VOLUSIA COUNTY SCHOOLS
"LEADING WITH GRACE AND RESPECT"

7th Edition

April 2024

GUIDELINES
for
DESIGN AND CONSTRUCTION
of
EDUCATIONAL FACILITIES
for
THE SCHOOL BOARD
of
VOLUSIA COUNTY FLORIDA

FACILITIES SERVICES

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INTRODUCTION TO THE
GUIDELINES
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April, 2024

The purpose of this manual is to provide the design professional with a general listing of design criteria from a technical, facilities perspective. The manual is divided into chapters, which reflect the Construction Specification Institute (CSI) Master Specification Format. It is not the intent of this manual to direct design or insist upon any proprietary products, but merely to serve as a basis of quality and standardization needs for the district. Volusia County Schools Division 0 standards are available on the District website and are to be incorporated into your documents.

Design contracts awarded after April, 2024 shall comply with this document.

Design professionals are expected to incorporate the criteria set forth in this manual into all projects. Variances from the items listed herein should be coordinated with the VCS Construction Project Manager and confirmed in writing.

The VCS Construction Project Manager is the designee responsible for administering a project and is the Owner's Representative. All contact with the Owner and all direction to the Architect/Engineer shall be through this representative, herein after referred to as Owner.

Any comments, suggestions for improvements in the content of this manual are encouraged and always appreciated. We hope this guide will be of assistance to you and your staff and look forward to a successful project to improve the quality of education for the students of Volusia County Schools.

The acronyms below are abbreviations referenced throughout this manual.

ADA	Americans with Disabilities Act
A/C	Air Conditioning
A/E	Architect / Engineer
AGC	Application Generic Controller
AHU	Air Handling Unit
AI	Analog Input
AIA	American Institute of Architects
AMCA	Air Movement and Control Association
AMR	Automated Meter Reading
AO	Analog Output
API	Application Program Interface
ASC	Application Specific Controller
ASHRAE	American Society of Heating, Refrigeration & Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASCE	American Society of Civil Engineers
ASP	Application Service Provider
ASTM	American Society for Testing and Materials

AWG	American Wire Gage
AWI	Architectural Woodwork Institute
BAS	Building Automation System
BTU	British Thermal Unit
CAC	Custom Application Controller
CATV	Cable Television
CCTV	Closed Circuit Television
CFM	Cubic Feet / Minute
CHWR	Chilled Water Return
CHWS	Chilled Water Supply
CMU	Concrete Masonry Unit
CPU	Central Processing Unit
DC	Direct Current
DDC	Direct Digital Controller
DDE	Dynamic Data Exchange
DEP	Department of Environmental Protection
DI	Digital Input
DO	Digital Output
DOE	(Florida) Department of Education
DTMF	Dual Tone Multi-Functional
DWV PVC	Drain Waste Vent Polyvinyl Chloride
DX	Direct Expansion
ECC	Engineering Control Center
EEPROM	Electronically Erasable Programmable Read Only Memory
EIFS	Exterior Insulation and Finish System
ELL	Elbow
EMS	Emergency Management System
EMT	Electric Metallic Tubing
EP	Electric-pneumatic
ESE	Exceptional Student Education
FAC	Facilities (Volusia County Schools Facilities Services)
FACP	Fire Alarm Control Panel
FBC	Florida Building Code
FCC	Fire Command Center
FDOT	Florida Department of Transportation
FISH	Florida Inventory of School Houses
FMT	(Volusia County Schools) Facilities Maintenance Technician
FPA	Florida Product Approval
FS	Florida Statute
GA	Gauge
GC	Global Controller
GPS	Global Positioning Satellite
GUI	Graphical User Interface
HID	High Intensity Discharge
HTTP	Hypertext Transfer Protocol
HVAC	Heating, Ventilating and Air Conditioning
IDF	Intermediate Distribution Frame
IEEE	Institute of Electrical and Electronic Engineers
I/O	Input / Output
IP	Internet Protocol
ISA	The Instrumentation Systems and Automation Society

ISS	Intelligent Space Sensor
ITV	Intercom and Television
KMC	KMC Controls
LAN	Local Area Network
LC	Local Controller
LED	Light Emitting Diode
LVT	Luxury Vinyl Tile
MC	Metal Clad
MDF/IDF	Main Distribution Frame / Intermediate Distribution Frame
MEP	Mechanical, Electrical, Plumbing
MERV	Minimum Efficiency Reporting Value
MDF	Medium Density Fiberboard
NEC	National Electric Code
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NWMA	National Woodwork Manufacturers Association
ODBC	Open Database Connectivity
O & M	Operating and Maintenance
OSHA	Occupational Safety and Health Act
OTDR	Optical Time Domain Reflectometer
PC	Personal Computer
PE	Pneumatic-electric
PID	Proportional-Integral-Derivative
PLC	Programmable Logic Controller
PPM	Parts per million
PVC	Polyvinyl Chloride
RAM	Random Access Memory
RF	Radio Frequency
RH	Relative Humidity
RPZ	Reduced Pressure Zone
RTD	Resistive Temperature Device
SBS	Styrene - Butadiene - Styrene
SDI	Steel Door Institute
SI	System Integrator
SID	Supervisory Interface Device (Gateways)
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SMS	Short Message System
SMTP	Simple Mail Transfer Protocol
SPD	Surge Protective Device
SREF	State Requirements for Educational Facilities
ST	Single Termination
TAB	Test and Balance
TCP/IP	Transmission-Control Protocol / Internet Protocol
TUC	Terminal Unit Controller
TVP	Television Production
UC	Unitary Controller
UL	Underwriters Laboratories
UPS	Uninterruptible Power Supply
UTP	Unshielded Twisted Pair
VAC	Volts Alternating Current
VAV	Variable Air Volume

VCS	Volusia County Schools
VCSB	Volusia County School Board
WAN	Wide Area Network
WET	Web-Enabled Technology
XIF	External Interface File
XML	Extensible Markup Language

GENERAL INFORMATION / DESIGN ELEMENTS

1. These guidelines apply to all new, existing, renovations, remodeling, and maintenance projects for Volusia County Schools.

2. The forms in the "Form" section of this manual are PDF forms. To use this feature, extract the page, save to your computer, fill in the form, then print.

3. All design and construction drawings shall be no larger than 30" x 42". All details shall be clearly shown and accurately referenced on the construction drawing.

4. Upon successful completion of bidding and award of the construction contract the Architect shall submit the following to the Owner: two (2) complete printed sets of the final approved construction documents for bidding including plans, project manual and all addenda; and digital documents of all drawings on CD or other Owner approved file transfer protocol (FTP), in AutoCAD (.dwg format), and PDF, **read-only files are not acceptable.** AutoCAD drawings shall be bound drawings with no external references allowed; file names shall be identical to the sheet it represents (i.e.: A100.dwg, etc.). Include the Engineer's plot configuration, special fonts and digital images.

5. Prior to any demolition work, the Owner shall prepare a list of items to be salvaged by the Owner. Owner maintains first right of refusal.

6. A list of major codes (with date of each code) utilized on the project shall be included on the drawings.

7. Each project shall include a site plan or at least partial site plan showing relative locations of existing buildings.

8. The A/E Team shall comply and develop practical design solutions that are functional and cost effective as described in Florida Statute 235.002(1) b.

9. Volusia County School Board endorses and supports the Teaming Program and expects all design team members and construction team members to actively participate and work towards maintaining a positive relationship among all team members throughout the project duration.

10. All radon protection requirements shall be clearly noted and detailed on the construction drawings. The Radon Resistant Construction Guidelines published by Florida Department of Health and Rehabilitative Services, current edition, is recommended.

11. The structural floor plans shall clearly show all floor drain locations and the extent/limits that the concrete slab requires pitching towards the drain (i.e., emergency showers, mechanical rooms, etc.) The floor at all locations within toilet spaces shall be sloped to a drain.

12. Exterior wall assemblies shall be CMU construction with exterior bituminous damp proofing and rigid insulation with brick veneer, split face CMU veneer; all cavity systems shall include weep holes and flashing with mortar netting.

13. All exterior walls shall be continuous to the underside of the roof deck assembly. Do not design soffits venting into an attic space above interior spaces. Above ceiling spaces shall be designed airtight to prevent outside air from entering ceiling space. Roof insulation shall be designed in the roof deck assembly and not placed on ceiling assemblies.

14. Parapet walls shall not be used in design unless the roof membrane is continuous up to, and counter flashed by, the coping. The parapet wall shall not extend more than 2' above the adjacent roof elevation. The coping will be continuous along the cap line and not be of masonry / precast construction without written approval. Parapet shall not completely enclose a roof so as to prevent drainage to the eave(s).

15. Metal roof systems or roofs that drain over the perimeter face of the building shall be designed with gutters and discharge into an underground collection system, where applicable. Discuss and decide on a direction pertaining to this item with the Owner during design.

16. EIFS wall systems shall not be specified for any location.

17. Please note the difference between “owner furnished” and “owner provided”.
    A. “Owner Furnished”: the owner will specify and order the equipment and ensure that it is on site for the contractor to build-up, install and test.
    B. “Owner Provided”: the owner will specify, order, build-up, install and test.
    C. It is normally our intention to utilize “owner furnished” equipment.

18. A bronze dedication plaque will be specified on new construction and major redevelopment projects. An example can be found in the Attachments section of this manual.

19. Re-number buildings: if a project requires existing buildings to be re-numbered, the changes will need to be reflected on the electrical panels, fire alarm panel, intercom, energy management, security, local law enforcement, fire department, F.I.S.H., etc.

20. Contractor to provide Post and Placard Box for permits on jobs, as required.

21. A/E to check and review the most recent VCS Comprehensive Safety Inspection Report, Environmental Reports, Asbestos Reports, and ADA Survey for items that may be included in project design.

22. Maximum weight of a set of plans shall be 35 lbs. Break plans into sections so no one section exceeds this weight.

23. ESE changing tables will be Owner furnished equipment. A space shall be provided for one as required. Space shall be a minimum of 3’ x 6’-6” with one electrical outlet at the location.

24. Provide Key Management System to include lockable key cabinet or cabinets on new facility construction and on major renovation projects. Provide one space for each door. Provide key tags; include tags for fifty percent (50%) future expansion.

25. If domestic appliances are a part of the project, they should be included in the contract.

26. Assure door openings are sufficient for replacement or moving of appliances in and out. (Example: washers and dryers for the athletic department.) Provide double doors with removable center mullion, if required.

27. Provide document cameras for demonstration areas instead of demonstration mirrors (science class, demonstration kitchens, etc.).

28. Refer to FS 255.2575 for green building requirements for public schools.

29. Specify at least three (3) products for each item specified or note approved equal. Exception: door hardware, closers, panic / exit devices.

30. Any “Performance Specified” structural item shall be clearly listed on the A/E project plans along with the code criteria to which the plans are designed.

31. Verify that all products that require Florida Product Approval (FPA) are so approved before specifying. Provide FPA number for each such product on the drawing.

VOLUSIA COUNTY SCHOOLS

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DIVISIONS

FACILITIES SERVICES

DIVISION 0

BIDDING REQUIREMENTS, CONTRACT DOCUMENTS, AND CONDITIONS OF THE CONTRACT

1. The following represents the standard documents of inclusion for Division 0; in some instances, a note~~s~~ of explanation *(in italics)* may follow document title.

   A. Cover Page
   B. Table of Contents
   C. Index of Drawings
   D. Advertisement for Bid
   E. Instructions to Bidders
   F. Bid Form
   G. Bid Bond Form (AIA Document A310-1970)
   H. List of Subcontractors
   I. Bidder Project Data for Self-Performed Portions of Work
   J. Trench Safety Act Form
   K. Bid Protest Bond Form
   L. Standard Form of Agreement Between Owner and Contractor (AIA Document A101-2017)
      This document has been modified by VCS and should be used for projects with an estimate of $100,000 or more; should the design professional desire other modifications or items of inclusion he/she should present those to the VCS Construction Project Manager for review.
   M. Exhibit A – Insurance and Bonds
   N. General Conditions of the Contract for Construction (AIA Document A201-2017)
      This document has been modified by VCS and should be used in conjunction with the A101-2017 and the A133-2019; should the design professional desire other modifications or items of inclusion he/she should present those to the VCS Construction Project Manager for review.
   O. Standard Form of Agreement Between Owner and Contractor for a Small Project (FAC 625)
      This document should be used for projects with an estimate of $25,001 to $99,999.
   P. Contractor E-Verify Affidavit
   Q. Performance and Payment Bond
   R. Contractor's Direct Material Purchase Affidavit
   S. Contractor Acknowledgment Form (Asbestos Survey)
   T. Application and Certification for Payment (AIA Document G702-1992)
   U. Application and Certification for Payment (AIA Document G703-1992)
   V. Partial Receipt and Release
   W. Consent of Surety to Reduction in or Partial Release of Retainage (AIA Document G707A)

   AA. Consent of Surety to Final Payment (AIA Document G707-1994)
   BB. Contractor Affidavit
   CC. Receipt and Release

2. The documents and forms listed above are available at the VCS website or from the Facilities Design & Construction department.

