, with nylon bushings. Mount instrument boxes 5' above finished floor. Locations of EZM's and power supplies will be shown on shop drawings. Direct power connection is preferred and system shall not have any exposed transformers outside of control panel cabinet.
13. Each motion detector shall be individually zoned. No splices in conductors shall be permitted at any point in this system. Each detector requires a 2.2K ohm resistor at the EOL.
14. Where required, the electrical contractor shall provide gang boxes for motion detectors and keypads. The wide-angle motion and long-range motion shall have a single gang box. Keypads shall have a double gang box, mounted 48" AFF. Motion detector in offices should be ceiling mounted, centered above the window opening(s). If in accordance with motion detector manufacturer specifications, motion detector in offices, classrooms, and corridors should be mounted 1" to 2" below lay in ceilings so as no conductors will be exposed and do not require boxes. Conduit mounts shall be used. Applications where motion detectors do not require gang boxes, each motion detector should be surface mounted on sheet rock or masonry walls. Remote transmission: Each Security Panel requires a network drop for transmitting all information to Central Station.
15. Install a Hold-Up button under the reception desk in the main office and wire as a dedicated zone to the main panel or nearest EZM.

16. Refer to Appendix A for Attachments 281000-A1, 281000-A2, 281000-A3, Intrusion Detection), (281000-B Access Control Systems), Specifications and Wiring Diagrams.

B. SYSTEM TESTING AND CERTIFICATION

1. Before programming of the Security Systems all draft programming, program labeling, zone list, and program schedules shall be submitted to WCPSS M&O Security Shop for approval and loading in the security monitoring receiver. Upon completion of the installation, Security Systems and Access Control Systems authorized representatives shall together test each and every initiating device for proper response and annunciation with WCPSS M&O Security Shop. Each area shall be verified for proper office, classrooms, corridor, numbers names and locations.
2. After successful completion of inspections and test, the warranty period begins. In the event of malfunctions or excessive false alarms, the contractor must take prompt corrective actions. The owner may require a repeat of the contractor's 100% system test or other inspections. Continued improper performance during the warranty period shall be cause to require the contractor to remove the system.

C. CODE REFERENCES

1. NFPA 70 – National Electric Code
2. NFPA 72H – Guide for Test Procedures for Protective Signalling Systems
3. NFPA 730 – Guide for Premises Security
4. NFPA 731 – Standard for the installation of electronic premises security systems

D. SYSTEMS

1. INTRUSION DETECTION:

- a) Intrusion Detection Systems shall be a Gemini/Napco Integrated Control Communicators for monitoring the status of detection devices, alarm conditions and communicating via Network NL-Mod. WCPSS security will determine all device locations and areas to be protected.
 - 1) Control Panels: Napco X 255
 - 2) Keypads: Maximum number of keypads to a system is 8. Napco RPCAe2 keypads are used with Gem P816, P1632, P3200, P9600 , Gem X255 control panels.
 - 3) Power supply – NS-P5ASUP, 5 Amp supervised power supply/charger.
 - 4) Communicator – GEMC-NL-MOD Network communication module.
 - 5) Napco EZM 8: 8-zone EZM Expansion Zone Module
 - 6) Remaining Components: Refer to Appendix A for Attachments 28 10 00 A1, A2, A3 for System Components ordering information.
 - 7) Motion Detectors:
 - a. Long range detector – Aritech AP-633/AP643 Passive Infrared Detector, by Sentrol, see AP 633/643 specification and feature page, or equal.
 - b. Wide-range motion detector - DSC-Bravo 600 dual PIR motion detector or functionally equivalent. See specification and feature page.
 - c. 360 Degree ceiling mount motion detector – DSC-Bravo PIR/Glass Break Detector, [Bravo-5GB](#), or equal. Use in classroom and office areas. See specification and feature page.
 - 8) Hold-up Button - USP HUB Hold-up button or functional equal.

2. ACCESS CONTROL:

- a) Access Control for all shall be S2 Security Management System. All ~~Elementary~~ schools shall have designated locations for the installation of door control and all required accessories. This system is intended as an integrated electronic access control system for secured access to designated areas.
 - 1) Provide S2 Security Netbox Access Control Solution with up to 32 doors of access control. Provide additional S2 Network Nodes where needed to accommodate additional access controlled doors.
 - 2) The S2 system shall be fully integrated and connected to the Wake County S2 Global ACS system for centralized administration of card holder records.
 - 3) Provide power supplies to match all electric hardware.
 - 4) Provide HID multiclass, mini-mullion, wall switch card readers – Part #: S2900PTNNEK0060-S2SEC or approved equal.
 - 5) All doors shall have the following:
 - a. REX (motion or internal switch)
 - b. Door Contact Switch (flush mount or internal)
 - 6) Provide a Minimum of 200 Prox Cards II per Site or School.
 - 7) Wiring for all Components follow Manufacturer's Specifications and Guidelines.
 - 8) Video Intercom - Provide a video intercom system with touchscreen monitor at the reception desk with the ability to unlock the main door through the access control system.
 - a. Video Intercom – Aiphone IP Addressable IX Series or approved equal.
 - b. Master Station – Aiphone IX-MV or approved equal.
 - 1. Removable SD Storage – minimum 32GB SanDisk or approved equal
 - c. Door Station – Aiphone IX-DA or approved equal.

3. COMMAND CENTER:

- a) This room can be located in a space that has windows. The preferred location is the Principal's main conference room. The room needs to have data and telecom outlets – phone to call emergency services, phone with inter-office ability to receive calls from classrooms, and a secondary phone to call outside numbers. The room requires capability to hear intercom annunciation. The room must have the capability to be locked from the inside.
 - 1) Wiring for all Components follow Manufacturer's Specifications and Guidelines.
 - 2) System components - Provide the following devices for use in the Command Center space only:
 - a. Master Control Administrative Telephone (master station) – Aiphone IX-MV or approved equal.
 - 1. Removable SD Storage – minimum 32GB SanDisk or approved equal
 - b. Standard Desk Phone – 2 each. (basis of design: Telecor HS-1301)
 - c. Intercom speaker - use existing, or add if needed: (basis of design: Quam System 5)
 - d. Locking door hardware – lockable from the inside, ANSI type F33 (basis of design: Stanley/Best 45H-7AT3H)

28 23 00 CCTV VIDEO MANAGEMENT SYSTEM

A. GENERAL

1. The surveillance software shall be of manufacturer's official product line, designed for commercial and industrial use.
2. The surveillance software shall be non-proprietary and operate with multiple server, camera, and network hardware manufacturers while based on commercial-off-the-shelf (COTS) hardware and software. The approved Enterprise Surveillance Manager software is ipConfigure. All video surveillance management systems must integrate with WCPSS's existing enterprise surveillance manager, ipConfigure. All proposed equals must submit working demo systems for a minimum 30-60 day review process by Energy and Physical Plant and the Security Department.
3. Refer to Appendix A, Section 28 23 00 – Attachment A for approved Camera Model List.
4. Refer to Appendix B, Section 28 23 00 CCTV Video Management System for full specifications.

28 31 11 FIRE ALARM SYSTEM

A. GENERAL

1. Provide new addressable, voice evacuation, fire alarm panel, all conduit, outlet boxes, fittings, addressable pull stations, analog intelligent reporting smoke detectors, speaker /strobes, and any control modules necessary for a fully functioning, fail-safe, supervised, annunciated system.
2. The system shall be electrically supervised against open circuits and grounds in the wiring to the alarm initiating, alarm indicating or control devices. Control circuit shall indicate system trouble if it is in other than normal operating condition. An open or ground in the system shall cause a visual and audible signal to sound continuously until the system is restored to normal or silenced by means of a silence switch on the control panel.
3. Operation of any manual station, smoke detector shall cause the sounding of a general alarm on all signals, automatically signal the supervisory agency, operate all flashing lights, activate system control outputs, annunciate the address in which the signal originated, and indicate the type of device activated.
4. The system shall be nominal 24 VDC, non-coded, and fully supervised (including control circuits, AHU shutdown circuits). All equipment supplied shall be new, must be listed for the purpose for which it is used, UL approved, and installed with a warranty (parts and labor) of at least one year from the date of acceptance.
5. The Fire Alarm Control Panel (FACP) shall be of modular type, for ease of future system expansion or modification. The FACP must display a steady "Power On" light (green) and must have separate "Alarm" (red), "Trouble" (amber), and "Signals Silenced" lights. LCD display shall indicate devices in alarm or trouble. The system shall be designed at no greater than 50% capacity with a final completion capacity of no greater than 60%. This shall be supported with documentation from the supplier.
6. The FACP power supply shall have a continuous rating adequate to power all zones and functions in full alarm continuously and must not exceed 60% of its output rating. Detection modules and alarm modules must be able to withstand prolonged short circuits in the field wiring, either line to line or line to ground, without damage. Signal circuits shall each be loaded to no more than 60% of their rated output capacity.
7. The following protection against voltage transients and surges must be provided by the fire alarm equipment supplier, and installed by the electrical contractor:
 - a) On AC Input: A feed-through (not a shunt-type) branch circuit transient arrestor such as the EFI HWM-120, Leviton OEM-120EFI, Northern Technologies TCS-HW, Transtector ACP100BWN3, or any equivalent UL Listed device submitted to and approved by the electrical design engineer. Install suppressor in a listed enclosure near the electrical panelboard, and trim excess lead lengths. Wind small coil in the branch circuit conductor just downstream of the suppressor connection. The Coil is to have 5 to 10 turns, about 1" diameter, and securely tie-wrapped. This series impedance will improve the effectiveness of the arrestor in suppressing voltage transients.
 - b) On DC Circuits Extending Outside Building: Adjacent to the FACP, and also near point of entry to outlying building, provide "pi" type filter on each leg, consisting of a primary arrestor, a series impedance, and a fast acting secondary arrestor which clamps at 30v to 40v. Example of acceptable models are: Simplex 2081-9027 and 2081-9028, Transtector TSP8601, the Ditek DTKxLVL series, Citel America B280-24V, Northern Technologies DLP-42. Submit specs on others to the electrical engineer and WCPSS for approval a minimum of 10 days prior to bid.