DIVISION 1
GENERAL REQUIREMENTS

1. Typical general requirements may vary with the size and complexity of any given project; coordinate items of inclusion with the Owner.

2. Subcontractors shall be required to attend a pre-installation meeting with the Contractor and Owner before beginning their work.

3. The architect shall state in the contract documents all permits (i.e., School Board of Volusia County Florida Building Permit, Water Management District, Site, utility, Right of Way Access, etc.) that are applicable to each project.

4. The contractor shall coordinate all inspections required during construction.

5. As-built site drawings submitted to the Owner shall be certified by a professional land surveyor and clearly show all as-built conditions, elevations and utilities.

6. The contractor shall be required to submit a complete set of as-built drawings in AutoCAD and PDF format in addition to the field maintained record set, or copy thereof, as required in AIA Document A201.

7. The architect shall require the contractor to submit material safety data sheets for all hazardous products and make them available at the job site.

8. Subcontractors listed on bid form shall not be changed without Owner approval. List shall include contractor name, address, phone number and state license number.

9. The contractor is expected to work in a safe manner.

10. The utmost consideration to safety shall be given while working around students and staff.

11. Barricades shall be maintained where required while construction is occurring and checked regularly. Contractor is required to submit a safety barrier plan to the VCS Building Department before a Building Permit is issued.

12. Access to and from the construction area needs to be planned and agreed upon by all involved.

13. Clean construction debris daily.

14. Interaction with students and staff is prohibited.

DIVISION 2
SITE WORK

1. The following considerations shall be addressed in the site design of a school.

   A. The allowance of future building expansion and the accommodation of ten (10) portable classrooms (grading, circulation patterns, water, sewer, electric, fire alarm, intercom, ITV and computer stub outs.
   B. The development of circulation patterns that separate pedestrian from vehicular traffic, the bus drop off from parent drop off, and staff parking from student parking.
   C. Provide a minimum turn radius of 60' at bus loops with a double width lane where possible. Allow for adequate stacking of vehicles.
   D. Athletic areas should be easily accessible from parking (i.e. for community use).
   E. Main building entrances shall be readily identifiable.
   F. Building orientations, which conserve energy and allow for natural light and ventilation.
   G. Providing handicapped accessibility.
   H. The identification and preservation of natural site features.
   I. Site plans will be reviewed by local jurisdiction. This shall be coordinated with the Facilities Site Acquisition and Intergovernmental Coordination Department.
   J. Concrete pads for up to six (6) dumpsters shall be provided; gates for dumpsters (if provided) should be swing rather than roll type.
   K. Entrance gates should be swing rather than roll type. If the opening requires a roll gate due to the extensive opening length, see *Attachments* section – Heavy Duty Cantilever Slide Gate.
   L. Demolition on our sites will require permits from the VCS Building Department.
   M. Playground equipment is to meet VCS specifications available from the Maintenance Safety Department. Plan for level area with no underground utilities – one primary and one intermediate site location.
   N. Depending on complexity - consider GPS coordinate identifier for all valve boxes.
   O. Vegetation buffers and areas to remain uncleared shall be clearly noted on the drawing. The Contractor shall be required to protect these areas during construction.
   P. Consider the use of recycled crushed concrete as a substitute for lime rock.
   Q. Specify Siamese backflow preventors at domestic potable water service coming into facility from right-of-way. (See Division 22 Plumbing for more specific information.)
   R. Provide potable water isolation valves at each individual building.
   S. Specify concrete grease trap tank, unless otherwise directed by VCS Project Manager.

2. Construction/site clearing debris shall be disposed of off-site unless specifically noted otherwise. This shall be the basis for bidding. Burning tree/shrub debris may be permitted with Owner approval. Note for A/E: Should the Contractor determine that burning is allowable with the local fire authorities and the Owner feels that allowing burning would best serve the Owner's financial interest, a credit shall be received from the Contractor. The Contractor is responsible for permits. No burns allowed in location of future buildings.

3. Soil cement base shall not be specified without written approval by the Owner.

4. Type SP 905 asphalt shall be specified in all vehicular traffic areas. Consider the use of recycled asphalt whenever possible. Provide 1 ½" asphalt for general driveways and 2" asphalt in bus loop.

5. All PVC utilities and main irrigation lines shall have #10 GA copper tracer wire located directly above the line and terminate on a metal device accessible from the surface without excavation. In addition, plastic marker tape indicating the type of line shall be located no less than 2' directly above the utility line. The tape and wire/terminations shall be inspected by the Owner prior to backfill. On main irrigation lines provide marking tape halfway between pipe and grade.

6. "Free draining soils" shall be used for all fill material. "Free draining soils" are defined as: clean sand containing five percent (5%) or less by dry weight of material passing the US Standard No. 200 sieve size.

7. All storm water outfalls shall have protection grates and horizontal energy dissipation pads per FDOT specifications. All grates shall be hot-dipped galvanized.

8. Provide Florida Accessibility Code for Building Construction compliant foot traffic grates at all trench drains and inlets at areas of pedestrian traffic.

9. Site design shall have perimeter fencing and secondary fencing between buildings. If gates are required between buildings. See “Attachments” section on sheet A1.0 for gate details.

10. TENNIS COURTS

    A. Fencing shall be vinyl, black or green-coated galvanized fabric.
    B. Court shall run north/south.
    C. Surfacing shall be Plexi-Pave or equal over asphalt.

11. Chain Link fence shall be minimum 9 GA galvanized fabric thickness at all locations. All posts shall be set in concrete bases. Tension wire in lieu of bottom rail shall be specified for all locations. Top and bottom selvage shall be knuckled/turned into the fabric. Provide minimum one gate 60” wide all locations for lawn mower. Galvanize fabric prior to weaving. New fencing shall match existing fencing at an existing school / facility.

12. Athletic courts shall be asphalt. Provide basketball goals on courts.

13. All Exterior athletic courts shall have flexible base material specified. Soil cement shall not be specified as a base material for any exterior athletic courts.

14. In addition to bacteriological water testing that may be required by DEP, a minimum of 1 bacteriological test for the interior of each floor and building shall be taken at a point directed by the A/E and at the contractor’s expense.

15. The specification shall clearly state any requirements for DEP permit clearances prior to activation of any potable or waste water system service. The specifications shall clearly require the contractor to submit test results and sealed as-built site utility drawings to the engineer. Upon acceptance of the system, the engineer of record shall submit the request form and supporting documents to DEP for system clearance. The engineer shall enforce this requirement under the construction contract. The engineer will clearly specify any requirements for similar action for any systems that are under the jurisdiction of local municipalities and will enforce these requirements.

16. Refrigerant shall not be vented during demolition and shall be captured, handled and disposed of per DEP regulation.

17. Disposal of fluorescent tubes and magnetic ballasts shall be performed in accordance with Federal and State recycling regulations.

18. SITE DRAINAGE / GRADING

    A. The construction drawings shall clearly show (with appropriate spot elevations) finish grades in the areas of structures/buildings and shall be designed to shed surface runoff away from the structures/buildings. The A/E shall ensure that the finish floor elevations shall be a minimum of 8” above adjacent finish site grades to ensure positive runoff away from the structures/buildings and 12 inches (12”) above the base flood elevations.
        1) Provide finished grade elevations at designated playground areas.
        2) No water shall be designed to sheet flow over sidewalks from landscape areas or roofs; design to flow away from sidewalks.

B. Renovation projects shall be designed to make modifications to spaces and adjacent grades such that the above criteria are met. Swales and runoff collection systems shall be designed and clearly shown on the construction documents to ensure drainage away from all buildings.
C. Design for storm drainage away from buildings, parking areas and driveways. Consider flow of concentrated storm drainage, design to slow down velocity. Concentrated drainage across sidewalks shall not be allowed, nor will ponding be allowed. Discharge from roofs and canopies shall be directed away from buildings and walks or tied to an underground storm drainage system.
D. Take roof rain leaders to underground systems (when appropriate) utilizing a sleeve flush with grade.
E. Install storm drainage collection devices with a positive outfall in all areas where water can be trapped, especially in closed basin such as between buildings, interior courtyards and other similar conditions.
F. The contractor shall obtain a copy of the St. Johns River Water Management District drainage and driveway permits and comply with all provisions therein.
G. All storm drainage pipe installed shall comply with FDOT and Volusia County material and construction specifications.
H. As built drawings, signed and sealed by a Florida registered surveyor, will be required upon completion of the retention basins and storm drainage system. Drawings shall include all invert and grate elevations of all storm pipe and structures and representative top of bank and bottom elevations on the retention basins.
I. Do not use under-drains.
J. When sodding next to pavement or sidewalk, always set/lay the top of the sod ¾" lower than the pavement finish grade. This will prevent sod from trapping water on the pavement or sidewalks. Slope grade a maximum of three percent (3%) for first five (5) feet.
K. Sod the side slopes of a retention basin or swale to reduce erosion but seed and mulch the bottom to maximize percolation.

19. TERMITE PROTECTION

A. The general contractor will schedule a meeting, at the site, with the owner, architect and pest control operator to discuss procedures, chemicals and ratios of mix.
B. Termiticide treatments shall not be applied at existing facilities during occupied hours.
C. Termite protection chemicals shall be brought to the site in sealed containers and mixed on site with the Owner present. Owner to witness breaking of seal.
D. All applications are to be witnessed by the Owner. 24-hour notice shall be given to the Owner of scheduled treatments. Prior to application the contractor will be responsible for calculating the square footage, lineal footage and any other dimensions needed to determine the proper ratios of mix being applied.
E. If termite activity is discovered during the warranty period of five (5) years, the Contractor will re-treat soil and repair or replace damage caused by termite infestation, without cost to the Owner. The Contractor shall pay the entire cost of retreatment if required, including the costs of providing access to the soil, repair of resulting damage to concrete, and project details.

20. LANDSCAPE PLANTING

A. Xeriscaping no maintenance preferred; otherwise minimal landscaping.
B. All landscaping shall have root ball wraps cut back prior to planting.
C. A/E's are encouraged to consider sodding throughout entire site. Use proper sod to match soil conditions. Bahia sod shall be used unless other type is approved by Owner.
D. All spaces between newly placed sod shall be filled in with organic material, rolled and fertilized as deemed necessary.
E. Renovation/addition projects, the A/E shall require the Contractor to isolate and protect existing planting not involved in the project.

F. All species should be native to or acclimated to Central Florida, hearty, drought tolerant and require low maintenance (see attachments).
G. Warranty trees and shrubs through indicated maintenance period, and until final acceptance.
H. Warranty trees and shrubs for a period of one year from the date of substantial completion against defects including death and unsatisfactory growth, except for defects resulting from neglect by Owner, abuse or damage by others, or unusual phenomena or incidents which are beyond Landscape Installer's control.
I. Require Contractor to offer, as an alternate, a one-year maintenance contract for new landscaping.
J. To the extent possible sodded areas should be easily accessible for mowing.
K. Deciduous trees shall not be planted within fifty feet (50') of the perimeter of the building.
L. Landscape mulch shall be all shredded Cypress mulch.

21. ATHLETIC FIELDS

A. Baseball, Softball fields shall have a sand/clay ratio of 20/80 to 30/70 with surface additive.
B. Dugouts shall consist of aluminum canopy chain link fencing and aluminum bench on concrete pad.
C. Provide drinking water fountains at athletic fields.
D. Restroom facilities available for users of the athletic fields shall be within 400 feet (400') of bleacher locations.
E. Provide recessed hose bib (in valve box) in grass area directly behind pitcher's mound at baseball and softball fields.
F. All new tracks shall be of FDOT 9.5 SP asphalt mix (with rubber coating) and laid out in the metric system (400 meters).
G. Prefer a concrete apron curb at running tracks.

22. IRRIGATION

A. Irrigation systems shall be designed by the A/E and clearly detailed on the construction drawings. Irrigation systems designed by the installer shall not be allowed. Use Rainbird, Hunter or equivalent unless approved by the Owner.
B. Schedule 40 PVC pipe shall be specified for irrigation lines. Provide one inch (1") minimum supply line. All irrigation heads shall be pop-up type, regardless of application. Fixed head, stationary risers shall not be specified.
    1) New Irrigation lines connected to re-use water lines shall be "purple" pipe PVC.
    2) Existing irrigation lines connected to re-use water lines shall have purple sprinkler heads/caps.
C. All irrigation wells shall have as a basis of bid, one-hundred (100) feet in depth. A unit cost ($/FT of depth) shall be solicited for depths in excess of one-hundred (100) feet Pump and controls design shall be selected for ease of maintenance.
D. Sprinkler systems shall be directed away from buildings and shall not spray on buildings.
E. Existing systems should be evaluated and field inspected prior to new work being specified.
F. Sprinkler systems shall not spray on or across sidewalks, driveways, running tracks or courts.
G. Wipe clean all glue joints of excess adhesive.
H. The pipe edge should be tapered on PVC 2" and larger.
I. Irrigation Systems shall be designed and installed according to County Regulations (specifically the "Water Wise" ordinance 2004-2005).
J. At substantial completion, demonstrate a control wire integrity test, assuring the minimum ohm requirements are satisfied.
K. At substantial completion an Owner training session will be required.

23. Provide traffic grade caulking material over expansion joint material.

24. MARQUEE ELECTRONIC MESSAGE CENTER

A. Shall be located at the entrance/exit of parent pick up loop.
B. Basis of design
1. Watchfire double face twinpak (slim) 53”H x 99”W x 5”D.
2. Aluminum cabinet painted school color made as (1) unit (5) coat acrylic polyurethane map system by Matthews paint or equal.
3. 16MM RGB, 80 H. x 160 W. pixel matrix
4. Vents/fans for thermal management.
5. Ingress protection front/rear.
6. Light sensor photocell auto-adjust
7. (5) Year part / (10) Year available warranty
8. Provide control system software with training by manufacturer.
9. Provide AC surge protection.
10. Spare parts kit
11. One empty 1” conduit from message center to nearest IDF or MDF.

DIVISION 3
CONCRETE

1. Color/stained concrete shall not be used in design or specified without written approval.

2. ACI 318 and other code requirements shall be clearly noted on the construction drawings. The structural engineer of record shall verify this and any additional requirements (including all certifications) with the VCS Building Department.

3. Minimum 3000 psi at 28-days.

4. Location of all expansion/control joints will be shown on plans. Sawn control joints shall be cut as early as possible and with 24-hour maximum.

5. Owner's testing laboratory will perform field quality control tests and submit test reports. The testing service will make additional tests of in-place concrete when test results indicate need. The Contractor shall pay for the additional tests when unacceptable concrete is verified.

6. For under-slab vapor barriers use widest practical widths, lapping should be a z-lock not less than 6 inches wide with taped lap placed in the direction of the spreading of the concrete.
   A. Under-slab vapor-barrier shall be used under all slabs on grade.
   B. Under-slab vapor-barrier shall be used under all sidewalks and include welded wire mesh reinforcing.
   C. Wire mesh shall be supported by two (2") mesh-ups.

7. Specify tooled control joints for exposed concrete sidewalks or plaza areas. Saw cut tooled joints to achieve designed depth.

8. Use of fiber mesh prohibited without Owner approval.

9. Driveways shall be sloped or crowned to prevent water from draining across sidewalks.

10. Weight room floors shall be reinforced, six inches (6") thick, 4,000 psi concrete.

DIVISION 4
MASONRY

1. EXTERIOR WALLS

   A. Cavity wall (masonry veneer on concrete masonry unit back-up) construction. Veneer shall be of durable material, such as, brick or split-face block and should be maintenance-free and resistant to vandalism.

   B. Tilt wall system

      a. Foundation: The foundations for columns shall be monolithic spread concrete footings on compacted subgrade. Walls will be supported by concrete footings on compacted subgrade. The ground floor shall be concrete slab on grade.
      b. Walls: The walls are composed of a reinforced concrete tilt wall system.
      c. Roof: Roof framing consists of a steel deck on steel joists, steel beams, and reinforced concrete tilt wall system.
      d. Floor: Framing consists of concrete on composite steel deck on steel joists on steel beams and reinforced concrete tilt wall system.

      NOTE: Details of the Panel Wall Joint Detail #11, Thermal spray foam detail *Roof Detail #1* and *Typical Parapet-LWIC Detail* #5 are located in the "Attachment section.

   C. VCS ultimate design wind speed- 155 mph as referenced in "Additional Requirements" section – Volusia County Wind Speed.

2. INTERIOR WALLS

   A. Walls in student occupied spaces shall be of block construction. Eight-inch (8") block is preferred as it provides greater cavity space for conduit and plumbing. Other interior walls may be gypsum wallboard on metal studs. Impact resistant drywall eight feet (8') from finish floor. Finish of walls shall be latex epoxy paint, durable and easily cleanable.

3. Wall ties specified for brick veneer cavity wall systems shall be hot dipped galvanized hook and eye type. Corrugated metal ties and continuous joint reinforcing bridging the cavity space shall not be allowed.

4. Bituminous damp-proofing shall be specified as troweled, rolled or sprayed on application. If a sprayed-on application is considered acceptable, it shall be specified to be applied in no less than 3 separate coats per approved manufacturer's recommendations and verified to the Owner's satisfaction. Specify mill thickness in addition to number of coats (tolerances).

5. Brick or CMU veneer joints shall be tooled concave. Raked joints shall not be specified unless approved in writing by the Owner.

6. Weep hole shall be open head joints.

7. All exterior brick support angles where the underside of the angle is exposed (i.e., lintels, windows, etc.) shall be specified to be hot dipped galvanized or stainless steel.

8. All control/expansion joints shall be shown on the plans. Architect to show brick joints and engineer to show CMU joints. Engineer to provide all locations for control joints and expansion joints on approved documents.

9. Through-wall flashing systems shall be detailed on the drawings.

10. Split-face block shall be used as veneer only, not for solid unit load bearing walls.

DIVISION 4
MASONRY

11. Glass block will not be specified for any location without written approval.

12. The building code requires a clear air space between brick veneer and its supporting wall. The air space shall be a full one-inch minimum dimension, be open, and be clean (no mortar or insulation in the air space). Specification shall require the contractor to keep this air space clean during construction.

13. For consistency, use face of brick. Saw cut as needed. Avoid turning and using end of brick to eliminate color variations (zipper effect).

14. Sprayed on waterproofing for masonry restoration shall be water based only.

DIVISION 5
METALS

1. All structural steel welds shall be specified to be properly cleaned and coated with zinc chromate primer.

2. Steel members exposed to the exterior and weather shall be specified as receiving hot-dipped galvanized coatings. Fastening hardware to be hot dipped galvanized or stainless.

3. Structural steel specified shall have minimum yield strength of 36 ksi (ASTM 36).

4. Contractor shall be responsible for scheduling all weld testing per plans/specs and manufacturers recommendations.

5. All welding shall be done with a certified welder per applicable work and shall have current certification on site available to Owner.

6. All material per this division shall be stored off the ground.

7. Signed and sealed design drawings for any performance specified work of this division shall be required and shall be submitted to and approved by the VCS Building Department prior to the commencement of said work. Design drawings shall be reviewed and approved by the A/E and the construction plans submitted to the VCS Building Department.

8. Trusses shall be certified by a Florida Registered Engineer to meet wind load criteria of ASCE 7, current edition as adopted by the Florida Building Code.

9. Exterior soffit and facia shall meet Florida Product Approval as exterior components.

10. Structural design and placement drawings for all performance designed roof trusses, bar joists, and pre-stressed concrete tees/slabs shall be signed and sealed by a Florida Registered Engineer. Signed and sealed placement drawings shall be part of the specialty engineer's design drawing submittal.

11. All light gauge metal framing shall be designed by the A/E of record on the project plans.

12. Metal roof and floor deck shall not be fastened with pneumatic, or powder activated fasteners.

13. All dowels or anchor bolts set in epoxy require submittal to and approval by the VCS Building Department.

DIVISION 6
WOOD AND PLASTICS

1. Fire resistive treated lumber shall not be specified. For interior wall backing, use sixteen (16) gauge metal flat strap.

2. Bases for cabinets shall be 2 x 4 (minimum) pressure treated material.

3. All materials in cabinets shall be specified as seven 7-ply plywood (minimum), typical three-quarter inch (¾"), with the exception that doors may be specified as commercial grade high density particle board, three-quarter inch (¾") minimum meeting AWI standards. At sinks, marine grade plywood for counter top, typical 4 feet from center line of sink in both directions.

4. All exposed surfaces of cabinets shall be laminated in accordance with AWI standards. Three (3) millimeter plastic band on all exposed edges (door edge, drawer edge, etc.)

5. Miter protruding corners of counter tops.

6. All surfaces of cabinets that are not exposed shall have a balance sheet.

7. Reveal overlay five (5) knuckle hinges (.095") thick steel five (5) knuckle institutional grade quality (grade 1 per ANSI/GHMA A156.9). Hinge shall permit door swing 270 degrees. Doors less than 48" in height require two (2) hinges and doors over 48" height require three (3) hinges.

8. Pulls: Anodized aluminum wire pull must be eight (8) millimeter diameter with ninety-six (96) millimeters on center mounting holes.

9. Drawer Slides: Grade 1, bottom mount, ¾ extension, 100 lb. load rated, epoxy coated, roller bearing.

10. Shelf clips shall be inserted molded plastic, with double pin engagement, 32 millimeters on center and shall have ¾" and 1" anti-tip locking tabs.

11. The A/E shall ensure the coordination of millwork with the MEP items for proper heights and locations to meet all code and ADA requirements.

12. All millwork work shall conform to "Custom" grade as defined in the latest edition of the AWI "Quality Standards" unless detailed as a higher grade. Millwork shall not be delivered until the building and storage areas are sufficiently dry so that the millwork will not be damaged by excessive changes in moisture content.

13. Individual storage room shelves shall not exceed three feet (3') span between supports and be capable of supporting fifty (50) pounds per lineal foot.

14. Pressure treated wood shall not be exposed to contact.

15. The A/E shall design and detail the method / pattern of anchorage of wall cabinets to the wall.

16. Counter tops to be laminate or "Quartz"; "Corian" counter tops shall not be specified.

17. Casework manufacturer shall offer a five (5) year warranty to the owner against defective materials and workmanship.
18. Standard "cubbies" (see Attachments section – Elementary School Storage "Cubbies" Detail).

DIVISION 7
THERMAL & MOISTURE PROTECTION

1. PREFERRED ROOFING SYSTEMS

   A. Modified Bitumen (SBS) Roofing
      1) The roof system will have a minimum of one one-hundred-eighty-pound (180 lb.) inner-ply and one two-hundred fifty pound (250 lb.) cap sheet which will have a granular surface. Install roof system over minimum one-quarter (¼) per foot slope.
      2) Twenty (20) year total roof system warranty inclusive of roofing materials from roof deck to finish membrane. Provide non-deductible roofing warranty inclusive of all material and labor.
      3) If the manufacturer fails and/or refuses to issue the required roof warranty, the contractor surety shall make repairs or take corrective action as required of the manufacturer so that the intended warranty is delivered to the owner.
      4) Roofing contractor will contract either directly with Owner or indirectly as a subcontractor to warrant work against leaks and faulty or defective materials and workmanship for two years from final completion.
   B. Fleece Backed Single Ply Roofing Membrane fully adhered directly to light weight insulating concrete deck.
      1) Minimum twenty-two (22) gauge metal deck
      2) Twenty (20) year materials/Two (2) year Labor
      3) Manufactures
         a) GAF – PVC-KEE blend sheet (GAF EverGuard PVC XK 60-mil Fleece-Back Membrane)
         b) Johns Manville – Fleece-back (JM PVC FB with Elvaloy KEE Polymer)
         c) Soprema – PVC-KEE blend sheet (Soprema Sentinel KEE P150 HFB)
         d) Carlisle – PVC-KEE blend sheet (Carlisle PVC SureFlex KEE HP FleeceBACK)
         e) Fibertite – 45 mil FiberTite-SM-FB – KEE sheet
      4) Use manufacturer clad metals.
      5) Roofing contractor will contract either directly with Owner or indirectly as a subcontractor to warrant work against leaks and faulty or defective materials and workmanship for two years from final completion.
   C. Metal Roofing
      1) Metal roof system shall be installed with no less than two (2) and twelve (12) slope, with continuous panel run from ridge to edge installed over a solid deck design with a peel and stick membrane, i.e. Ice and Water Shield or equal.
      2) Twenty (20) year leak free system warranty.
      3) Roofing contractor will contract either directly with Owner or indirectly as a subcontractor to warrant work against leaks and faulty or defective materials and workmanship for two years from final completion.
      4) Provide a stainless-steel tie-off located near the ridge of sloped roofs. This tie-off should project through the roof and be designed to accept a safety harness hook. Load rating equals three hundred (300) pounds.
      5) Metal roof panels shall not be roll formed on the job site unless approved by the Owner. Metal roof panels shall be roll formed in the manufacturer's permanent factory and transported to the job site.
      6) All roof curbs shall be provided and installed by the roof system manufacturer and be designed for that specific roof system.
      7) All lighting arrestor system parts shall be secured to the metal roof standing seams with anchor clips acceptable to or provided by the roofing manufacturer. Do not "glue" anchors to the metal roof. Penetrations shall be kept to a minimum.
   D. Asphalt Shingle Roofing
      1) If chosen, asphalt shingle roofing systems shall be specified as a minimum, around a thirty (30) year architectural, fungus resistive shingle.
      2) Roofing contractor will contract either directly with Owner or indirectly as a subcontractor to warrant work against leaks and faulty or defective materials and workmanship for five years from final completion.
   E. All roofing is to meet a specific roof assembly per Florida Product Approval, per FS 553.