8. The location of each fire alarm initiating device shall be clearly indicated at the FACP and all annunciators. A wood framed up-to-date map with correct room numbers that indicates the location of each device and its identifying label shall be included.
9. The following spare parts shall be provided with the system, each one individually packaged and labeled. These items will be turned over to the owner. *Increase any resulting decimal quantities of spare parts to the next higher whole number.*
 - a) Fuses 2 of each size used in the system
 - b) Pull Stations 2% of total connected to the FACP
 - c) Indoor Horns & Speaker Strobes 4% of total connected to the FACP
 - d) Spot Type Detector Heads & Bases 4% of total connected to the FACP
 - e) Duct Smoke Detectors Heads 4% of total connected to the FACP
 - f) Monitor and Control Modules 2% of total connected to the FACP
10. Sprinkler System Monitoring:
 - a) The following sprinkler system alarm and supervisory functions shall be provided as a part of the fire alarm system.
 - 1) Waterflow alarm, by sprinkler zone (not to exceed one floor).
 - 2) Supervision of each control valve.
 - 3) Supervision of air pressure, if used (both high and low).
 - 4) Supervision of fire pump.
 - b) Sprinkler supervisory monitoring of flow switches, tamper switches, and similar functions shall be accomplished with a separate system address for each activity monitored.
11. Kitchen Exhaust Hood Extinguishing Systems:
 - a) Installation shall comply with the current edition of NFPA Standard for the type of system installed.
 - b) This system shall be monitored by the fire alarm system with a separate address.
 - c) The following operational requirements are generally provided directly by the extinguishing system. The Contractor shall verify that the means for providing the following operation sequence is in place:
 - 1) The exhaust fan must continue running after the system has been discharged, (except on carbon dioxide systems) to remove smoke; the supply fan should stop running.
 - 2) All sources of heat for appliances served by the extinguishing system (both electric and/or gas) must be turned off.
12. System manual evacuation signal and paging control:
 - a) The system shall provide dual audio output which shall allow the evacuation signal and prerecorded message to be transmitted over selected circuits while simultaneously permitting paging to be transmitted over other selected circuits.
 - b) Each signal circuit shall have three manually selected modes.
 - 1) Automatic mode; the circuit shall operate in its preprogrammed, selective evacuation signal and prerecorded message sequence.
 - 2) Manual evacuation mode; the circuit shall transmit the evacuation signal and prerecorded message upon manual selection at the fireman's control and status panel.
 - 3) Paging mode; when the paging mode is selected during either automatic or manual evacuation mode, the evacuation signal shall continue to sound until the microphone button is pressed for a paged signal. Once the microphone button is released, the evacuation tone shall again sound when in the manual or automatic evacuation mode. When not in automatic or manual evacuation, the paging mode shall operate as described without the prerecorded evacuation signal.

- c) Each circuit shall be provided with a visual indicator to indicate that the evacuation/prerecorded message sequence is being transmitted and a second indicator to indicate that paging or the alerting signal is being transmitted.
 - d) A function selector switch shall permit emergency voice and alarm transmission to be made to selected areas by the use of zone selection switches. The alarm tone shall continue to sound in those zones not selected for voice transmission.
 - 1) The function selector switch shall allow all alarm tones to be silenced and selective voice transmission only shall be permitted via zone selection switches.
 - 2) If the function selector switch is not returned to the normal position, prior to closing the access panel, an audible and visual trouble signal shall be initiated.
 - 3) Facility for total building evacuation or paging shall be accomplished by means of a dual function "all circuit" switch.
 - 4) Each alarm zone shall be provided with an individual selection switch for the purpose of selective voice and/or tone transmission. Zone selection switches shall be maintained contact type with visual indication operation. The voice communication system shall have provision for at least a separate zone for the following:
 - a. Each floor of each building.
 - b. Penthouse level.
 - c. Exit stairwells (one zone each stairwell).
 - d. Elevator lobbies per local code authority.
 - e. Elevator cabs.
 - f. Each area of rescue assistance.
13. Elevator Recall:
- a) Installation shall comply with NC Department of Labor and ANSI A17.1.,
14. HVAC Control:
- a) Installation shall comply with HVAC Sequence of Operation per Division 23.

B. COMPONENTS

1. The maintenance department maintains the fire alarm systems within the Wake County Public School System. In order to maintain the fire alarm systems efficiently and keep downtime to a minimum WCPSS has found it cost effective to develop specific standards for fire alarm design, installation and acceptance. Therefore, the fire alarm system shall be limited to systems manufactured by SimplexGrinnell, **Mircom** or **Siemens** with a capacity of at least 2,000 input points.
2. **CONTROL PANEL:**
 - a) Fire alarm control panel shall be of the addressable type, using a two wire circuit, individual initiating devices such as automatic smoke detectors, heat detectors, and manual fire alarm pull stations shall communicate their exact identity and status. Additionally, notification appliance circuits (horns, bells, strobes, etc.) as well as other control circuits (fans, dampers, etc.) shall be individually controlled and supervised. The system shall be designed at no greater than 50% capacity with a final completion capacity of no greater than 60%. This shall be supported with documentation from the supplier/installer.
 - b) Power supply/battery: 120V AC operation at 60 Hz. Battery and charging shall provide 24 hours of standby and 5 minutes of alarm battery. Submit calculation for battery selection.
 - c) Automatic digital alarm communicator with emergency power pack (battery and charger unit), cellular/IP communicator, Bosch B465. Communicator shall be compatible with SimplexGrinnell Central Monitoring Station. Communication method shall be cellular. The installer must program the communicator to SimplexGrinnell before final inspections and tests. The fire alarm system shall be monitored for alarm, trouble, supervisory, and water flow.

- d) Addressible detector base with integral addressable electronics constantly monitor the status to the detachable photoelectric, ionization, or heat detector heads, and communicate changes of status to the addressable interface module.

3. ANNUNCIATORS:

- a) On all systems the annunciator shall be a supervised, remotely located backlit LCD display containing a minimum of eighty (80) characters for alarm annunciation in clear English text. The LCD annunciator shall display all alarm and trouble conditions in the system.

4. ZONE MAPS:

- a) Zone maps shall be provided for FACP location and all annunciator locations. Zone maps shall be large enough to read all devices easily and clearly indicate their location. All zone maps shall show only the initiating devices and correct and up-to-date layout of the entire building with correct room numbers. Zone maps shall be in wood frames mounted to the wall.

5. ALARM INITIATING DEVICES:

- a) Addressable Pull Stations - Pull Station shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key. Pull stations that employ a glass break rod, glass or plastic covers are not acceptable.
 - 1) All pull stations shall have a positive, visual indication of operation and utilize a key type reset.
 - 2) Construction: Pull stations shall be constructed of Lexan or other material; suitable to the installation environment with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches or larger. Stations shall be suitable for surface mounting or semi flush mounting as shown on the plans. Unless otherwise indicated on the drawings, pull stations shall be mounted 42" to 48" above finished floor to the operating handle.
 - 3) All boiler rooms shall have pulls stations at all exits.
- b) Analog Photoelectric Smoke Detectors: Photoelectric smoke detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density. Unless otherwise indicated on the drawings all smoke detectors shall be photoelectric type.
 - 1) Detectors must be the plug-in type, each having a separate base, to facilitate replacement and maintenance. When replacing a detector for maintenance reasons the detector must not require any special tools or programmer to set its address. When installed in a room, detectors shall be oriented so their alarm light is visible from the nearest door to the corridor, unless Remote Alarm Indicator light (RAIL) equipped.
 - 2) A smoke detector shall be required within 15 feet of main FACP, power extenders, NAC expansion panels and other control equipment.
 - 3) Spot type smoke detectors mounted within 12 feet of a walking surface shall have their built-in locking device activated.
 - 4) Unless suitably protected against dust, paint, etc., detectors shall not be installed until the final construction clean up has been completed. The Contractor at no additional cost to the Owner must REPLACE contaminated detectors.
 - 5) Identification of individual detectors is required by the unique number indicated on the Drawings. These device numbers, which must also be shown on the shop

drawings, shall be permanently affixed to the detector base. Identification labels must be printed labels with black lettering on a clear or white background. Handwritten labels or labels made from embossed tape are not acceptable. Labels must be large enough to read without the use of a ladder.

- c) Thermal Detectors: Thermal Detectors shall be intelligent addressable devices rated at 135°F and unless otherwise indicated on the drawings shall have a rate-of-rise element rated at 15°F. (9.4°C.) per minute. Thermal detectors shall use an electronic sensor to measure thermal conditions caused by a fire and shall on command from the control panel, send data to the panel representing the analog level of such thermal measurements.
- d) Duct Smoke Detector: In-Duct Smoke Detector Housings shall accommodate an intelligent photoelectric sensor as described elsewhere. The device, independent of the type used, shall provide continuous analog monitoring from the panel. When sufficient smoke is sensed, an alarm signal shall be initiated at the FACP.
 - 1) Installation: Duct detectors and related items shall be furnished and connected by the Division 16 (Electrical) Contractor but installed by the Division 15 (Mechanical) Contractor. Duct detectors shall be installed to be accessible for periodic cleaning.
 - 2) Where shown on the Drawings air duct/plenum detectors must have a Remote Annunciator Indicator Light (RAIL) located in the nearest corridor or public area and identified by an engraved label affixed to the wall or ceiling. RAILs shall be provided with a key-type or magnetic test switch.
 - 3) Duct detector sampling tubes shall extend the full width of the duct. Those over 36 inches long must be provided with rear support. The preferred method for doing this is to have the tube go through the far side of the duct, with the point of penetration tightly sealed to prevent air leakage around the tube. This facilitates smoke testing and tube cleaning. Duct smoke detector mounting position and air sampling tube orientation are critical for proper operation. The Manufacturer's detailed installation instructions and NFPA 72 installation instructions must be followed.
 - 4) At each duct detector a 12"x12" minimum access door, removable latched type, must be provided to facilitate sampling tube inspection and cleaning. Airflow direction must be permanently indicated on the duct, to help assure sampling tubes are installed and maintained in the correct orientation.
- e) Tamper Switches: Sprinkler system valve tamper switches are provided under Division 21. Provide monitor module as required on all valves including all post indicator valves.
- f) Flow Switches: Standpipe system water flow switches are provided under Division 21. Provide monitor module as required.

6. NOTIFICATION APPLIANCES:

- a) Where possible ceiling-mounted devices are preferred in areas other than corridors, especially in classrooms and conference rooms. Exceptions to this are that corridors shall have wall-mounted devices and small bathrooms may have wall-mounted devices. All ceiling-mounted devices shall have proper candela and spaced in accordance to the current NFPA 72.
- b) Strobe Lights shall be located as shown on the drawings. Strobe lights indicated for use at exterior of the building shall be mounted at the indicated elevation and listed for use in wet locations. Strobe lights shall have the following specifications:
 - 1) Voltage: Strobe lights shall operate on 24 VDC nominal.
 - 2) The flash rate shall not exceed two flashes per second (2 Hz) nor be less than one flash every second (1 Hz) throughout the listed voltage range of the appliance.