2. FLASHING AND SHEET METAL

   A. Aluminum: ASTM B 209-90, Alloy 3003, Tempe H14 AA-C22A41 baked on enamel finish 0.040" thick, at edge detail and 0.050" at coping.
   B. Stainless Steel: ASTM A 167-91 Type 304, soft temper, twenty-four (24) gauge thick, smooth 2B finish if not painted.
   C. Manufacturers laminated metal twenty-four (24) gauge stainless steel for all flashing areas on single ply roofs.
   D. All metal flashing shall meet current SMACNA guidelines.
   E. Metal decking scheduled to receive light weight concrete shall be designated G90.

3. Coping shall be aluminum or stainless steel and mechanically fastened to the structure.

4. Maintenance/walkway pads shall be specified around all sides of HVAC equipment on single ply and modified bitumen capped asphalt built-up roofs. (Contrasting color suggested).

5. Pitch pans shall not be used.

6. Avoid as much as practical roof mounted HVAC equipment.

7. Sprayed on waterproofing for masonry restoration shall be water based only.

8. Provide roof access hatches, ladders and fall suppression systems for high roof areas, example: auditorium roofs, gymnasium roofs, cafeteria roofs and multistory classroom roofs.

9. Conduit on roofs shall not be allowed.

DIVISION 8
DOORS AND WINDOWS

1. For aluminum windows, all extrusions shall be 0.125” minimum thickness with stainless steel hardware and fasteners, and impact glazing to have low E coating #2. Screens shall be included and specified as aluminum.

2. Architect shall specify hollow metal doors and frames in lieu of aluminum storefront. The use of heavy-duty aluminum entrance doors (store front) shall require the prior approval of the Owner.

3. Acceptable Manufacturers

	PRODUCT	ACCEPTABLE MANUFACTURER	ACCEPTABLE SUBSTITUTE
	Butt Hinges	Stanley	Hager
	Locksets, Latch sets, Privacy sets, Deadlocks, Cylinders	Schlage Lock Co.	None (School District Standard)
	Exit Devices (Panic Devices)	Von Duprin	None (School District Standard)
	Door Closers	LCN	None (School District Standard)
	Overhead Stops & Holders, Magnetic Holders	Rixon-Firemark	Glynn-Johnson
	Push Plates, Pull Plates, Kickplates, Wall Bumpers, Floor Stop & Holders	Rockwood Mfg. Ives	Quality, Brookline
	Threshold, Weather Strip, Transom Astragal, Sound Seal, Light Seal, Automatic Door Bottoms	Pemko Mfg.	Zero, Reese, Guard

4. Locksets for interior and exterior doors shall be ND-series with Primus interchangeable core. Provide keys as follows:

    6 Grandmaster
    4 Building sub-masters (per building)
    3 Classroom change keys (per classroom)
    3 Control keys

FUNCTIONS REQUIRED:

1. ND96 for offices, classrooms, storerooms, mechanical rooms, electrical rooms (NOTE: Electrical and mechanical rooms use tactile warning lever.)
2. ND85 for staff restrooms (this will be a single core, not primus key to C-145, provide emergency override key)
3. ND40 for individual and student restrooms (35-250 emergency key)
4. 99 Series for panic bars with 96 lever outside trim (If double doors, one with lever trim and one with no trim)
5. Aluminum gates cores (20-740-XP-262). We have zones - coordinate with VCS Project Manager.
6. Lever to be Rhodes Type
7. Interchangeable primus core (20-740) classic primus system for buildings.
8. Finish G626 (Satin Chromium)

Note: For new construction, major renovations, and door hardware replacement, use hardware type NDE, AD-400 or ND. Meet with VCS Project Manager to determine which type hardware to specify.

See “Attachments” section for details – AD-400 Networked Wireless Electronic Lock and NDE Mobile Enabled Wireless Cylindrical Lock.

DIVISION 9
FINISHES

1. Plaster and stucco lath shall be hot dipped heavy duty galvanized weighing at least 3.4 # / yd^2 (unless approved by the Owner). Stucco stops, control joints, etc shall be PVC.

2. Stucco finishes shall be specified as “sand finish” only, unless matching existing. Use alkaline resistant glass or polypropylene fibers 1/2” long.

3. Specify high impact dry wall in areas of corridors, cafeteria, and common spaces from finish floor up to 8 feet high.

4. Cementitious wallboard shall be specified for metal stud walls to receive tile in areas exposed to moisture.

5. Ceramic floor tile specified in restrooms shall be minimum 2” x 2” size, non-slip, with large radius cove base.

6. If a color banding or pattern in tile is desired, the banding / pattern shall be clearly detailed on the construction drawings. This also applies to LVT and carpet tiles.

7. Where quarry tile is specified, it shall be non-slip type with matching bull nose base.
   A. Provide a 4’ x 4’ sample to include cove base on two sides with corner detail. Sample to show texture, finish, thickness, coving material, etc.
   B. If floor drain is involved, sample board to include sloping to drain.
   C. Sample to be approved by owner and architect prior to start.
   D. All floor tile areas specify epoxy grout.

8. Poured epoxy flooring may be used in custodial rooms, mechanical rooms, electrical rooms or rooms where the public has no access (clarify areas with VCS).

9. Acoustic tile ceilings shall be 2’ x 2’, exposed grid with lay-in tile; moisture resistant finish in wet areas.

10. MODULAR CARPET

PART 1 – INTRODUCTION

10.1

A. This section serves as a specification guideline for providing project design services for VCS. The design professional shall provide construction documents for related projects and products which comply with the requirements and recommendations contained herein. Any request for clarification or to vary from the section requirements shall be directed to the VCS Project Manager.

B. The design professional and contractor shall comply with all resilient floor specification requirements stated herein. No variance from these guidelines shall be approved during the shop drawing process without prior written approval from the VCS Project Manager.

C. <u>Resilient Flooring Design Goals:</u>
Sustainability - It is in the best interest of VCS and our environment to utilize products that promote sustainability. Sustainability refers to the longevity of a product, the amount of recycled content, and if the product can be recycled at the end of its life.
Maintenance – It is in the best interest of VCS and our environment to utilize products with low maintenance. Maintenance refers to the initial and routine maintenance of applying a polish, wax, sealant or other type of topical finish; Limiting the amount of time and chemicals used to maintain the floor while not inhibiting its longevity.

D. Select colors and patterns that conceal scratches. White and off-white colors are not recommended. Luxury vinyl tile (LVT) with dark colors tend to show scratches more than medium or light colors. Solid color choices shall be limited to accent areas.
E. Resilient tile and sheet install direction, pattern, and seaming shall be clearly addressed in the drawings and specifications.
F. Transitions and moldings shall be clearly addressed in the drawings and specifications.
G. Expansion joint details, where required, shall be clearly addressed in the drawings and specifications. Expansion joints shall not be filled with underlayment and must be properly detailed with approved covers.
H. Carefully address new and existing furniture glides and casters, if applicable, to ensure they are the correct type for the flooring type specified.
I. Resilient floors are not allowed at building entrances, provide suitable finish flooring or walk-off carpeting where required.

10.2 Product Selection

A. The design professional shall submit, no later than the submission of the 50% construction documents, schedule information regarding floor tile location, color, material, size, gauge, as well as similar information for base and edging.
1. VCS must approve all resilient flooring and related products. Samples of all resilient flooring and related products as well as manufacturer's product literature must be submitted to and approved by VCS prior to the 100% construction document submittal.
2. Vinyl sheets to be used in clinic areas only.

B. See Part 3-Products for additional requirements and recommendations for specific products.

PART 2 – GENERAL

10.2.1 Summary

A. This section includes resilient tile flooring, resilient sheet flooring, resilient wall base, resilient stair coverings, resilient transitions, and related accessories. This section does not include Resilient Athletic Flooring.

10.2.2 Submittals

B. Product Data: Provide manufacturers complete product data for each type of resilient flooring material, underlayment, adhesive, and other installation accessories as required. Including:
Product data and test results as required in section 2.6 and part 3 of this specification.
Product data related to adhesive and other installation accessories.
Indicate type of installation method.
Sub floor preparation requirements and instructions.
C. Shop Drawings: Provide shop drawings, if required in construction documents, indicating seam locations, layout or pattern, tile install direction (quarter turn, ashlar, random, etc.) and sheet pattern direction for VCS approval.
D. Samples: Provide samples for verification purposes in the manufacturer's standard size, showing full range of color, texture, and pattern variations expected. Prepare samples from the same material to be supplied to the owner, when required by the project.
E. Warranties: The resilient flooring manufacturer shall provide copies of their sample warranties with their bids.

10.2.3 Closeout Submittals:

A. Maintenance Data: Submit manufacturer's recommended cleaning and stain removal procedures and maintenance schedule.

B. Warranty: Must include “proof of purchase” indicating original purchaser, installer, install dates, etc. as required by manufacturer to maintain proof of warranty. See also 2.8 Warranties.

C. Moisture Testing: Submit moisture testing results. See also Part 4.1 Subfloor Preparation, Section C Moisture testing.

10.2.4 Attic Stock:

A. Required Overages: Each project requires a percentage of USEABLE overage of the installed area, as listed below, for each type, color, and pattern; delivered, wrapped, and labeled. Floor manufacturer shall include the required amount of overage in their bids as follows:

1. Resilient tile and sheet:
   Less than 5000 sf ordered = 10% but not less than one box
   More than 5000 sf ordered = 5% but not less than 250 sf
   Sheet goods must be supplied in the largest roll width available, and overage should be one single piece meeting the percentages above.
2. Resilient wall base, stair coverings and related accessories:
   Less than 5000 lf ordered = 10%
   More than 5000 lf ordered = 5% but not less than 250 lf Wall base must be supplied in coils, not strips

10.2.5 Pre-installation Coordination:

A. Sub-floor Verification: The contractor shall visit the site and familiarize him or herself with the work to be accomplished. If verification of sub-flooring is required, the contractor shall, upon approval from the VCS Project Manager, remove a section of the existing flooring material as required and then patch and repair the section to match the original condition.

B. Pre-installation Meeting: A pre-installation conference shall be held prior to the removal of existing floor (if applicable) and subfloor preparation. The meeting shall include representatives from the sub-contractor that is installing, general contractor or construction manager, design professional and the VCS Project Manager. The following items shall be discussed:

1. Review existing conditions, presence of hazardous materials, existing floor removal, and sub floor preparation required.
2. Review installation requirements previously submitted including installation method and direction, adhesives, transitions, and seaming.
3. Substrate moisture testing results shall be discussed, see Part 4.1 Sub floor preparation, Section C Moisture testing.