- 3) Wall-mounted appliances shall be mounted such that the entire lens is not less than 80 in. and not greater than 96 in. above the finished floor.
 - 4) Ceiling-mounted appliances shall be in accordance with the current NFPA 72.
 - 5) Spacing and candela of devices shall be in accordance with the current NFPA 72.
 - 6) Strobe lights are not required in stairs.
- c) Audible/Visual Combination Devices:
- 1) Wall-mounted appliances shall be mounted such that the entire lens is not less than 80 in. and not greater than 96 in. above the finished floor. Spacing and candela of devices shall be in accordance with the current NFPA 72.
 - 2) The standard audible evacuation signal shall be the three-pulse temporal pattern described in NFPA 72.
 - 3) Alarm notification appliance circuits are to be Class "B". The load connected to each circuit must not exceed 60% of rated module output. Shop drawings must show calculated NAC current draw and voltage drop at the EOL.
 - 4) Addressable audible/visual devices may be used only if they are compatible with the main FACP and do not require any additional panels.
- d) Speakers shall be located as shown on the drawings; speakers located outdoors shall be listed for wet locations. Speakers shall have the following specifications:
- 1) Voltage: Speakers shall operate on 25V or 70.7V RMS nominal.
 - 2) Programming: Speakers shall be field programmable without the use of special tools to provide multiple sound levels from 0.25 to 2.0 Watts.
 - 3) Sound Level: Speakers shall have a sound level of at least 90 dBA measured at 10 feet from the device and have a frequency range of 400 to 4,000 Hz.
- e) All Notification Appliances shall be clearly labeled with NAC panel, circuit number, and device number.

7. MISCELLANEOUS SYSTEM ITEMS:

- a) Addressable Dry Contact Monitor Module: Addressable Monitor Modules shall be provided to connect one supervised IDC zone (either Style D or Style B) of conventional Alarm Initiating Devices (any Normally Open [N.O.] dry contact device) to one of the Fire Alarm Control Panel Signaling Line Circuit Loops. Monitor modules shall be installed as required by the system configuration. All required monitor modules may not be shown on the Drawings.
- b) Two Wire Detector Monitor Module: Addressable Monitor Modules shall be provided to connect one supervised IDC zone, either Class A or B (Style D or Style B operation) of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device) to one of the Fire Alarm Control Panel Signaling Line Circuit Loops. Monitor modules shall be installed as required by the system configuration. All required monitor modules may not be shown on the Drawings.
- c) Addressable Control Module: Addressable Control Modules shall be provided to supervise and control the operation of one conventional Notification Appliance Circuit (NAC) of compatible, 24 VDC powered, polarized Audio/visual (AV) Notification Appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contract relay if the contacts are rated properly for the operation.
- d) Isolator Module:
 - 1) To minimize the impact of a wiring fault (short), isolation modules or (if the ceiling height is <10 feet) isolator base type initiating devices shall be provided as follows:

- a. After each 25 devices and control points on any addressable circuit.
 - b. For each addressable circuit that extends outside the building walls.
 - c. In or immediately adjacent to the FACP, at each end of the addressable loop.
- 2) These two isolators must be in the same room as the FACP and within 15 feet. But they shall not be mounted inside the FACP.
 - a. For loops covering more than one floor, install isolator at terminal cabinet on each floor (with additional isolator[s] on any floor with over 25 addresses).
- 3) Operation: Isolator Modules shall operate such that if a wire-to-wire short occurs, the Isolator module shall automatically open-circuit (disconnect) the SLC loop. When the short circuit condition is corrected; the Isolator Module shall automatically reconnect the isolated section. It shall not be necessary to replace or reset an Isolator Module after its normal operation.
- e) Door Hold-Open Magnets: Smoke doors are permitted to be held open by 24vdc wall mounted magnets powered by the FACP, and released upon alarm. The resulting current drain must either be included in the standby battery calculations or the system programmed to drop the door load upon loss of 120vac power (unless restored within 60 seconds). The programmer of the FACP must show documentation of this. Door magnets shall be suitable for mounting in a single gang electrical device box. They shall be furnished with keepers, door chains, and other accessories as required to properly hold open doors as indicated on the Drawings. Threaded rod may be utilized for spacing adjustment as specified in Door Hardware (not more than 5" in length) and must be compatible with the fire alarm system. Holding force of the magnet shall be appropriate for the door to be held open. Proper attachment of door magnet hardware to doors is the responsibility of the Division 26 contractor. Door hold open magnets shall operate in a fail-safe manner, i.e., the door shall release in event of a failure of voltage to the device. All magnets shall release on general alarm.
- f) The FACP shall have supervised bypass switches to be used by maintenance personnel that will individually bypass the audio/visuals, intercom tone, AHU Shutdown, smoke dampers, door holders, and elevator recall. All bypass switches will cause a trouble condition on the panel until restored to the normal position.

8. EMERGENCY VOICE/ALARM COMMUNICATIONS SYSTEM

- a) As indicated on the drawings provide emergency voice communication systems with the following characteristics and features:
 - 1) Systems with voice capability shall comply with NFPA 72 concerning one-way Public Address (PA) emergency communications, especially with regards to survivability requirements. Provide dual riser systems as required to comply.
 - 2) One-way voice/alarm systems shall be dual channel, permitting the application of an evacuation signal to one or more zones simultaneously with manual voice paging to the other zones. Communication zones shall be capable of being selected in any combination.
 - 3) Each floor, exit stairwells (one zone each stairwell), elevator lobbies per local code authority, elevator cabs, each area of rescue assistance, and large assembly space shall be a separate communication zone.
 - 4) Control module shall be provided, which contains a central oscillator motherboard, microphone inputs and dual channel mixer/pre-amplifier circuits necessary for proper system operation. Provide two (2) in-phase alarm oscillators and two (2) independent auxiliary oscillators. Provide Slow Whoop alarm oscillators which make a slowly ascending tone from 200 to 830Hz in 2.5 seconds.
 - 5) Dual pre-amplifier module shall provide continuous supervision of the dual pre-amplifier, dual alarm oscillators and microphone output levels. This module shall provide individual channel "trouble" LED's, automatic monitoring and switching for all system amplifiers.

- 6) A hand-held, push-to-talk microphone with self-winding five-foot coiled extension cable shall be recessed within a protective panel-mounted enclosure at the Main Control Panel. The microphone shall be a noise-canceling communication type with a frequency range of 200 to 4,000Hz.
- 7) A control switch module shall be furnished to provide manual access for authorized fire-fighting personnel of the audio control module functions. Include "all circuits", "manual alarm", "auxiliary 1 tone", "auxiliary 2 tone", "oscillator stop", and "audio trouble reset" pushbuttons.
- 8) Provide switches for manual speaker circuit selection.
- 9) Dual channel message player shall provide a prerecorded evacuation message and shall contain switching circuits, volume control, trouble indication, selection switches, test switch, and speaker.
- 10) Provide duplicate tone oscillators, pre-amplifiers, and power amplifiers. In the event of an amplifier, a pre-amplifier or a tone oscillator failure, the system shall automatically switch all functions performed by that failed unit to an assigned standby unit.
- 11) Normal amplifier power shall be a minimum of 125% of the full speaker load, per channel. For calculation purposes use the amplifiers continuous two-tone output rating and the designed power setting for each speaker. A copy of this calculation shall be provided as part of the submittals.
- 12) At least one back up amplifier shall be provided for each transponder location. The minimum backup power shall be equal to the largest amplifier served from the transponder. Failure of any amplifier shall automatically result in the defective unit being switched offline and replaced with the backup.
- 13) The system panel shall include a local speaker and switch for testing the prerecorded message.

9. VOICE AMPLIFIER CABINET (TRANSPONDER)

- a) Wherever a Voice Amplifier Cabinet (Transponder) is indicated on the drawings, provide a UL listed, modular, programmable, microprocessor-based network interface remote panel with the following features for a distributed network fire alarm system. The FTR shall control all notification appliance circuit extender panels within the zone of transponder service and/or auxiliary control outputs. Provide audible voice evacuation signal speaker amplifiers, dual channel paging amplifiers, intelligible voice drivers, power supplies, batteries, hardware, and standby amplifiers for capacity as required for the Base speakers, specified future Tenant devices, and 25% spare within Fire Alarm Transponder panels. The fire alarm transponder typical area of service shall include the floor the transponder is located on, and where transponder capacity allows, one floor above, and one floor below. Refer to the Fire Alarm Riser Diagram for additional information and transponder quantities.

10. WIRING:

- a) The manufacturer's recommendations for wiring shall only be used as a minimum requirement.
- b) All wire shall be new, UL approved and marked, and brought to the site in original packages.
- c) Wire insulation shall be one of the types required by NEC. All wires shall be sized per NEC for the load serviced. All wire shall be approved for fire alarm installations.
- d) "Pig tailing" and Tee Tapping is prohibited for all system circuits.
- e) Fire alarm signal line circuit shall be wired "Class A" and notification circuits shall be wired "Class B" with the end of line resistor clearly and permanently marked on the last device.
- f) Wire splicing should be at a minimum. Wire nuts and crimp connectors are prohibited. There shall be no splices other than by use of terminal blocks. Permanent wire markers

shall be used to identify all splices and terminations for each circuit. All junction boxes shall be painted red and labeled to indicate the circuits or function of the conductors contained therein.

- g) No wire run or circuit shall be longer than 80% of the maximum allowable length and power consumption for the wire size and application.
- h) All wiring shall be color coded in accordance with the following scheme, which shall be maintained throughout the system, without color change in any wire run:

1) Initiating Circuits, General	Red (+)/White (-)
2) Initiating Circuits, Smoke Detectors Only	Violet (+)/Gray (-)
3) Signal Line Circuit cable	Red jacket with Red (+)/Black(-)
4) Notification Appliance Circuits	Blue (+)/Black (-)
5) AHU Shutdown Circuits	Yellow (+)/Brown (-)
6) Door Control Circuits	Orange (+)/Orange(-)
7) Elevator Capture Circuits	Brown
- i) Detection or alarm circuits must not be included in raceways containing AC power or AC control wiring. Within the FACP, any 120 VAC control wiring or other circuits with an externally supplied AC/DC voltage above the nominal 24 VDC system power must be properly separated from other circuits and the enclosure must have an appropriate warning label to alert service personnel to the potential hazard.
- j) The system shall be electrically supervised for open or (+/-) ground fault conditions in SLC, alarm circuits, and control circuits. Removal of any detection device, alarm appliance, plug-in relay, system module, or standby battery connection shall also result in a trouble signal. Fire alarm signal shall override trouble signals, but any pre-alarm trouble signal shall reappear when the panel is reset.
- k) All connections at the FACP must be made by the Manufacturer's authorized, factory trained representative (rather than by the electrical contractor).
- l) All One-way Voice Alarm shall be wired with twisted pair copper conductors AWG 18 minimum in shielded cable, Belden 8790, West Penn 293, or equivalent. Cable jacket color shall be gray, with red (+) and black (-) conductor insulation. The shields shall be continuously connected from the amplifiers to the end of line. Tape the shield splice at each speaker and handset, to insulate from ground. All shields shall be single point grounded at the amplifier, unless prohibited by system manufacturer.
- m) Each speaker circuit shall be supervised so that an opening in any circuit will result in audible and visual trouble indication.
- n) Should the system be unable to transmit the pre-recorded message because of failure, the system shall automatically revert to the fire alarm signal transmission mode.