10.2.6 Quality Assurance

A. Fire Performance Characteristics: Provide resilient flooring meeting or exceeding the following fire performance characteristics or the current requirements of the authority having jurisdiction, whichever is more restrictive.

a) Critical Radiant Flux:
   Test Method: ASTM E-648; NFPA 253.
   Rating: Class II minimum

B. Static Load (ASTM F970): All floors must have a minimum PSI of 250.

a) High traffic areas: corridors, lobbies, assemblies, classrooms, dining areas, lounges, elevators, and rolling zones require flooring materials with a preferred static load limit greater than 250 PSI.

C. Maintenance Requirements: Flooring materials requiring a polish, wax, sealant, or other type of topical finish shall not be specified on new projects. Flooring that requires a polish, wax sealer, or other topical finish shall ONLY be specified on

renovation projects which require patching and/or matching existing flooring materials.

10.2.7 Delivery, Storage, and Handling

A Deliver materials to site in original sealed factory wrap, clearly marked with the manufacturer's number, type, color, production run number, and manufacture date.

B Store materials in watertight and dry storage facility. Rolled goods are to be stood upright.

C Move materials into the space where they will be installed at least 48 hours in advance of installation. The permanent HVAC system should be fully operational and set to the minimum temperature and relative humidity as required by the manufacturer.

10.2.8 Warranties

A Manufacturer: Submit, for the VCS acceptance, manufacturer's standard warranty document executed by the authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights VCS may have under the condition of the contract documents. Below are the warranties required where applicable:

b) Sheet Vinyl & Solid Vinyl Tile: minimum 10-year commercial warranty, high traffic areas require products warranted for 20-years. High traffic areas are defined in Part 2.6 Quality Assurance, section B, number 1.

c) Vinyl Composition Tile (VCT), Rubber Tile, Rubber Sheet, & Resilient Stair treads: minimum 5-year commercial warranty

d) Resilient Wall Base: minimum 2-year commercial warranty

e) Resilient Accessories: minimum 1-year warranty for defects

B Contractor/Installer Warranty: The contractor shall provide VCS a written warranty guaranteeing all work performed under the contract for a period of one year after the date of substantial completion. In this written guarantee, the contractor shall agree to make all repairs or corrections required to maintain the completed work in first class condition for the one-year period at no cost to VCS.

PART 3 – PRODUCTS

10.3.1 General

A. All resilient flooring and accessories shall be of the same millrun to maintain consistency.

10.3.2 Entryway Flooring

A. Entryway Flooring: required at building entrances.

10.3.3 Resilient Tile Flooring

A. Vinyl Composition Tile (VCT), Vinyl Enhanced Tile (VET), or Quartz Composition Tile: Less than 34% vinyl content. Composition tile that requires initial and/or routine polish shall ONLY be specified on renovation projects that require patching/ matching to existing conditions.

1. Comply with ASTM F1066.
    1. Class 1 (Solid Color) or Class 2 (Through Pattern)
2. Color and Pattern uniformly distributed through thickness.

B. Solid Vinyl Tile (SVT): More than 34% vinyl content

1. Comply with ASTM 1700.
    1. Class I – Monolithic, homogeneous
    2. Class II – Surface decorated, heterogeneous, inlaid
    3. Class III – Printed film, luxury vinyl tile (LVT), or enhanced resilient tile (ERT)

2. Class III shall have a minimum 20 mil wear layer. High traffic areas are required to have a minimum 30 mil wear layer. High traffic areas are defined in Part 2.6 Quality Assurance, section B, number 1.
3. High traffic areas require a urethane wear layer that is reinforced with an aggregate. Acceptable forms of aggregate are ceramic beads, quartz, aluminum oxide, or diamond technology. The hardness of the coating increases respectively.
4. No initial or routine polish, wax, sealer, or other topical finish shall be required.
5. NOT recommended for: areas with spiked shoe traffic (cleats).

C. Resilient Tile Adhesive: Provide adhesive approved by the manufacturer for intended use condition. Pressure sensitive adhesive shall be used in most cases with the exceptions noted below.

1. Epoxy adhesive shall be used in areas subject to moisture such as flooring near water fountains, in a restroom, or near the coast where flooding may occur.
2. Use low VOC adhesives.

10.3.4 Resilient Sheet Flooring

A. Sheet Vinyl: Homogenous, through color/pattern vinyl without backing.
1. Comply with ASTM F1913 for homogeneous (no backing).
2. Seams shall be heat welded as required by the manufacturer and application. Color of weld rod shall match adjacent floor color and be provided by floor manufacturer.
3. No initial or routine polish, wax, sealer, or other topical finish shall be required.

B. Resilient Sheet Adhesive: Provide adhesive approved by the manufacturer for intended use condition. Pressure sensitive adhesive shall be used in most cases.

10.3.5 Resilient Wall Base:

A. Rubber Wall Base:

Comply with ASTM F1861
Styles B (w/toe) Type TS (thermoset rubber) or TP (thermoplastic rubber)
Group 1 solid (homogeneous) or group 2 layered (heterogeneous)
Continuous coil lengths ONLY.

B. Resilient Wall Base Adhesive: Provide adhesive approved by the manufacturer and suitable for the intended substrate.

10.3.6 Resilient Stair Treads:

1. Rubber Stair Treads: Include treads and treads with integrated riser.

a) Comply with ASTM F2169 for stair treads.
Type TS (thermoset rubber) or TP (thermoplastic rubber)
Class 1 or 2 (smooth or pattern),
Group 1 (abrasive strip) or 2 (contrasting color for visually impaired)

2. Resilient Stair Tread Adhesive: Provide adhesive approved by the manufacturer and suitable for the intended substrate.
A. Power tape and pressure sensitive tape installation methods are not allowed for stair treads.

10.3.7 Resilient Floor Covering Accessories:

A. Floor Covering Accessories: Includes transitions, reducers, adapters, nosing, stringers, and risers.
   1. Homogeneous.
   2. Power tape and pressure sensitive tape installation method not allowed for stair nosing.

PART 4 – EXECUTION

10.4.1 Sub-floor Preparation

A. General:
   1. Floors shall be free of all wax, grease, paint, oil or any other substance that would create adherence problems.
   2. Holes, cracks, and other depressions in the existing floor slab shall be filled or patched and brought to a true plane with underlayment or patching compound approved by the flooring manufacturer.
   3. Sub-floor irregularities shall be addressed properly to prevent excessive wear that would void the manufacturer's warranty.

B. Subfloors: Concrete slab shall comply with ASTM F710. Wood subfloor shall comply with ASTM F1482.

C. Moisture Testing: perform the following tests as required by the flooring manufacturers for new and existing concrete floors. Do not proceed with installation if reading measurements exceed the limits specified by manufacturer. Moisture mitigation or special adhesive is required if test results exceed manufacturer's specified limits.
   1. Moisture Vapor Emission Tests in accordance with ASTM F1869.
   2. Concrete Internal Relative Humidity Test using situ probes in accordance with ASTM F2170.
   3. 3rd party moisture testing is required for projects over 5,000 SF.
   4. Testing of sub-floor shall occur after the new concrete floor has fully cured, the building is permanently enclosed, and the HVAC system operating for the minimum time, temperature, and relative humidity as required by the flooring manufacturer.

D. Primer: if required by manufacturer, prior to application of adhesive.

E. Underlayment and Patching Compounds: Use only cementitious underlayment; patching compounds are used for filling cracks, holes, and leveling the floor. Provide as required and approved by flooring manufacturer.

10.4.2 Installation

A. Removal & Installation: Comply with manufacturer's requirements, guidelines, and recommendations in order to maintain manufacturer's warranty, including but not limited to:

   Removal of old adhesive, either mechanically or by encapsulation as required by manufacturer, prior to installing the new floor. See part 4.1 Sub-floor Preparation.
   Preparation of sub floor. See Part 4.1 Sub-floor Preparation.
   Base and molded corners shall be firmly adhered to walls and other vertical surfaces with tight joints. Base throughout its entire length shall have its top and bottom edges in firm contact with the floor and walls. Base shall be scribed accurately to molded corners and to door frames.

   1. Installing over existing resilient floors due to asbestos containing materials is decided by VCS on a case-by-case basis. Approvals must be obtained in written format from the VCS Project Manager. If no project manager is assigned to the project than approval shall be obtained from VCS Building Services.
      Remove existing wax or floor polish without chemicals and/or prime as required by the manufacturer of new flooring.

If existing floor is not asbestos containing material, it shall always be removed prior to installation of new floor.

B. Comply with the Resilient Floor Covering Institute's Recommended Work Practices.

10.4.3 Cleaning & Protection

A. Initial Wet Cleaning: Wait at least 48 hours after installation, or longer as required by manufacturer and adhesive, before performing the initial wet cleaning process.

B. Post installation: Comply with the following procedures after materials are installed:
1. Remove excess adhesive, seam sealer, paint and other surface blemishes using a cleaner recommended by the manufacturer.
2. Vacuum and remove all debris.

C. Protection: Provide floor protection as required by manufacturer after floor is installed. Including the following:
1. Restrict foot traffic immediately after installation for 72 hours or as required by manufacturer and adhesive.
2. Protect the floor with Ram Board or similar product approved by the manufacturer until construction is complete. Seams of protective cover shall be taped to prevent sand and other abrasive materials from damaging the floor.
3. Protect resilient floor during installation of furniture, furnishings, and equipment to prevent scratches from dragging or sliding items.
4. After protective materials are removed the floor should be inspected and any damage that occurred shall be repaired and the entire floor cleaned before acceptance.
5. Damage to the facility or surrounding property incurred by the contractor during any stage of resilient flooring installation shall be repaired and the damaged area restored to its original condition by the contractor at no expense to VCS.

10.4.4 Close Out Procedure

Submittals: The following items are to be submitted to the Owner at the end of the project:
1. See Part 2.3 Closeout Submittals
2. See Part 2.4 Attic Stock

11. Carpeting

PART 1 – INTRODUCTION

11.1 General

A. This section serves as a specification guideline for providing project design services for the Volusia County School District (VCS). The design professional shall provide construction documents for related projects and products which comply with the recommendations and requirements contained herein. Any request for clarification or to vary from the section requirements shall be directed to the VCS Project Manager.

B. The design professional and contractor shall comply with all applicable carpet specification requirements stated herein. No variance from these guidelines shall be approved during the shop drawing process without prior written approval obtained from the VCS Project Manager.

C. VCS reserves the right to test all carpet materials delivered to the site for compliance with specification requirements. The contractor will be liable for replacement should these materials fail testing.

D. Do not specify carpet on stair treads and risers unless approved in advance. Approvals must be obtained in written format from the manufacturer and the VCS Project Manager.

E. Select colors and patterns that alleviate soiled appearance. Medium to dark colors are preferred. Solid color choices shall be limited to accent areas.

F. Carpet install direction, pattern, and seaming shall be clearly addressed in drawings and specifications.
G. Transition and moldings shall be clearly addressed in the drawings and Specifications.
H. Expansion joint details shall be clearly addressed in the drawings and specifications.
I. Dye lot sizes shall be identified and clearly addressed in the specifications and drawings, preventing multiple dye lots from being installed in one room.

11.2 Product Selection

A. Product Type: The design professional shall be responsible for carpet type and color selection. Based on appropriateness of use, design selections shall be made from the following:
1. Modular Carpet: Recommended for general use and where additional cleanability, acoustical dampening and durability is desired. Modular carpet is also recommended where frequent carpet replacement is anticipated, where access to the substrate is necessary and where replacement of roll goods is impractical due to obstructions in the space.
2. Entryway Flooring: Required at all building entrances subject to high pedestrian or service traffic.

B. Use of Carpet: Carpet shall be applied to areas within projects according to the following recommendations:
1. Very High Traffic Zones –Use walk-off carpet or similar materials in the immediate vicinity of the doorway, elevator entrance or other highly concentrated traffic zone. As traffic concentration begins to be more spread out, transition to carpet using the recommendations below for high traffic zones.
2. High Traffic Zones – Modular carpet is recommended for high traffic zones where frequent carpet replacement is likely. These zones must be designed carefully and with respect to the challenges of each project, but in general, the designer should consider modular carpet in corridors, lobbies, atriums, classrooms, aisles, assemblies, lounges and similar spaces. Careful consideration should be given to the conditions of the transition of modular carpet to other types of carpets and flooring types.
3. Classrooms and Offices – Due to the severe use, likelihood of spills, and acoustical considerations, modular carpet is recommended for most classrooms and offices.

PART 2 – GENERAL

Summary

This Section includes carpet, carpet adhesive, and carpet accessories.