C. SYSTEM TESTING & DOCUMENTATION

- 1. Upon completion of the installation the Division 26 Contractor and the Manufacturer's authorized representative together shall perform a complete system test and submit test documentation to WCPSS. The test shall include but not be limited to the following:
 - a) All initiating devices shall be tested for alarm. Smoke detectors shall be tested with smoke.
 - b) All circuits shall be tested for supervision. Signal Line Circuits shall be tested for "Class A".
 - c) All sprinkler devices shall be test for alarm, supervisory, and trouble situation.

- d) All control circuits (AHU shutdown, door holders, dampers, etc.) shall be tested for proper operation on a alarm condition and for wire supervision.
 - e) Elevator recall functions shall be tested to ensure proper recall programming.
 - f) All notification appliances shall be tested for proper operation, synchronization, and supervision.
 - g) Check zone map for proper location of all devices.
 - h) Verify that devices and wire are properly labeled.
 - i) Verify that the addressable device's descriptive custom label at the panel corresponds to its actual location. Devices located at fire doors and corridors should have a room number reference (e.g. "Fire doors by room 103 L1S02" or "Exit by room 160 M3-21").
 - j) Verify proper system monitoring with SimplexGrinnell. Test that ALARM, WATERFLOW, SPRINKLER SUPERVISORY, and SYSTEM TROUBLE signals were sent and received properly.
2. After the initial test has been completed and the system is clear of trouble all test documentation including a printout of all custom labels and a NFPA 72 "Record of Completion" form shall be submitted to WCPSS for approval. At this time WCPSS representatives may perform a 100% functional test of the fire alarm system. The Contractor and the Manufacturer's authorized representative that installed the system must be present. Should the results of this test not be satisfactory to WCPSS representatives, then corrections will be made and a re-test will be required at the Contractor's expense.
 3. After WCPSS representatives have approved the system the A/E may schedule an inspection with the Authority Having Jurisdiction, Wake County Fire Marshal. The Contractor, Engineer and the Manufacturer's authorized representative must be present for this test.
 4. After successful completion of inspections and tests, the warranty period begins. In the event of malfunctions or excessive nuisance alarms, the Contractor must take prompt corrective action. The Owner may require a repeat of the Contractor's 100% system test, or other inspections. Continued improper performance during the warranty period shall be cause to require the Contractor to remove and replace the system.

D. SYSTEM DOCUMENTATION, TRAINING, AND MAINTENANCE

1. The contractor shall provide the A/E with three copies of the following:
 - a) As-built wiring and conduit layout diagrams, including wire color code and/or label numbers, and showing all interconnections in the system.
 - b) Technical literature (cut sheets) of all parts of the fire alarm system, control panels, modules, annunciators, communication panels, notification appliance panels, notification devices, initiating devices, power supplies, batteries, and any other devices that are connected to the system.
2. The Manufacturer's authorized representative shall provide a minimum of eight hours training for the Owner's designated employees in proper operation of the system and in all required periodic maintenance. Scheduling of training must be arranged to meet the Owner's schedule.
3. The instruction shall include a minimum of two copies of a written, bound training summary for future reference.
4. Basic operating instructions shall be framed and mounted at the FACP.

28 40 00 BI-DIRECTIONAL AMPLIFIER SYSTEM

A. GENERAL

1. WCPSS will use third party contractor for field survey, design, and installation of system.
2. A field survey shall be performed during the construction phase to evaluate the requirements of the system to be provided. The facility should be relatively complete with all walls, doors, and windows installed.
3. An allowance in the contract shall be utilized for the field survey, design, and installation of the system to be provided. Coordinate with WCPSS on exact dollar amount to be utilized. If system is deemed not required by the field survey, the remaining allowance shall be returned to WCPSS.
4. Electrical power for the BDA system shall be included in the base contract (not part of the allowance). All circuits serving system shall be connected to emergency generator.
5. Roof penetration for roof mounted antenna shall be provided above nearest IDF room in the base contract (not part of the allowance). Roof antenna location shall be on high roof elevation of building. Coordination shall be made with Wake County Facilities Design and Construction Representative.
6. The BDA System will require monitoring for fault issues. The design shall include criteria for an interface to the fire alarm system for point monitoring. Fault code monitor points shall be determined by the Designer with input from the BDA consultant and local AHJ.

B. SYSTEM TESTING

1. The objective of a functional performance test is to demonstrate that the system is operating according to the owner's project requirements, applicable code requirement, and contract documents. Functional testing facilitates bringing the system from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and function of the system.
2. The BDA system will be tested in accordance with the latest IFC (NCBC) Code Section 510.
 - a) The testing authority will provide a copy of the test results to the Owner to be included as part of the overall Commissioning exercise for building systems.
 - b) Testing shall include the fault/alarm points as defined per the design intent that that will be transmitted to the fire alarm front-end panel.
 - c) The testing authority will provide a copy of the test results to the Owner to be included as part of the overall Commissioning exercise for building systems.

C. SYSTEM DOCUMENTATION, TRAINING, AND MAINTENANCE

1. The contractor shall provide the A/E with three copies of the following:
 - a) As-built wiring and conduit layout diagrams, including wire color code and/or label numbers, and showing all interconnections in the system.
 - b) Technical literature (cut sheets) of all parts of the system and any other devices that are connected to the system.
2. The Manufacturer's authorized representative shall provide training for the Owner's designated employees in proper operation of the system and in all required periodic maintenance. Scheduling of training must be arranged to meet the Owner's schedule.
3. The instruction shall include a minimum of two copies of a written, bound training summary for future reference.

DIVISION 31 – SITE WORK

31 25 00 SLOPE PROTECTION AND EROSION CONTROL

A. GENERAL

1. GRADING: Shall allow for storm drainage away from building, parking areas, and driveways. Consider flow of concentrated storm drainage, design to slow down velocity below erosive or dangerous levels. Concentrated drainage across walks shall not be allowed, nor will ponding on walks, parking areas, or drives be allowed. Discharge from canopies shall be directed away from walks and tied directly into underground storm drain line system.
2. Top of finish grade next to exterior walls shall be set a minimum of 6 in. below top of finish floor except a building entrance locations.
3. All slopes shall be less than 1 in 2.5.
4. The recommended slope for paving is between 1% and 2%. Slopes in excess of 5% will not be permitted except in special circumstances where the Owner's prior approval will be required. ADA ramps at 12:1 slope is allowed, if properly designed to comply with ADA requirements. No vehicular or walkway path cross-slopes shall exceed 2% without Owner's prior written approval.
5. Do not stockpile excavations permanently on site. (except with Owner's prior written permission and with a permanent stabilized surface)
6. All cleaned topsoil shall be screened and stockpiled for site use or other use by WCPSS.
7. Site designers shall be required to use a 25 year storm frequency (not a 10 year storm frequency) in sizing site retention capacity (temporary and permanent). Volume shall be as required to reduce post-development peak flow to pre-development level as demonstrated by reservoir routing analysis of proposed conditions.
8. Site designers shall use a 25 year storm frequency when calculating site water flow rates for pipe system capacities unless there is a critical situation such as flooding the building or adjacent properties. Site designers shall be required to notify the Owner in writing of any and all critical situations. Designer shall confirm the safe passage of the 100 year frequency storm event.

31 31 16 TERMITE CONTROL

A. GENERAL

1. RE-TREATMENT AND REPAIR: If subterranean termite activity is discovered during warranty period, Contractor will re-treat soil and repair or replace damage caused by termite infestation, without cost to the Owner.
2. The Pest Control Subcontractor shall pay the entire cost of re-treatment if required by the North Carolina Department of Agriculture or if required to comply with these specifications including the costs of providing access to the soil, repair of resulting damage to concrete, and project delays.

B. PRODUCTS

1. Soil Treatment Solution: Use a non-repellent emusible concentrate termiticide for dilution with water, specially formulated to prevent infestation by termites. Provide a solution recommended by Applicator and acceptable to Architect and approved for intended application by the manufacturer and registered and approved by EPA and the North Carolina Department of Agriculture, Structural Pest Control Division. Use only soil treatment solutions which are not injurious to planting (i.e. TERMIDOR 80WG).
2. Acceptable products include those listed below:
 - a) Termidor 80 WG
 - b) Premise 75
 - c) WCPSS approved equal.
3. Warranty Period: 5-years from date of Substantial Completion

C. EXECUTION

1. Surface Preparation: Remove foreign matter could decrease effectiveness of treatment on area to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and foundations. Toxicants may be applied before placement of compacted fill under slabs, if recommended by toxicant manufacturer.
2. Mixing: Mix emulsible concrete termiticide into solution on site with confirmation by the Owner's testing laboratory.
3. Apply according to manufacturer's recommendations as approved by the Designer.
4. Apply termiticide at the following locations:
 - a) Perimeter Foundation Walls
 - b) Slab Penetrations
5. WCPSS reserves the right to request soil samples be taken by the North Carolina Department of Agriculture Structural Pest Control (919.733.6100). The pesticide recovery level must meet their minimum requirements prior to proceeding with construction.
6. Reapply soil treatment solution to areas disturbed by subsequent excavation or other construction activities following application.

DIVISION 32 – EXTERIOR IMPROVEMENTS

32 10 00 WALKWAY, ROAD, AND PARKING PAVING

A. GENERAL

1. **CONCRETE WALKWAYS:** Shall be minimum of 4 in. thick and 5 ft. wide with a broom finish. Use construction joints at a maximum of 5 ft. on center and expansion joints at a maximum of 30 ft. on center. Use wider walkways at entrances and bus and parent drop off areas.
 - a) Top of walks shall be flush with ground. Flare out walk surfaces at intersections.
2. **CONCRETE PAVING:** shall be made of reinforced concrete and a minimum of 6 in. thick on a 6" ABC Base. Where sidewalks are used for maintenance access they shall be reinforced/thickened to meet vehicular load requirements.
 - a) Paving be provided in front of dumpster pad locations and service docks for a minimum distance of 16 ft. and minimum thickness of 6 in. thickness reinforced concrete on 6 in. ABC or as per geotechnical report recommendations.
3. **ASPHALT PAVING:**
 - a) Driveways, heavy truck access and bus parking - surface course shall be a minimum of 1-1/2 in. Superpave S9.5A on 2 in. of binder course Superpave I19.0B on 8 in. compacted ABC base course. (may be adjusted based on geotechnical report recommendations)
 - b) Car parking areas - surface course shall be a minimum of 1-1/2 in. Superpave S9.5A 8 in. compacted ABC base course. (may be adjusted based on geotechnical report recommendations)
4. **PAVEMENT MARKING:**
 - a) Use only fast dry product designed for marking traffic lanes on parking lots and designating parking spaces and vehicular or foot traffic control markings. Acrylic water based ready mixed latex for use on asphalt or concrete exterior surfaces conforming to the following minimums.
 - 1) Pigment, percent by mass, ASTM D3723 45%
 - 2) Viscosity ASTM D62, 75 - 90 (ku)
 - 3) Non-volatile, percent by mass, FTMS 141, 40%
 - 4) Lead, mercury, chromates, 0%
 - 5) Dry to no pickup ASTM D711, 30 minutes
 - 6) Flexibility FSS TT-P-1952, no cracking or flaking
 - 7) Surface temperature at application, 120 deg. F maximum (surface dry and > 5 deg. F. above dew point)
 - 8) Two coat application
 - 9) Apply by brush, roller, airless sprayer
 - 10) Color: white or yellow standard. Blue or red may be used only if necessary for local code requirements.
 - 11) Certification: USDA approved.
 - 12) Thickness when dry, 6mL to 7.5mL.

- 13) Thermoplastic: The material shall contain at least 30 percent of graded glass beads by weight. It must contain enough titanium dioxide pigment to ensure a color similar to Federal Highway White, Color No. 17886 as per Federal Standard 595.
 - 14) The material must be resistant to deterioration due to exposure to sunlight, water, oil, gasoline, salt or adverse weather conditions.
 - 15) All thermoplastic striping shall be a North Carolina Department of Transportation (NC DOT) approved mix that minimizes the slipperiness of the marking surface.
 - 16) Provide MSDS sheet.
- b) Surfaces to be lined must be clean, dry, and free of dust, oil, grease, wax, rust, or bleeding stains, plus other foreign matter that could be detrimental to the adhesion of the coating.
 - c) Vendor will be responsible for surface preparation to achieve proper adhesion of coating.
 - d) Old traffic lines or line changes, not over painted, should be removed prior to application of the new coating. All new numbers, letters, symbols and markings must match existing shapes, sizes, and styles at that location. Black out charge occurs only when WCPSS directs a change in traffic pattern, numbering or words. Layout charges apply only when measuring and laying out new parking spaces or lots and not additional free running lines on pavement.
 - e) Care must be taken to achieve the specified dry film thickness. Uniform, even coats must be obtained. No thinning, cutting, or watering of paint will be permitted; manufacturer's application rate must be followed. Quality, durability, and neatness of work will be constantly reviewed throughout the contract period.
 - f) All stencilled letters and numbers shall be 12" unless otherwise directed.
 - g) The markings must be capable of conforming to pavement contours, breaks and faults through the action of traffic at normal pavement temperatures. The markings shall have resealing characteristics, such that it is capable of fusing with itself and previously applied thermoplastic when heated with a torch.
 - h) The surface must have a minimum skid resistance value of 55 BPN when tested according to ASTM E303.
 - i) Thermoplastic markings shall be in accordance with the latest edition of the "Manual on Uniform Traffic Control Devices for Streets and Highways" U.S. Department of Transportation.
 - j) Thermoplastic traffic line paint shall be a reflectorized thermoplastic pavement striping material applied to the road surface in a molten state by mechanical means. It shall have surface application of glass beads which, upon cooling to normal pavement temperature, will produce an adherent reflectorized stripe of the specified thickness and width.
5. All work shall be in accordance with the NC Department of Transportation "Standard Specifications for Roads and Structures" and the Asphalt Handbook Manual Series No. 4 (MS-4) 7th Edition. Compliance to these standards shall be verified with density testing by either core samples or nuclear density gauge at all paved areas, with particular attention given to bus driveways and parking areas. The testing shall be done by the Contractor and overseen by the Designer as required for reimbursement by the state.
 6. All pavements located in Triassic soils shall be designed in accordance with these specifications by a Professional Engineer with expertise in geotechnical engineering. These areas are shown on Attachment 32 10 00-A which includes all areas located west of the Jonesboro Fault Line.
 7. All materials, mixes and construction techniques shall comply with Section 1008, Aggregate Base Course for Stabilization, Section 610, Asphalt Concrete Plant Mix Pavements and

Section 620, Asphalt Binder for Plant Mix, of the North Carolina Department Of Transportation Standard Specifications for Road and Structures (2006). A job mix formula shall be furnished prior to the application of the asphalt.

8. CONCRETE CURB AND GUTTER:

- a) Shall be integral, one-piece curb and gutter with a broom finish. Height of curb shall be six inches and width of curb and gutter shall be a minimum of 24 in. Install construction joints at a maximum of 5 ft. on center and expansion joints at a maximum of 30 ft. on center. Extruded curb is acceptable; however, it shall be properly installed and back-filled. Use of extruded curbs installed on the surface of the roadway is unacceptable. Eliminate Curb and Gutter when possible to permit natural drainage.
- b) Shall be provided at all concrete and asphalt paved areas. The grade of driveway shoulders shall be flush with top of curb.

9. CONCRETE WHEEL STOPS: Precast, air-entrained concrete, 2500-psi minimum compressive strength, 4-1/2 inches high by 9 inches wide by 72 inches long. Provide chamfered corners and drainage slots on underside and holes for anchoring to substrate. No plastic or rubber wheel stops may be used.

10. WHEEL STOPS

- a) STOPS: Designer shall selectively provide wheel stops in selected parking areas to ensure that parked vehicles do not block side walks or other access ways and in any areas as required to protect lighting poles or other above surface structures in parking areas.
- b) ANCHORS: Galvanized steel, 3/4-inch diameter, 10-inch minimum length.

11. FIRE DEPARTMENT ACCESS ROADS: shall be constructed of asphalt per direction above. Coordinate location with authorities and with WCPSS Facilities Design & Construction Department.

12. GRAVEL SERVICE ROADS: Use of gravel surfaced roads is discouraged and requires prior written approval from the owner.

13. BUS ENTRANCE DRIVEWAYS: Shall have a minimum forty foot curb radius.

32 18 00 ATHLETIC PAVING AND SURFACE

A. GENERAL

1. Grading and marking of athletic paving and surfaces shall be in compliance with National Federation High School Association Standards as adopted by the North Carolina High School Athletic Association. Copies of the standards are available by contacting the NCHSAA at 919-962-2345 or PO Box 3216, Chapel Hill, NC 27515.
2. All construction shall comply with the general specifications provided by the United States Tennis Court and Track Builders Association, Baltimore, MD, unless more stringent requirements are indicated.
3. Track-surfacing shall be a recommended slope of 1%-2% towards in-field. This will require installation of concrete edging or curbs and underground drainage systems. Any concrete edging or curb must allow for passage of surface water off of track surface. At existing sites where such drainage systems do not exist, it is acceptable to slope 2% away from in-field. Two (2) 4 in. diameter empty conduits shall be provided under track installations for future water and power lines. Swells should be installed to divert water away from these areas.
4. No materials may be placed if the temperature is not at least 50 degrees F and rising.
5. The track shall be marked and measured by a professional track striper using specifications and guidelines approved by the appropriate governing body (NCAA, IAFF, NFSHSA). Certification of complying with NCHSAA standards by an installer of competent experience for striping of track shall be provided upon completion of striping.

B. MATERIALS

1. Provide a complete color coating system of patching mix, re-surfacer, texture color coat, finish color coat, and line paint from a single manufacturer. Tennis court surfacing shall be acrylic surface on 2 inches minimum S9.5A asphalt surfacing on minimum 6 inches of compacted stone base course.
2. Track surfacing shall be rubberized latex surfacing on 2 inches S9.5A asphalt surfacing on minimum 8 inches of compacted stone base course. SBR (styrene-butadiene rubber) rubber particles or EPDM (ethylene-propylene-diene rubber) rubber may be used for the surfacing. A primer or tack coat of Latex Binder mixed with clean, potable water shall be sprayed on the track surface at the manufacturer's recommended rate. Track color will be black and track surfacing will be a minimum of 1/2" thick. A final compatible surface coat to provide protection from ultraviolet light degradation and to provide additional wear resistance is to be applied.
3. Striping paint shall be approved acrylic latex and colors shall be as per NFSHSA standards or as selected by owner.
4. Basketball courts and hard surface play areas shall be 4 in. minimum reinforced concrete on compacted sub-grade is acceptable or 1 inch SASC F-1, (60 lb./sq. yd.) on 2 inches S9.5A asphalt surfacing on 8 inches of compacted stone base course.
5. Provide oval 220 yd. track with asphalt surface at elementary sites.
6. Playground surface materials – Refer to Guideline 11 68 13.

32 31 00 FENCING

A. GENERAL

1. Fencing is required for security around exterior mechanical equipment areas and for security and sport functions at tennis courts, volleyball courts, baseball fields, and softball fields. Where equipment enclosure fencing is adjacent to main buildings it is desirable for fence construction to match building construction.
2. Provide chain link fences and gates as complete units obtained from a single source including necessary erection accessories, fittings and fastenings. Dimensions indicated for pipe, roll-formed, and H-sections are outside dimensions, exclusive of coatings.
3. Mechanical Equipment Areas shall be enclosed with fence construction a minimum of 6ft. high. Provide clearance around equipment as required for service and operation. Gates shall be a minimum of 4 ft. wide. Enclosures shall meet local ordinance requirements.
4. [Fire Lane/Access Road Gate: Where a fire lane/access road is included in the design, a lockable access gate is required for vehicular traffic. See detail "Service Road Gate Detail" provided in Appendix C - WCPSS Provided Standard Details for basis of design.](#)
5. Tennis courts shall be enclosed with a 10 ft. high chain link fence with 4 ft. wide gates.
6. High school baseball and softball fields shall be enclosed with a 6 ft. high chain link fence with 14 ft. wide service and 4 ft. wide player gates. Crowd separation fences only need to be 4 ft. high. A 12 ft. high chain link backstop with a 4 ft. high foul ball screen set at 45 deg. shall also be provided at softball fields. At baseball fields the backstop shall be 18 ft. high and the foul ball screen shall be 6 ft. high. Dugouts shall be a minimum of 8 ft. high and the fencing between the backstop wing and the dugouts shall be a minimum of 10 ft. high. All framework on backstops and hoods shall be welded.
7. Middle School Softball Fields shall have an enclosure fence; however, a 10 ft. high chain link backstop with a 4 ft. high foul ball screen set at 45 degrees shall be provided.
8. Sand volleyball courts shall be enclosed with a 10 ft. high chain link fence with 4 ft. wide gates.
9. Subject to compliance with requirements, the following manufacturers are acceptable for use.
 - a) Allied Tube and Conduit Corporation
 - b) American Fence Corporation
 - c) Anchor Fence, Inc.
 - d) Page Fence Div/Page-Wilson Corp.
 - e) Cyclone Fence/United States Steel Corp.
10. Install chain link fence in accordance with ASTM F 567 and written installation instructions of fencing manufacturer to provide secure, aligned installation. Excavate postholes to minimum depth and diameter as recommended by fence manufacturer. Fill holes with concrete and set posts plumb, in line, and at proper spacing. Specify that no concrete is to be exposed above finished grade at fence posts.
11. Equipment enclosures made of chain link shall have posts set with-in perimeter of concrete pad. Concrete pad to be sloped to allow for proper drainage. Chain link equipment enclosures to have top, middle and bottom rails
12. All gates to be secured with padlock furnished by Owner.