11.2.1 Related sections

Section 09 65 00 Resilient Flooring & Accessories (resilient wall base)

11.2.2 Submittals

Section 09 65 00 Resilient Flooring & Accessories (resilient wall base)

A. Product Data: Provide manufacturers complete product data for each type of carpet material, adhesive, and installation accessories as required, including:
1. Product data and test results as required in section 2.7 and part 3 of this specification.
2. Product data related to adhesive and other installation accessories.
3. Indicate type of adhesive (glue down, peel & stick tabs, etc.)
4. Sub floor preparation instructions.

B. Shop drawings: Provide shop drawings, if required in construction documents, indicating seam locations, location of dye lot changes, tile install direction

(quarter turn, ashlar, etc.) and broadloom pile direction for the design professional's approval.

C. Design Guideline Compliance: The carpet manufacturer or specifying design professional shall fill out the "Carpet Compliance Checklist," attached at the end of this document indicating compliance and submit it to the VCS Project Manager assigned to the project.

D. Samples: Provide samples for verification purposes in manufacturer's standard size, showing full range of color, texture, and pattern variations expected. Provide 2 additional samples to the VCS Project Manager for submittal to VCS Building Services for testing purposes. Prepare samples from same material to be supplied to the owner.

E. Warranties: The carpet manufacturer shall provide copies of their written warranties with their bids. See also section 2.8.

11.2.3 Closeout Submittals

A. Maintenance Data: Submit manufacturers recommended cleaning and stain removal procedures and manufactures maintenance schedule.

B. Warranty: Must include "proof of purchase" indicating original purchaser, installer, install dates, etc. as required by manufacturer to maintain proof of warranty.

11.2.4 Attic Stock

A. Required Overages: Each project requires a percentage of USEABLE overage of the installed area, as listed below, for each carpet type, color, and pattern; delivered, wrapped and labeled. Carpet manufacturer shall include the required amount of overage in their bids as follows:

1 sy – 1000sy ordered = 10% but not less than 25sy

1001 sy – higher ordered = 5% but not less than 50sy

11.2.5 Pre-installation Coordination:

A. Pre-installation Meeting: A pre-installation conference shall be held prior to the removal of existing floor (if applicable) and subfloor preparation. The meeting shall include the VCS Project Manager, the sub-contractor that is installing, general contractor or construction manager, and the design professional. The following items shall be discussed:

1. Review existing conditions, presence of hazardous materials, existing floor finish removal, and sub floor preparation required.
2. Review installation requirements previously submitted including installation method and direction, adhesives, transitions, and seaming.

11.2.6 Quality Assurance

A. General: Provide carpet identical to that tested as required below, by independent, approved testing agencies. All carpet supplied to each project under this contract shall comply with applicable testing and inspecting organization for each test required below:

1. Fire Performance Characteristics: Provide carpet meeting or exceeding the following fire performance characteristics or the current requirements of Building Code authorities, whichever is more restrictive.

a) Carpet Surface Burning Characteristics – small scale ignition test (Methenamine Pill Test):

Test Method: CPSC FF-1-70, 16 CFR Part 1630, or ASTM D-2859

Rating: Pass.

b) Critical Radiant Flux:

Test Method: ASTM E-648; NFPA 253.
Rating: Class I.

c) Smoke Generation Characteristics:
Test Method: ASTM E-662.
Rating: 0 - 450.

B. Appearance Retention Characteristics – Provide carpet meeting or exceeding the following:

d) Texture Appearance Retention Rating (TARR):
Test Method: Carpet and Rug Institute (CRI) Test Method 103 rated in accordance with ASTM D-7330 using ASTM D-5252(commercial hexapod).
Rating:
I. Severe Use (3.5 min. TARR rating) for corridors, assemblies, entries, lobbies, dining areas, and lounges
II. Heavy Use (3.0 min. TARR rating) for conference rooms, classrooms, staff and administration offices

b) Soil Resistance:
Treatment by fiber manufacturer

c) Stain Resistance:
Treatment by carpet manufacturer

C. Installer Qualifications: installer shall be approved by the flooring manufacturer and demonstrate a minimum of five (5) years of experience with similar materials, quantities, and complexity.

11.2.7 Warranties

A. Manufacturer: The manufacturer shall supply unrestricted, full replacement non-prorated warranties as listed below:

1. Wear: No more than 10% yarn loss by weight for a minimum of 15 years of carpet under normal use.
2. Edge Ravel: Guaranteed no edge ravel in normal use for a minimum of 15 years of normal carpet use.
3. Tuft Bind: Guaranteed not to zipper for a minimum of 15 years of normal carpet use.
4. Delamination: Primary and secondary backings guaranteed not to delaminate for a minimum of 15 years of normal carpet use.
5. Dimensional Stability: Guaranteed not to lose dimensional stability for a minimum of 15 years of normal carpet use.

B. Contractor/Installer Warranty:

1. The contractor shall give VCS a written, notarized warranty guaranteeing carpet installation and related work for a period of one year after the date of substantial completion. The warranty shall commit the contractor to making all repair and replacement including labor and materials at no cost to VCS.

PART 3 – PRODUCTS

11.3.1 Modular Carpet

A. Carpet Materials:

1. Construction: tufted – level or multi-level loop pile.
a) Tip shear allowable:

30% or less of the total pattern

Projects less than 10,000sf

Restricted to corridors not adjacent to entries, conference rooms, staff and administration suite or offices.

2. Yarn: Type 6,6 nylon
3. Dye method: 100% yarn dyed, 100% solution dyed, or a combination of yarn dyed, and solution dyed.
    a) Continuous and piece dyed: allowable in projects less than 10,000sf.
4. Pile yarn face weight: 18 oz per square yard or higher measured according to ASTM D-5848.
5. Average pile yarn density: 5500 minimum measured according to HUD/FHA UM-44d.
6. Gauge: 1/10, 1/12, 5/64, 1/16, or 1/20, measured according to ASTM D-5793.
7. Stitches per inch: 8.0 minimum measured according to ASTM D-5793.
8. Backing:
    a) Primary: Tufted – 100% reinforced synthetic, woven or non-woven
    b) Secondary: High performance, and moisture impermeable

B. Carpet Adhesive: Provide adhesive by the carpet manufacturer for intended use condition. No substitutions. All adhesive used for modular carpet tile shall be a releasable adhesive.

11.3.2 Entryway Flooring

A. Walk off carpet tile:
1. Contains reinforced nylon with polypropylene scraper fibers and yarns to remove dirt soil and moisture from shoes.
2. Moisture resistant hard back modular tile.
3. Entrance Mat Systems are not allowed.
4. Entrance Grilles & Grids are not allowed.

11.3.3 Acceptable Carpet Manufacturers

A. Manufacturers: Subject to the requirements of this specifications, provide carpet manufacturers as follows:
1. Interface
2. Mannington
3. Tarkett
4. Milliken
5. Other, if approved in advance

PART 4 – EXECUTION

11.4.1 Removal & Installation

A. Comply with manufacturer's requirements, guidelines, and recommendations in order to maintain manufacturer's warranty, including but not limited to:
1. Removal of old adhesive prior to installing new carpet.
2. Priming or encapsulating old adhesive prior to installing new carpet.
3. Preparation of sub floor.
4. Installing over existing resilient floors due to asbestos containing materials is decided by VCS on a case-by-case basis. Approvals must be obtained in written format from the VCS Project Manager.

a) Remove existing wax or floor polish without chemicals and/or prime as required by the manufacturer of new flooring.
b) If existing floor is not asbestos containing material, it shall always be removed prior to installation of new floor.

11.4.2 Sub-floor Preparation

A. General:

1. It is the responsibility of the flooring contractor to remove any existing carpet and pad prior to installing new carpet.
2. All surfaces on which the carpeting is installed shall be clean and free of dust, dirt, and debris. Floors are to be thoroughly swept and vacuumed by the carpet contractor before applying adhesive.
3. Floors shall be free of all wax, grease, paint, oil or any other substance that would create adherence problems. Cracks, pour joints, etc. are to be filled with a top-quality patching compound and finished smoothly. The carpet contractor, through the project construction contractor, shall notify the design professional and VCS of any flooring conditions that would prevent the completion of satisfactory work.
4. Any holes, cracks, depressions, or other imperfections shall be filled and brought to a true plane with non-shrinking grout.
5. The design professional shall inspect the surface preparation prior to the installation of the carpet.
6. Moisture tests of substrates are required prior to the installation of carpet. A satisfactory reading, conforming to the manufacturer's requirements, shall be obtained before installation is permitted.

11.4.3 Installation

A. General:

1. Comply with Carpet & Rug Institute (CRI 104) – latest edition of the Carpet Installation Standard.
2. Use low VOC adhesives unless specifically authorized by the VCS Project Manager.
3. Carpet shall not be installed prior to drywall installation.
4. All carpet edges exposed to view shall be finished with a metal strip or molding unless it abuts to a thicker LVT (Luxury Vinyl Tile) meant to eliminate transition moldings.
5. The contractor is responsible for coordinating material delivery and installation with the sequencing of the work. Carpet shall be installed using an installer, installation materials, i.e., adhesives, edging, etc., and methods approved by the carpet manufacturer.
6. All carpet shall be installed in strict accordance with the approved shop drawings.
7. Do not install multiple dye lots within one room.

B. Modular:

1. Contractor shall follow the floor pattern, tile direction, and adhesive type as submitted and outlined in section 2.3 submittals.
2. Ensure straight-square installations by applying at least two perpendicular chalk lines onto the substrate (at a 90-degree angle to each other). These chalk lines should extend the entire length and width of the area to be covered. A laser line can also be utilized for this purpose. The location and intersection point of the chalk lines should be determined to achieve the design intent and reduce waste.
3. Tile in the completed installation should be tight but not compressed with no visible gaps, peaks, or overlaps.

4. Rolling, if required by manufacturer, should be performed to press the tile into the adhesive.
5. Some modular tiles have pre applied adhesives (peel and stick) that have special floor preparation requirements. Consult the carpet manufacturer for recommended installation procedures and the use of primers, if required.

11.4.4 Cleaning & Protection

A. Post installation: provide the following procedures after materials are installed:
   2. As job progresses, surplus adhesive squeezed out between joints shall be removed.
   3. Remove excess adhesive, seam sealer, paint and other surface blemishes using a cleaner recommended by the manufacturer.
   4. Remove defective or long yarns protruding from surface.
   5. Vacuum and remove all debris.
   6. Any stains remaining shall be removed by approved methods.
   7. Upon completion of work, all wall base and edging shall be cleaned, and all foreign materials removed by approved methods.
   8. Damage to the facility or surrounding property incurred by the contractor during any stage of carpet installation shall be repaired and the damaged area restored to its original condition by the contractor at no expense to VCS.

11.4.5 Project Closeout

A. Closeout Submittals: the following items are to be submitted to the owner at the end of the project.
   1. See Part 2.4 Closeout Submittals
   2. See Part 2.5 Attic Stock

12. Band rooms shall receive anti-microbial carpet at instrument performing locations.

13. Rubber Textured Stair Tread: Type A Rubber, FSRR-T650E complete with pre-molded stair nosing.

    A. Gauge: minimum ¼”
    B. Manufacturer / length / nosing type color:
       1) Length shall be entire run of stair
       2) Pre-molded nosing types: square, round or adjustable nosing
       3) Color to be homogenous

14. Dance room and gymnasium floors shall be cushioned wood.

15. Ceramic tile on wall surfaces shall be full height if on metal studs and cement backer board, provide ceramic tile wainscot on block walls.

16. Vinyl wall coverings shall not be specified for any location.

17. Carpet shall not be used on vertical surfaces (completely or partially) as a wall finish or base.

18. No oil-based paints shall be used.

19. All interior wall surfaces shall be painted with acrylic semi-gloss for exposed concrete block, satin for drywall. Waterborne latex epoxy paint will be specified in corridors, restrooms, cafeteria, and common areas.

20. Exterior wall surfaces shall be painted with 100% acrylic paint.

21. Exterior doors, columns and trim shall be painted with 100% acrylic enamel.

22. Each coat of paint on surfaces shall be tinted slightly different from the previous coat to verify the application of subsequent coats.

23. Oil base wood sealer for gymnasium floors is acceptable. Provide proper ventilation.

24. If the project includes a weight room or other use that requires the use of rubber floor matting, they shall be designed into the project with care taken to provide proper transitions at door openings.