B. MATERIALS

1. Fabric shall typically be No. 9 gauge (0.148 in.) finished size steel wires, 2 in. woven diamond mesh, with knuckled salvage at both top and bottom. Do not extend fabric above top rail any more than is necessary for attachment to rail. Furnish one-piece fabric widths. Fabric finish shall be galvanized, ASTM A 392, Class II, with not less than 2.0 oz. Zinc per sq. ft. of

surface or aluminum, ASTM A 491, Class II, with not less than 0.40 oz. aluminum per sq. ft. of surface.

2. Coated Fabric shall be No. 9 gauge (0.148 in.) finished size steel wires. The overall size of the wire shall be the wire diameter (0.148 in.) plus the coating thickness as specified.
3. Fittings and Accessories shall be galvanized, ASTM A 153.
4. Framing and Accessories shall be galvanized steel, ASTM A 120 or ASTM A 123, with not less than 1.8 oz. Zinc per sq. ft. of surface.
5. End, Corner and Pull Posts shall have minimum sizes and weights as follows:
 - a) Up to 6 ft. fabric height, 2.375 in. OD steel pipe, 3.65 lbs./lin. ft., or 3.5 in. x 3.5 in. roll-formed sections, 4.85 lbs./lin. ft.
 - b) Over 6 ft. fabric height, 2.875 in. OD steel pipe, 5.79 lbs./lin. ft., or 3.5 in. x 3.5 in. roll-formed sections, 4.85 lbs./lin. ft.
6. Line Posts shall be spaced 10 ft. on center maximum, unless otherwise indicated of following minimum sizes and weights:
 - a) Up to 6 ft. fabric height, 1.90 in. OD steel pipe, 2.70 lbs./lin. ft. or 1.875 in. x 1.625 in. C-sections, 2.28 lbs./lin. ft.
 - b) 6 ft. to 8 ft. fabric height, 2.375 in. OD steel pipe, 3.65 lbs./lin. ft. or 2.25 in. x 1.875 in. H-sections, 2.64 lbs./lin. ft.
 - c) Over 8 ft. fabric height, 2.875 in. OD steel pipe, 5.79 lbs./lin. ft. or 2.25 in. x 1.875 in. H-sections, 3.26 lbs./lin. ft.
7. Baseball and Softball backstop posts shall be 4 in. O.D. pipe, 9.11 lbs./lin.ft. Connecting joints of all framework at backstops shall be welded.
8. Gate posts shall be furnished for supporting single gate leaf, or one leaf of a double gate installation, for nominal gate widths as follows:

Leaf Width	Gate Post	Lbs./Lin. Ft.
Up to 6 ft.	3.5 in. x 3.5 in. roll-formed section	4.85
	or 2.875 in. OD pipe	5.79
Over 6 ft. to 13 ft.	4.000 in. OD pipe	9.11
Over 13 ft. to 18 ft.	6.625 in. OD pipe	18.97
Over 18 ft.	8.625 in. OD pipe	28.55

9. Top rail pipe sections shall not be less than 18 ft. long and shall be fitted with couplings for connected lengths into a continuous run. The couplings shall not be less than 6 in. long, with 0.070-in. minimum wall thickness, and shall allow for expansion and contraction of the rail. Open seam outside sleeves shall be permitted only with a minimum wall thickness of 0.100 in. Top rail shall pass through the line post tops. Top rail shall be securely fastened to terminal posts by either pressed steel or malleable steel galvanized connections.
10. Tension wire shall be 7 gauge, coated coil spring tension wire (metal and finish to match fabric) and locate at bottom of fabric.
11. Post brace assembly shall be provided as manufacturer's standard adjustable brace at end and gate posts and at both sides of corner and pull posts, with horizontal brace located at mid-height of fabric. Use 1.66 OD pipe, 2.27 lbs./lin. ft. or equal, for brace, and truss to line posts with 0.375 dia. rod and adjustable tightener.
12. Provide weather tight closure cap with loop to receive top rail; one cap for each post.
13. Stretcher bars shall be provided as one-piece lengths equal to full height of fabric, with minimum cross-section of 3/16 in. x 3/4 in. Provide one (1) stretcher bar for each gate and end post, and two (2) for each corner and pull post, except where fabric is integrally woven into post. Do not space stretcher bar bands over 15 in. on center, to secure stretcher bars to end, corner, pull and gate posts.
14. Fabricate perimeter frames of gates from minimum 1.90 in. OD pipe with finish to match fence providing security against removal or breakage connections. Provide horizontal and

vertical members to ensure proper gate operation and attachment of fabric, hardware and accessories. Space frame members' a maximum of 8 ft. apart unless otherwise indicated. Provide same fabric as for fence, unless otherwise indicated. Install fabric with stretcher bars at vertical edges and at top and bottom edges. Attach stretcher bars to gate frame at not more than 15 in. on center. Install diagonal cross bracing consisting of 3/8 in. dia. adjustable length truss rods on gates to ensure frame rigidity without sag or twist.

15. Provide hardware and accessories for each gate, galvanized per ASTM A 153. Hinges shall be of a size and material to suit gate size, non-lift-off type, offset to permit 180 deg. gate opening. Provide 1-1/2 pair of hinges for each leaf over 6 ft. nominal height. Latch shall be forked type of plunger-bar type to permit operation from either side of gate, with padlock eye as integral part of latch. Provide keeper for vehicle gates, which automatically engages gate leaf and holds it in open position until manually released. For double gates, provide gate stops consisting of mushroom type flush plate with anchors, set in concrete, and designed to engage center drop rod or plunger-bar. Include locking device and padlock eyes as integral part of latch, permitting both gate leaves to be locked with single padlock. Latch height must meet applicable requirements for ADA access.
16. Provide sliding gates with manufacturer's standard heavy duty inverted channel track, ball-bearing hanger sheaves, overhead framing and supports, guides, stays, bracing, hardware, and accessories as required.
17. Provide wire ties spaced 12 in. on center. For tying fabric to rails and braces, use wire ties spaced 24 in. on center. For tying fabric to tension wire, use hog rings spaced 24 in. on center. Manufacturer's standard procedure will be accepted if of equal strength and durability.
18. Provide concrete consisting of Portland Cement, ASTM C 150, aggregates ASTM C 33 and clean water. Mix materials to obtain concrete with a minimum 28-day compressive strength of 2500-psi using at least four (4) sacks of cement per cubic yard, 1 in. maximum size aggregate and maximum 3 in. slump.

32 80 00 IRRIGATION SYSTEM

A. GENERAL

1. Refer to Section 33 10 00.C.3 for irrigation backflow preventer requirements.
2. Use metered water supply so the amount of water used for irrigation can be subtracted from main meter to save sewage charges.
3. Use triple elbow swing joints at all heads.
4. Install metal identification tapes over all PVC lines, including non-charged drainage lines used for winterization.
5. Minimum 18 inches cover to top of main lines. Minimum of 12 inches cover to top of lateral lines. If lines cross under asphalt / concrete surface, a minimum of 24 inches cover to top of lines which should be placed in a schedule 40 sleeve.
6. Engineer shall require contractor to dimension actual location of all irrigation lines on as built drawings. A minimum of two (2) dimensions from building reference point shall be provided and a bury depth indicated.
7. Control Panel shall be installed minimum 3 ft from ground level and required to be within sight of the irrigated field.
8. Backflow preventer shall be provided unions. All above ground installations shall be within a heated enclosure with electrical outlet.
9. Irrigation lines shall be installed from goal post to goal post NOT across the field.
10. All underground piping installed for temporary watering become property of WCPSS and shall follow all above requirements.

B. EQUIPMENT

1. Use Toro, Rain Bird, or Hunter heads and compatible control panel and components that will not invalidate warranties for heads used.
2. Irrigation supply line shall be PVC SDR 21/PR200 type 1, grade 1 with PVC schedule 40 solvent weld fittings.

32 92 00 GRASS SEEDING

A. GENERAL

1. The Designer shall require the contractor to stage construction so all playground and athletic field grass seeding occurs early enough to allow grass to develop through one growing season prior to substantial completion. When substantial completion is scheduled for June through December, grass seeding shall occur prior to April 15. It will be the contractor's responsibility to fertilize, irrigate and cut the maturing grass until substantial completion. The areas of playground and athletic grass seeding along with scheduled seeding date shall be shown on Designer's Landscape Planting Plans.
2. At renovation/addition projects, the Designer shall require the Contractor to isolate and protect existing lawn areas not involved in the new construction.
3. Irrigation should be provided for front of school and athletic playing fields.
4. Areas immediately around the buildings and court-yard areas need to be sodded (Bermuda preferred) unless areas are to be irrigated. If lawn grass seeding cannot be done with Bermuda due to growing season restraints, a temporary seed mixture can be used but contractor is held responsible for returning to site and overseeding with Bermuda in the proper planting season (preferably April/May).
5. During the one-year warranty period, the contractor shall be responsible for all watering of grass to get them through periods of no rainfall or take responsibility to re-establish those areas which perish.
6. After weed eradication, rough grading and seedbed cleaning is done; limestone, basic fertilizers and any soil improving additions shall be well mixed into the top 4 to 6 in. of soil. This can be accomplished with a rotary tiller, disking, plowing or even spading. Amount of limestone application should be determined through soil testing. Following rate of basic inorganic fertilizers are recommended for seedbed preparation.
7. WCPSS shall review, test, and approve seedbed preparation and seeding methods prior to and during seeding.
8. All disturbed areas that are to be seeded or sodded need to have 3-4 inches of clean, screened topsoil applied to the surface prior to seed or sod application. It is expected that contractor should provide 95% coverage of all lawn and field areas prior to substantial completion.
9. Netting under sod must be removed. In no instance will anything extending above the surface be allowed in any sod areas.
10. Establishment of an acceptable lawn has been a dismal failure in most projects before yours. Accordingly, this area requires added attention in contract documents and project administration and supervision. It is essential that a well-established stand of grass is present when school first begins.
11. Contractor shall continue to pick up rocks and debris greater than ½ inch in diameter until occupants move-in and contractor demobilizes.

Application Rate:

Fertilizer	Pounds/Acre (minimum)
10-10-10	200
5-10-30	325
46-0-0	100

12. On final grading and starter fertilizer; check slope, remove all foreign materials and stones larger than 1/2 in. Level soil and roll with heavy (250-300 lbs.) roller. Keep soil damp, not dry or wet, when it is worked. Alternately rake and roll area until foot marks cannot be seen readily or they are less than 1/4 in. deep.
13. Apply starter fertilizer at a rate that will provide 1 to 1-1/2 lbs. of actual nitrogen/1000 sq. ft. Rake starter fertilizers into soil surface about 1 in. deep and proceed with grass seeding.
14. From time of seeding to substantial completion the Contractor shall keep maturing grass irrigated on a regular basis. This shall be a minimum of once a day until two (2) weeks after date of seeding. Thereafter, irrigation shall be done a minimum of once every week if less than 1/2" actual rainfall has occurred since last watering.

B. GENERAL

1. Lawn grass seeding shall be 7 lbs. of annual rye/1,000 sq. ft. from September 15 through March 30. From April 1 through June 15 seeding shall be Un-hulled Common Bermuda at a rate of 3 lbs./1000 sq. ft.
2. Athletic field grass seeding shall be composed of sod forming grasses. The best variety for the Wake County area is Bermuda. The first preference is hybrid Bermuda Tifton 419. Sodding has given best results with sprigging being satisfactory when given enough time to establish. Un-hulled Common Bermuda is next and should be seeded at 3 lbs./1,000 sq. ft. This seeding needs the entire growing season from April 15 through August 30 to develop. Annual Rye Grass can be planted during fall and winter months for temporary cover. Sod with netting underlayment must have netting removed.

32 93 00 LANDSCAPING PLANTING

A. GENERAL

1. Landscaping planting offers a cost effective means to enhance overall project appearance, provide privacy at outdoor learning areas and provide summer sun shading and winter wind breaks. All species should be of hearty, durable variety and require minimum maintenance. Do not use plants with thorns, or toxic foliage, flowers or fruit.
2. At renovation/addition projects, the Design shall require the Contractor to isolate and protect existing planting not involved in the new construction.
3. When mulching slope plantings in low visibility, for outlying areas, triple shredded hardwood mulch can be used to keep down costs. Do not use pine straw (costly to keep up). When slopes are in high visibility areas or slopes are greater than 3:1, landscape with trees and/or shrubs and/or a non-mow seeding such as Love Grass. Slopes of lesser grade can be seeded with Bermuda or annual rye grass to get them established. Contractor shall provide tree/shrub protection fence that is out at the drip line of the tree (anything closer and the tree roots could be damaged).
4. Plants sizes should be the minimum allowed by the local municipality requirements.
5. Tree, shrub, and ground cover planting shall have 8 in. minimum deep plant beds with incorporation of 5% by volume of decomposed organic matter. All plant beds shall receive an application of pre-emergent "herbicide" a minimum of two weeks before area is mulched. Application of pre-emergent "herbicide" must be witnessed in person by a representative of the Owner. All trees and shrubs shall be mulched with a minimum of 3 in. of brown-dyed mulch as specified herein. Islands in parking lots should be mulched in their entirety. They shall not be planted with grass.
6. All shade trees planted under or near power line shall be below them at mature height. At driveway and parking areas all trees shall be a height that lower branches will not obstruct motorists' line of sight.
7. All shrubs placed near buildings shall be selected from varieties so that at mature height the planting will not overgrow or obstruct vision from windows. All shrubs shall be planted 4 feet from any building walls. At driveway and parking areas shrubs shall be selected from varieties so that at mature height the planting will stay below the motorists' line of sight.
8. All trees shall be stabilized by using 3 stakes and guy wires. Attach guy wires to tree using fabric straps. Locate wood stakes inside of mulch bed to avoid conflict with lawn mowers. Contractor to be responsible for removal of all stakes, straps and guys within warranty period.
9. Pines planted for slope stabilization need to be loosely staked so that the stake can remain on them at least two years (so that the root can reorient and ties won't girdle the tree trunk). Use decomposable (maximum 3 year life expectancy) tree straps material only, no string or wire. Pines may be balled & bur-lapped staked, or bare root with no staking required. No containerized pines are allowed.
10. Slopes 3:1 or greater in low visibility front lying areas can be planted with non-mow vegetation; i.e. groundcover junipers (Parsons, Bar Harbor, preferred) or weeping love grass (Winter Jasmine or Forsythia can be added for interest) or daylilies but must be mulched with dyed brown mulch only. Pines or other evergreens can be used on slopes where screening is needed.
11. Shrubs in beds adjacent to curbs or service areas need to be planted at least 3 feet from the edge of curb so buses/cars do not run over them passing each other in a narrow drive.
12. Streetscape trees cannot be located under overhead lines.
13. Landscape design must be coordinated with designated security personnel.

B. MATERIALS

1. Tree, shrub and ground cover planting shall be drought-tolerant species specified where possible. See sections C, D, & E herein for preferred species and section F herein for species to avoid.
2. Imported fire ant control: In order to limit importation of Fire Ants, WCPSS prefers that local plants be used. However, whether local or imported from outside the area, plants shall be accompanied by a certificate stating "certified under all applicable state and federal quarantines." In addition, the specifications shall require that the Design Consultant shall inspect each shipment of plant materials for the presence of imported fire ants.
3. Mulch for trees and shrubs is specified as follows:
 - a) Raw Material: Mulch material should be comprised of at least 80% hardwoods (pallet mulch or cypress preferred) , with moisture content of 30% or less, and pass through a maximum screen size of 1 5/8". Raw material should contain no yard waste, construction debris, or any other extraneous material.
 - b) Mulch Colorant: Should be an iron oxide based colorant, and must be applied with "fogging" or spray technology (Becker Underwood Sahara System or equivalent) as opposed to an "immersion" or bath system.
 - c) Product Performance: Mulch supplier must present documentation showing colorfastness of finished material of at least 2 years without significant fading.

C. PREFERRED PLANT LIST

1. Acer Ginnala - Amur Maple
2. Acer Palmatum - Japanese Maple (protected location preferred). Inspect to make sure free of Gloomy Scales prior to install.
3. Acer Rubrum - Red Maple (all varieties)
4. Cedrus Deodara - Deodara cedar
5. Carpinus spp. - Hornbeam
6. Cercis Canadensis – Redbud (all varieties acceptable)
7. Cornus Kousa- Dogwood (all varieties-can use Cornus Florida but concern has been raised because of susceptibility to anthracnose - prefer Cornus Kousa)
8. Cryptomeria Japonica - Japanese Cedar, all varieties
9. Fagus spp. – Beech, only in large open areas due to mature size.
10. Ginkgo Biloba - Ginkgo-males only due to smell of fruit
11. Juniperus Virginiana - Eastern Red Cedar, all varieties
12. Lagerstromia Indica - Crepe Myrtle (mildew-resistant var., may also use dwarf or semi-dwarf variety)
13. Lagerstromia Faurieri
14. Magnolia Grandiflora - Southern Magnolia (may also use dwarf variety)
15. Magnolia Stellata - Star Magnolia
16. Magnolia Virginiana - Bay Magnolia
17. Magnolia X – Any of the saucer magnolias
18. Malus spp (all types of Crabapples, do not use near sidewalks or any paved areas)
19. Metasequoia Glyptostroboides - Dawn Redwood
20. Pinus Taeda - Loblolly Pine (Avoid planting near building or where they will overhang parked cars)
21. Pinus Thunbergiana - Japanese Black Pine
22. Prunus Caroliniana - Carolina Cherry Laurel
23. Prunus Cerasifera - Purple Leaf Plum
24. Prunus X'yedoensis - Yoshino Cherry
25. Prunus X'okame - Okame Cherry
26. Prunus serrulata 'Snowgoose' – Snowgoose Cherry
27. Prunus serrulata 'Kwanson' – Kwanson Cherry
28. Quercus spp. Oak (any except Willow Oak)
29. Quercus Virginiana – Live Oak
30. Salix babylonica – Weeping Willow (near stormwater ponds or wetlands)

31. *Taxodium distichum* - Bald Cypress, all varieties.
32. *Trachycarpus fortunei* – Windmill Palm (at focal points)
33. *Ulmus Parvifolia* – Chinese Elm (Lace bark preferred)
34. *Zelkova Serrata* - Japanese Elm

D. PREFERRED SHRUB LIST (avoid shrubs near playgrounds if code permits)

1. *Abelia Grandiflora* - all species. Do not use on Elementary campuses, near windows, on or around playgrounds anywhere, or near parked cars due to bees.
2. *Acuba Japonica* (variegated in shaded locations only)
3. *Azalea* sp (Encore types preferred)
4. *Barberry Thumbergii* - Crimson Barberry (dwarf variety only) -do not use on Elementary campuses or near windows or playgrounds anywhere. Do not plant near parking lot medians due to thorns and bees.
5. *Camellia* spp. – (shaded protected or partial sun locations only)
6. *Chaenomoles Japonica* – (where pruning is not needed; not near parked cars or playgrounds due to bees.)
7. *Chamaecyparis* spp. - false Cypress (all var.)
8. *Cleyera Japonica* - where pruning is not needed
9. *Euonymus Alatus* - Dwarf Burning Bush
10. *Forsythia* spp. - where pruning is not needed
11. *Gardenia* (all varieties)
12. *Hibiscus Syriacus* – *Althea* (not near windows or parked cars or playgrounds or anywhere bees may be a concern)
13. *Ilex* spp. - Holly - (All var. - Var. w/berries placed away from windows) -dwarf variety preferred due to no pruning needed.
14. *Illicium Parvifolium* - Anise Bush
15. *Jasminum* spp - (all var except climbers which may be poisonous)
16. *Junipers* spp (all except tall growing varieties)
17. *Lagerstromia Indica* - Dwarf Crepe Myrtle (mildew resistant variety)
18. *Leucothoe* spp (shaded location only)
19. *Mahonia* spp (Holly grape all var.) – (do not use on Elementary campuses or near windows or playgrounds at other campuses or near parking areas due to bees.)
20. *Myrica Cerifera* - Wax Myrtle – (where pruning is not needed; not near parking areas)
21. *Nandina Domestica* - (prefer dwarf var.)
22. *Osmanthus* spp. - Tea Olive (all var.) -do not use near any windows or playgrounds
23. *Pieris Japonica* - Andromeda - (shaded location)
24. *Pinus Mugo* - Dwarf Pine
25. *Prunus L. Schipkaensis* – Skiplaurel
26. *Rhododendron* sp - (shaded location only)
27. *Sarcococca* spp. (shaded location only)
28. *Sabal minor* – Sabal minor palm
29. *Spirea* spp. (all var.)
30. *Thuja* spp. (dwarf var. only)
31. *Viburnum* spp. (all varieties)
32. *Weigela Florida* (all var) -do not use on Elementary campuses or near windows or playgrounds at other campuses or near parking areas due to bees.