25. Weight room floors shall be strengthened (6” thick concrete 4000 psi).

DIVISION 10
SPECIALTIES

1. Architect shall utilize the *Accessibility Standards for Children's Environments* for additional recommendations/standards required in children's environments for disabilities (this information is available through VCS Facilities, Design and Construction).

2. The A/E shall coordinate the interior signage with the Owner, to ensure it is consistent with existing and proposed Florida Inventory of School Houses (FISH) designation. Room numbers on the drawings and on schedules shall be designated and accurately reflect FISH designations. The FISH number shall be specified for installation on the center of the door header (black background with white letters) in addition to the signage required by Florida Accessibility Code. The number on the header shall be affixed to the frame with stainless steel, vandal resistant screws. The Architect shall complete DOE documents necessary to update the FISH database as a result of a project's additions, renovations and / or demolition(s) and furnish to the Owner any revisions / additions on the Owner's schematic building and site plan in the following:

   A. One letter (8 ½" x 11") size print set (or other appropriate size)
   B. AutoCAD file(s) on CD or other appropriate digital device
   C. PDF file(s) on CD or other appropriate digital device

3. All rooms shall have a permanent identification sign at the appropriate location next to the entrance door to the room. Room name, room number and Braille characters shall be on each sign. Size of sign and characters shall meet FBC Accessibility / requirements. See "Attachments" section – Signage Requirements

4. All electrical, mechanical and systems rooms shall have a permanent sign on the entrance door stating, "No Storage Allowed".

5. "Exterior windows" - attach 4" vinyl classroom FISH number to the inside lower corner of each window. Coordinate with VCS Safety and Security.

6. All signage required by SREF and the Florida Building Code (FBC) shall be clearly detailed and locations shown on the construction drawings (i.e., Fire Alarm Pull Station Inside, Fire Extinguisher Inside, Secondary Egress, etc.).

6. Dedication Plaque will be located at entry to main office building. See "Attachments" section - Bronze Dedication Plaque.

7. WALKWAY CANOPIES

   A. Aluminum walkway canopies shall not be specified in custom extrusions.
   B. Aluminum walkway canopy shall have a minimum 0.7 mils finish.
   C. Walkway canopy lighting shall be specifically included with the electrical contractor. Electrical conduit shall be installed under the walkway and concealed with cover plates from fixture to fixture.
   D. Provide raised section for vehicular access to courtyards.

8. Accordion folding partitions shall have support structural details clearly delineated in the construction drawings.

9. Fire extinguisher cabinets shall not be located on the exterior of any building. A "FIRE EXTINGUISHER INSIDE" sign shall be used for exterior corridor type facilities as allowed in FBC Section 423. Fire extinguisher cabinets shall be non-lockable and have plastic lens rather than glass lens. Recess cabinets when possible.

10. Toilet room partitions shall be solid plastic type similar to "Santana Products, Inc."

A. Vandal & theft resistant hardware.
B. Stainless steel / aluminum hardware.
C. Cap sharp edges.
D. All privacy screens including urinal screens to be attached to floor with floor anchors.
E. Color: black marble preferred.

11. Inverted “V” or “Y” sight proof louvers and vents shall be used.

    A. All exterior louvers shall meet Florida Product Approval, per FS553.

12. Toilet and Bath Accessories

    A. Materials to be Stainless Steel, commercial grade, seamless welded.
    B. Single fold towel cabinets only.
    C. Polished Stainless Steel mirrors shall be specified for student toilet spaces in all schools.
    D. A bookshelf shall be provided in-group student toilet room.
    E. Heavy duty (institutional model) high volume hand dryers, minus heating element, preferred in group toilet rooms.
    F. ESE student restrooms may require special equipment. Coordinate with VCS Project Manager.
    G. Paper towel dispensers, toilet paper dispensers, and soap dispensers will be owner provided and contractor installed items.
    H. Sanitary napkin containers in all female adult and female child group restrooms

12. Exterior Building Letters and Building Numbers

    A. Letters and numbers are etched and giving a fine satin texture to receive anodic oxide coating that retards corrosion. Spray letters with two coats of clear high quality polyurethane.
    B. Pin mounted, ¾ inch standout, baked enamel finish.
    C. Letter and number style Twentieth Century.
    D. Material – cast aluminum.
    E. Installation method – projected mounted.
    F. Location and size – indicate on drawings.
    G. Baked enamel finish selected from manufacturers standard colors.
    H. Fabrication
        1. Cast lugs into back of character and tap to receive threaded mounting studs.
        2. Form individual letters by casting.

DIVISION 11
EQUIPMENT

1. All Owner furnished equipment shall be clearly noted on the schedules and construction drawings.

2. All permanent interior basketball goals shall be operable with an easily accessible electric winch and shall be provided with a safety strap.

3. Benches in locker rooms shall be permanent type. Wood or metal benches shall not be specified.

4. Exterior basketball goal posts shall have minimum wall thickness of schedule 40 with a hot dipped galvanized coating. Meet wind-loading requirements.

5. Revolving dark room doors shall not be used. Use a “maze” entrance hallway.

6. Cubical curtains shall not be full height or shall be provided with mesh uppers.

7. Changing tables, where provided, (clinic and full-time ESE class) shall be adult size with waterproof mat with a minimum weight capacity of 165 lbs. Tables shall be electric powered with height adjustment from 25.5” to 39” above finished floor.

8. Exterior benches shall maintain minimum corridor width criteria.

DIVISION 12
FURNISHINGS

1. Metallic, vertical or horizontal blinds shall be specified for all interior windows. Plastic type shall not be specified.

2. Manually operated roller shades with single rollers for all exterior windows. Specify manual roller shades by one of the following manufacturers, as basis of design:
    a. Draper, Inc.
    b. MechoShade Systems
    c. Hunter Douglas
    d. Inpro Corporation
    e. Levolor Contract

    Shade material – light blocking fabric.

3. Telescoping bleachers shall be extended / recessed through a motorized system. Designs shall utilize modular systems in lieu of custom manufactured type. Wheelchair seating area shall be permanently open for wheelchairs; not convertible regular seats.

3. Provide heel-proof FBC Accessibility compliant, recessed foot grilles at direct entry doors into a wood gym floor.

4. Medicine cabinets shall be lockable.

5. Provide locks on all laboratory casework doors and drawers.

6. Entry way flooring walk off carpet tile shall be installed at all exterior high traffic entrances (see Division 9 - Finishes).

DIVISION 14
ELEVATORS

1. School elevators shall be key operated (provide 12 keys) or keypad operated as well as being capable of being operated normally.

2. A cargo elevator with an extended ceiling height should be considered.

3. Tile flooring.

4. A bumper approximately eighteen (18) inches above floor shall be provided to protect walls from handcarts, etc.

5. Do not use elevators that have priority operating systems. They must use a universal operating system program accessible to any service company.

6. A five-year service warranty shall be provided.

7. ELEVATOR TELEPHONE STANDARDS

   A. When the emergency push button is pressed, the elevator emergency phone will activate the line and place a call to a pre-programmed telephone number. If during the dialing process the number does not answer the call, the elevator emergency phone can be set to dial an alternative number. The elevator emergency phone will cycle between the programmed emergency numbers until it connects a call. Once this happens the digital voice announcer messages is given (so the remote party knows the location of the emergency). Communication is now established between the remote party and the location of the elevator emergency phone.
      1) The emergency telephone can be programmed remotely from any Touch Tone telephone.
      2) The emergency telephone must have the capability of dialing more than one emergency number automatically. If a Ring no answer call is detected, the phone will try dialing with the next available number, until a call is connected.
         First Emergency telephone number to Security:
         From the Westside of Volusia County 8-1-386-943-7626
         From the Eastside of Volusia County 9-226-7852
         Second Emergency telephone number: 9-911
      3) The emergency telephone must have a voice announcer included as a standard, which is used to identify the location of the calling elevator. The message is recorded directly from any remote touch tone telephone (DTMF). The voice announcer message format is school name, building number, and a detailed description of the elevator location. Example voice announcer messages: "This call is being placed from the Deland High School elevator located in building 1, South side, the Auditorium".
      4) Elevator emergency phone telephone system must meet all code requirements.

   B. Suggested elevator equipment room station cable termination requirements.
      1) Horizontal distribution of voice cabling shall be via 4 pair Category 6 unshielded twisted pair cabling. Cables shall originate at horizontal patch panels located in the respective IDF and terminate at a jack installed in the elevator equipment room.

DIVISION 22
PLUMBING

PLUMBING

A. Fixtures
   1) Wall hung toilets are not acceptable (use floor mounted) and wall hung urinals must have accessible chase.
   2) Specify urinals with strainers built into the casting of the product.
   3) Whenever possible on renovations and in all new facilities provide floor sinks in all custodial closets.
   4) Preferred Manufacturers
      a) Sloan
      b) Royal
   5) Provide in wall fixture carriers as required.
   6) Provide water efficient fixtures including self-closing faucets and low flush toilets and urinals.

B. Domestic Water
   1) Provide isolation valves for each building on exterior wall in valve box, if practical, or in-ground valve box, including isolation valves for long runs and main veins between buildings when appropriate.
   2) Stop valves are required on all fixtures.
   3) Do not put flush valves in walls, unless chased and accessible for maintenance.
   4) Plumbing Equipment Pipes in kitchens should be exposed.
   5) Use Type K soft copper under slab for potable water supply.
   6) Use Type L hard copper above slab.
   7) All copper water lined through walls and floor slabs shall be sleeved.
   8) Preferred Manufacturers
      a) Chicago
   9) Boosters
      a) Install booster heaters for dish machine final rinse so there is no need for mixing valves.
      b) Preferred Manufacturer
      1. Hatco
   10) Re-circulating Pumps:
      a) Preferred Manufacturers
         1. Taco
         2. Armstrong
         3. Bell & Gossett
   11) Water Coolers:
      a) Preferred Manufacturers
         1. EBCO
         2. OASIS
   12) Backflow Preventers:
      a) Main waterlines shall have a dual backflow system (two backflow preventers of the same size). The two together shall equal the water flow of the supply line.
      b) Use only RPZ type.
      c) Backflow preventers shall be no less then twenty-four inches from lowest point on back
      d) flow to ground.
      e) Backflow preventers shall have four test cocks.
      f) Backflows should be enclosed in a fenced area fenced with a gate for access.
      g) Backflow preventers shall have freeze protection installed at 7” above grade on the school side of the preventer.
      h) Preferred Manufacturers
         1. Watts
         2. Febco

13. Valves:
    a) Provide quarter (¼) turn shut-off at all fixture supplies
    b) Provide above ground water shut-off at all buildings

C. Sanitary

1) Piping under slabs shall be both cast iron hub and spigot with elastomeric joints or ASTM 2665-D, DWV PVC.
2) Acid Waste systems shall be fused seal type plastic pipe. Glass waste pipe shall not be specified.
3) Use deep seal traps in lieu of trap primers.
4) Use tamper proof vent caps on the roof plumbing vents.
5) Provide clean-outs every fifty (50) feet inside and one hundred (100) feet outside of Buildings.
6) All emergency showers shall be designed with floor drains connected to the plumbing waste collection system. Floors shall be properly sloped toward drain.
7) Grease Traps:
    a) Must be accessible by truck from pavement.
    b) Set so storm water does not run in at the cover.
    c) Kitchen floor drains shall drain into the grease trap.
    d) Trees should not be planted near the grease trap.
    e) Provide reverse clean out at all grease traps.
    f) Shall be cleaned of all sand gravel before accepting.
8) The installation of natural and liquefied propane lines shall be specified to be performed by a state licensed contractor, certified to install gas line systems. Contractor shall submit certification for approval.

DIVISION 23
HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

LISTED MANUFACTURERS

1. These design guidelines list PREFERRED manufacturers and MANDATORY manufacturers for various products. The project design engineer shall provide project specific specifications that contain the preferred and mandatory manufacturers listed in these design guidelines for products that apply to the project. Where preferred manufacturers are indicated in the design guidelines, the engineer shall list those manufacturers plus additional manufacturers deemed acceptable to the engineer. Where mandatory manufacturers are indicated in the design guidelines, the engineer shall only list those manufacturers in the specifications.

2. Prior to the issuance of the final project addendum, the engineer shall confirm the acceptability of all the manufacturers specified.

GENERAL GUIDELINES

1. CODE COMPLIANCE

   A. All work shall comply with the latest version of the applicable codes and the Florida Building Codes.
   B. The Architect and Engineer shall select and specify insulation systems that satisfy the minimum energy standards as defined by the Florida Building Code. The A/E shall provide the energy code verification forms that are required to be submitted with a building permit application.