E. GROUNDCOVER LIST (avoid all ornamental grasses near buildings, play grounds, walkways and parking areas)

1. *Ajuga Reptans* - (shade only)
2. *Carex* (all varieties)
3. *Gardenia Radicans* (Trailing Gardenia)
4. *Helleborus* – Hellebore (all varieties)
5. *Hemerocallis* spp - Daylilly
6. *Hosta* spp - (shade only). Avoid where deer are an issue.

7. Jasminum Nudiflorum – Winter Jasmine
8. Juniperus - (prefer Procumbens and Parson varieties; do not use Shore, Blue Rug Blue Pacific, and Sargent varieties)
9. Mondo Grass – all types.
10. Ophiopogon Jap. - Nana Dwarf
11. Pachasandra-(shade only)
12. Phlox Subulata -(where spreading is not a problem)
13. Vinca Minor - (shade only)
14. Ferns – all varieties. Shade/partial sun.

F. PLANTS TO AVOID

1. Acer Platanoides – Norway Maple
2. Acer Saccharinum – Silver Maple
3. Acer Saccharum – Sugar Maple
4. Albizia Julibrissin – Mimosa
5. Berberis Julianne - Wintergreen Barberry
6. Betula Nigra - 'Heritage' River birch
7. Buxus spp. - Boxwood
8. Cotoneaster spp. - (all var.)
9. Crataegus spp. - Hawthorne
10. Cupressocyparis Leylandii - Leyland Cypress
11. Elaeagnus Pungens -Thorny Elaeagnus
12. Evonymus Fortuni - Wintercreeper
13. Fraxinus spp. - Ash
14. Gleditsia Triacanthos Inermis - Thornless Locust
15. Hedera Helix
16. Koelreuteria Paniculata - Golden-Rain Tree
17. Liquidambar Straraciflua – Sweetgum
18. Ligustrum spp. - all var.
19. Liriodendron Tulipifera - Tulip Poplar
20. Liriope - (avoid due to crown rot)
21. Lonicera spp. - Honeysuckle
22. Nerium Oleander - Oleander
23. Photinia Fraseri
24. Phyllostachys spp - and all bamboo spp.
25. Platanus spp. – all Sycamore
26. Poplus spp. - (all var.)
27. Prunus Calleryana "Bradfordii" – Bradford Pear
28. Pyracantha spp. - Firethorn (all var.)
29. Quercus Acutissima – Sawtooth Oak
30. Quercus phellos – (Willow Oak)
31. Raphiolepis Umbellata – Indian Hawthorn
32. Rosea - Rose (all var.)
33. Tsuga canadensis - Canaadian Hemlock
34. Yucca spp. - (all var)
35. All vine species unless in a school maintained garden area
36. All ornamental grasses near buildings, parking areas, or playgrounds.

DIVISION 33 – SITE UTILITIES

33 00 00 – SITE UTILITY SYSTEMS

A. GENERAL

1. A magnetic locator tape shall be installed at all underground non-metallic pipe installations. This tape shall be buried at a depth of 12 in. below top surface of earth and 12 in. below top of subgrade at pavements and walks. Coordinate with Local Authority having Jurisdiction for marking requirements.
2. Engineer shall require contractor to dimension actual location of all underground water lines on as-built drawings. A minimum of two (2) dimensions from building reference points shall be provided and bury depth indicated.
3. Show new and existing grade contours on plans.

33 10 00 – SITE WATER SYSTEMS

A. GENERAL

1. The following Design Criteria are general items that shall apply to the design of all site water systems including fire suppression systems and domestic water services.

B. WATER SYSTEMS

1. Underground water service: Basis of Design
 - a. Basis of Design:
 - 1) 2-1/2 in. and less: Type “K” copper with silver solder joints
 - 2) 3 in. and larger: Cement lined ductile iron ASTM C151 with mechanical joints except straight sections may be push-on joints.
2. Specify minimum 18 in. cover to top of pipe for 2-1/2 in. and smaller.
3. Specify minimum 48 in. cover to top of pipe for 3 in. and larger.
4. It is preferred to locate backflow preventer inside building footprint. If on-site, install in above ground, heated enclosure. Verify with Authority Having Jurisdiction about requirement for location.
5. Locate meter at property line and/or right of way line in non-traffic area.
6. Specify second water meter for irrigation service. This will be on separate water line from main building service.
7. Water tap and meter costs provided by Owner.
8. Vault costs provided by utility contractor.
9. Water meter deposits paid by Owner.
10. WCPSS is exempt from paying acreage fees.
11. Provide profile of water distribution lines to site from nearest source of municipal water with all interferences.
12. Fire loop around building shall be 8 in. minimum with fire hydrants spaced no greater than 300 ft. and parts of the building no more than 300 ft. from a hydrant.
13. Fire hydrants and valves shall be approved by local inspectors.

C. BACKFLOW PREVENTER

1. Backflow preventer shall be provided unions. All above ground installations shall be within a heated enclosure with electrical outlet. Refer to Section 26 05 33-B.3.i. for conduit requirements.
2. Domestic Water System: Refer to Section 22 11 00-D.10 for backflow preventer information.
3. Fire Suppression System/Fire Loop: Double Detector Check Assembly (DDCA) installed above ground in a vault or insulated cover. Verify with Authority having Jurisdiction about requirement for Reduced Pressure Detector Assembly (RPDA) requirement in lieu of DDCA.
4. Irrigation: Reduced Pressure Zone Assembly installed above ground in a vault or insulated cover. Watts LF909 or WCPSS approved equal.
5. Utility contractor shall provide heated enclosure.

33 20 00 - SITE SANITARY SEWER SYSTEMS

A. GENERAL

1. The following Design Criteria are general items that shall apply to the design of all site drainage systems including sanitary sewer services.

B. PRODUCTS

1. DUCTILE IRON: ASTM C 150 Class 50 with push on joints. Minimum size shall be 8 in. diameter piping.
2. POLYVINYL CHLORIDE (PVC) PIPE: ASTM D 3034, SDR 35 on Class I bedding. Minimum size shall be 8 in. diameter piping.
3. POLYVINYL CHLORIDE (PVC) SCHEDULE 40 PIPE: ASTM, D2665. Provide in sizes 4 in. through 6 in.
4. CAST IRON: ASTM A 74, hub and spigot service weight. Provide in sizes 4 in. through 6 in.

C. EXECUTION

1. Minimum cover in non-traffic areas shall be 3 ft.
2. Minimum cover in traffic areas shall be as follows:
 - a. PVC: 5 ft. minimum on Class I bedding.
 - b. Ductile Iron: 3 ft. minimum on Class I bedding.
3. Provide profiles of sanitary sewer between manholes.
4. Use laser instrument to install all exterior sanitary sewer lines.
5. Minimum slope of sewer lines:
 - a. 4 in. – 1.00%
 - b. 6 in. – 0.60%
 - c. 8 in. – 0.50%
 - d. 10 in. – 0.28%
 - e. 12 in. – 0.22%
 - f. Minimum flow velocity – 2 FPS
6. Maximum slope of sewer lines shall be 10%
7. Sewer lines shall be straight with uniform slope between manholes.

33 40 00 - SITE STORM WATER DRAINAGE SYSTEMS

A. GENERAL

1. The following Design Criteria are general items that shall apply to the design of all site drainage systems including storm water services.

B. PRODUCTS

1. REINFORCED CONCRETE PIPE: shall be ASTM C 76 Class III
2. POLYVINYL CHLORIDE (PVC) PIPE: **shall** be ASTM D 3033, Type PSP SDR 35 or ASTM D 3034, Type PSM, SDR 35. Minimum size shall be 8 in. diameter piping to prevent blockages.
3. HIGH DENSITY POLYETHYLENE (HDPE) PIPE: shall be smooth interior Type "S". HDPE pipe must be manufactured in accordance with ASTM F-2306, AASHTO M-252 and/or AASHTO M-294.

C. EXECUTION

1. The design consultant shall make the material selection for the storm drainage piping based on the products allowed as listed above that will result in a cost effective and technically acceptable design.
2. PVC approved nominal diameters are 8 in. and larger.
3. HDPE shall be installed in accordance with ASTM D-2321.
4. HDPE approved nominal diameters are 6 in. through 60 inches.
5. For HDPE piping applications, utilize an adapter to transition from HDPE piping to reinforced concrete flared end sections.
6. Reinforced concrete pipe is allowed for all pipe sizes 12 in. and larger located under paving and for all pipes over 36 in. in diameter. Proper bedding and compaction details for larger diameter PVC pipe shall be included in construction documents.
7. PVC is allowed for pipes 36 in. in diameter or smaller when not located under paving.
8. Discharge from all storm drainage piping shall occur in a controlled fashion and in compliance with local jurisdiction storm water guidelines.

33 50 00 - SITE UTILITY MANHOLES

A. GENERAL

1. All reinforced precast concrete manholes provided shall be fully warranted by the manufacturer for the conditions they are installed.
2. Provide manhole to make connections to 6 in. and larger sewer.
3. Use 4 ft. diameter precast eccentric manholes with 15 in. on center.
4. Use drop manhole if elevation of sewer line exceeds 24 in. above manhole invert elevation.
5. Manholes shall be spaced at maximum of 300 ft. apart.

B. PRODUCTS

1. MANHOLES: Shall be precast concrete round eccentric cone manholes, provided with interior steps at 16" on center and top grates and frames appropriate for the structural loads required. Use ONLY precast rings for raising manhole top elevation.
2. CLEANOUTS: A concrete pad (or pre-cast concrete "doughnut" in unpaved areas) shall be provided around all storm and sanitary sewer cleanouts. Size of pad to be 24" X 24" X 4" thick.

C. EXECUTION

1. MANHOLES: Covers of storm drainage manholes shall be set flush with top of surrounding paving or finish grade. Where required by local code, mount covers of sanitary sewer manholes 12 inches above finish grade in lawn or planted areas.
2. CLEANOUTS: Shall be installed within 10 feet of building wall or downspout location at all underground storm drainage lines, and cleanouts provided thereafter spaced such that a 50 feet "snake" line can be utilized for unclogging if necessary.