2. OCCUPANT COMFORT

   A. Temperature Control
      The HVAC system shall provide classrooms and other significant spaces with independent temperature control. Thermostats shall be located on wall separate from computers. Thermostats shall be auto changeover with separate heating and cooling set points. Occupant range of control shall be:
      1) Cooling: 75 – 78 degrees Fahrenheit (75º – 78º F).
      2) Heating: 68 degrees Fahrenheit (68º F)
   B. Humidity Control
      1) Systems shall be designed to provide indoor design conditions that comply with the Florida Building Code (latest edition) and ASHRAE Standard 55-92. Indoor humidity shall not exceed 60% RH during full or part-load cooling conditions.
   C. Part Load Analysis
      1) Complete a psychrometric analysis of HVAC system performance at part load conditions and ensure required space humidity levels are not exceeded.
   D. Noise
      1) The HVAC system shall be designed to generate noise levels at or below the noise level standards established by ASHRAE for the applicable occupancy type. Noise levels shall be carefully considered in the selection of all mechanical equipment. Where required to meet the ASHRAE noise standard, measures such as sound attenuating walls, ceilings, attenuators, etc. shall be applied in the design.
   E. Ventilation Air Control
      1) Ventilation rates shall comply with ASHRAE guideline 62 including all addenda.
      2) HVAC systems for classrooms shall be designed to provide a separate low- occupancy operating mode that will maintain the space temperature and humidity at occupied set points, but ventilation air shall be off. This function shall be based upon a time-of-day schedule.
      3) All ventilation air delivered to occupied spaces shall be conditioned.
         a) Exceptions: Kitchen grease hoods, welding cabinets, and chemical hoods.

F. HVAC systems shall maintain a maximum CO2 concentration of 1200 ppm in occupied spaces to help maintain occupant cognitive dexterity. A minimum of one CO2 sensor shall be installed per AHU for verification.
G. Building Pressurization
    1) All buildings shall be designed to operate in a positive pressure state using conditioned outside air to achieve pressurization. Under no circumstances shall buildings be designed to operate in a negative pressure state during occupied or unoccupied periods.
H. Equipment Locations
    1) Air conditioning units, piping, and conduit shall not be installed on rooftops unless the Owner gives prior written approval.
    2) Rooftop power ventilators shall not be installed on roofs with a slope greater than 1:4.
    3) Air handling units, fan coil units, etc., shall not be installed in ceiling spaces or inside classrooms without prior written approval from the Owner.
I. Maintenance
    1) Air handling units shall be installed in mechanical rooms of sufficient size to provide manufacturer's recommended service and maintenance clearance.
    2) Desiccant-based energy recovery systems shall not be specified without the written consent of the project manager.
    3) Include separate training for school-based users and maintenance technicians on all mechanical equipment.
    4) Provide receivers on catwalks for portable davit crane.
J. Direct Expansion Equipment
    1) Where condensing units are installed near occupied spaces, sufficient noise barriers shall be included to prevent noise disruption of occupant activities.
    2) Utilize multiple compressors where possible.
    3) Utilize multiple circuit split face coil with the first stage of cooling on the bottom of the coil for multi-stage, constant volume equipment. Row split and intertwined coils are only acceptable in VAV applications.
    4) Use hot gas reheat where conditions require reheat for humidity control.
K. Chilled Water Systems
    1) Use control valves for the cooling coils with a minimum close off pressure of 100 psi or 1.5 times the pump dead head pressure, whichever is greater.
    2) Provide pumping redundancy in each system (CHW, CW, HW, etc.) to allow one pump failure in each system without affecting the overall system operation.
        a) a minimum of 100% redundancy for primary pumps, distribution pumps, and condenser water pumps.
    3) Utilize split face coils for multi-circuited units with the first stage of cooling on the bottom of the coil. Row split and intertwined coils are not acceptable.
    4) Specify 14 FPI max on 6 row (and less) coils. 12 FPI max for 8 row cooling coils.
    5) Coils must be piped counter-flow to airflow on cooling coils.
    6) Provide chilled water temperature control to provide adequate low temperature water for dehumidification.
    7) Chilled water temperature reset shall not be used.
    8) Design shall deliver chilled supply water at design temperature at part-load conditions: do not bypass water through an inactive chiller.
    9) Provide a strainer, balancing valve with flow measuring, and isolation valves at each coil.
    10) Specify pipe-flushing velocities to remove sand and debris prior to system start-up: main 10 f.p.s., branch piping 15 f.p.s.
    11) Provide accessible in-ground isolation valves in valve boxes outside each building.
    12) Pressure independent control valves are not allowed.
L. Condensate Disposal

1) Condensate drain piping shall be 1” minimum, sloped ¼” per foot to storm system and shall be designed to allow individual blowout of each line.
2) Separate drain lines are preferred. If drain lines are combined, provide full port valves on each line prior to combining.
3) Drywell collection systems shall not be specified on new facilities.
4) Where drywells must be used, specify horizontal drain fields of adequate size for the intended discharge quantity. May require County or DEP permit.

M. Document Information
1) Indicate CFM for all diffusers, return air grilles, and supply and exhaust fans on plans.
2) All supply and return inlets and outlets shall have manual balancing dampers.

N. Exterior HVAC Components
1) All exterior HVAC components shall be secured to resist wind load. A/E shall provide details on drawings.

O. When possible, eliminate gravel and other materials in enclosure for air conditioning equipment. Concrete pad is preferred.

3. SPECIAL OCCUPANCIES

A. MDF rooms campus computer server rooms and dry good storage rooms
1) Shall be provided with independent dedicated DX units that can operate 24 hours a day.
2) Where the condensing unit is more than 100’ from the air handler, a packaged AC unit with ducted condenser air shall be used.
3) Provide separate temperature sensor for the campus DDC system to monitor space conditions.
4) Preferred Manufacturers:
a) Mitsubishi
b) Carrier
c) EMI
d) Airdale
e) LG
f) Trane

B. Mechanical Rooms
1) Provide floor drains, hose bibs, 110v electrical outlet and adequate lighting for each room.
2) Paint mechanical room floors with battleship gray epoxy with paint chips and clear coat.

SECTIONS

The sections below must be verified on the Division 22, 23, 24 Conformance Statement located in the Forms area of this manual.

1. 01 91 00 – COMMISSIONING
A. Owner furnished commissioning shall be specified on all projects where the air handler capacity is greater than 40 tons combined for any building.
B. The contractor shall provide copies of the Startup/Commissioning reports to the engineer and the Owner’s TAB Agent.

2. 21 13 13 - FIRE PROTECTION SYSTEMS
A. Fire protection systems shall be designed and installed in conformance with the FBC and NFPA standards.

3. 21 23 00 - WET CHEMICAL FIRE EXTINGUISHING SYSTEMS
   A. Preferred Manufacturers:
      1) Ansul

4. 22 11 18 - BUILDING SERVICES PIPING
   A. Domestic Water
      1) Provide isolation valves for each building on exterior wall in valve box, if practical, or in-ground valve box, including isolation valves for long runs and main veins between buildings when appropriate.
      2) Stop valves are required on all fixtures.
      3) Do not put flush valves in walls, unless chased and accessible for maintenance.
      4) Plumbing Equipment Pipes in kitchens should be exposed.
      5) Use Type K soft copper under slab for potable water supply.
      6) Use Type L hard copper above slab.
      7) All copper water lined through walls and floor slabs shall be sleeved.
      8) Preferred Manufacturers
         a) Chicago
      9) Boosters
         a) Install booster heaters for dish machine final rinse so there is no need for mixing valves.
         b) Preferred Manufacturer
            1. Hatco
      10) Re-circulating Pumps:
         a) Preferred Manufacturers
            1. Taco
            2. Armstrong
            3. Bell & Gossett
            4. Grundfos
      11) Water Coolers:
         a) Preferred Manufacturers
            1. EBCO
            2. OASIS
      12) Backflow Preventers:
         a) Main waterlines shall have a dual backflow system (two backflow preventers of the same size). The two together shall equal the water flow of the supply line.
         b) Use only RPZ type.
         c) Backflow preventers shall be no less then twenty-four inches from lowest point on back flow to ground.
         d) Backflow preventers shall have four test cocks.
         e) Backflows should be enclosed in a fenced area fenced with a gate for access.
         f) Backflow preventers shall have freeze protection installed at 7” above grade on the school side of the preventer.
         g) Preferred Manufacturers
            1. Watts
            2. Febco
      13) Valves:
         a) Provide quarter (¼) turn shut-off at all fixture supplies.
         b) Provide above ground water shut-off at all buildings.
   B. Sanitary
      1) Piping under slabs shall be both cast iron hub and spigot with elastomeric joints or ASTM 2665-D, DWV PVC.
      2) Acid Waste systems shall be fused seal type plastic pipe. Glass waste pipe shall not be specified.
      3) Use deep seal traps in lieu of trap primers.

4) Use tamper proof vent caps on the roof plumbing vents.
5) Provide clean-outs every fifty (50) feet inside and one hundred (100) feet outside of Buildings.
6) All emergency showers shall be designed with floor drains connected to the plumbing waste collection system. Floors shall be properly sloped toward drain.
7) Grease Traps:
    a) Must be accessible by truck from pavement.
    b) Set so storm water does not run in at the cover.
    c) Kitchen floor drains shall drain into the grease trap.
    d) Trees should not be planted near the grease trap.
    e) Provide reverse clean out at all grease traps.
    f) Shall be cleaned of all sand gravel before accepting.

5. 23 01 30 - HVAC AIR DUCT CLEANING
    A. Require ductwork cleanliness to be maintained throughout construction. All ductwork shall be wiped clean before being installed, and shall have all open ends temporarily sealed to prevent dust, dirt and water from entering. Installed registers shall be sealed until system is operational.
    B. Require contractor to provide complete ductwork cleaning if dirt or debris is found in ducts.
    C. Existing Duct work to remain must be cleaned by approved contractor.

6. 23 03 01 - USE OF MECHANICAL SYSTEMS DURING CONSTRUCTION

7. 23 05 01 - MECHANICAL GENERAL REQUIREMENTS
    A. Operations & Maintenance (O & M) Manuals
        1) Operation and maintenance manuals shall include as a separate submittal item, preventive maintenance requirements with time schedule(s) for each item. The equipment master project manual information sheet shall be filled out for each piece of equipment and included in the operation and maintenance manual. Three sets of operation and maintenance manuals shall be turned over to the owner.
    B. If construction is to occur while the school is in session, require the contractor to coordinate with the onsite staff for any shutdowns of utilities, noisy work, and any work that will affect campus operations.
    C. VCS shall have right of first refusal for all existing equipment that is scheduled to be removed. The contractor shall dispose of items refused by VCS.

8. 23 05 13 - COMMON MOTOR REQUIREMENTS FOR HVAC

9. 23 05 14 - VARIABLE FREQUENCY DRIVES
    A. VFD’s shall have a manual bypass feature.
    B. Preferred Manufacturers:
        1) ABB
        2) Square D
        3) Danfoss
        4) Trane

10. 23 05 29 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

11. 23 05 48 - VIBRATION CONTROLS FOR HVAC PIPING AND EQUIPMENT
    A. All base-mounted motorized equipment with motors larger than 10 HP shall be specified with inertia bases.

12. 23 05 54 - MECHANICAL IDENTIFICATION

13. 23 05 93 .1 - CONTRACTOR ASSISTED TESTING, ADJUSTING AND BALANCING FOR HVAC
    A. The contractor shall schedule the Owner's TAB agent to perform an initial walkthrough 14 days prior to substantial completion.
    B. The construction documents shall specify that the mechanical contractor is responsible for coordinating their work with the owner's test and balance agent. All discrepancies, drive changes, etc. reported by engineer or owner's test and balance agent shall be corrected by contractor within five calendar days at no additional cost.
    C. The contractor shall provide a 3-ring binder labeled "Startup and Commissioning Forms" on-site with the permit drawings. During the course of construction, the contractor shall document the startup of each piece of equipment and file a copy of each startup form in the binder. The binder contents shall be reviewed by the engineer at each construction meeting and shall be made available to the TAB agent.

14. 23 05 93.2 - OWNER FURNISHED TESTING, ADJUSTING AND BALANCING FOR HVAC
    A. VCS shall provide a test and balance agent through a contract separate from the project.
    B. The engineer shall coordinate with the TAB agent and provide plans, specifications, and technical assistance as required.

15. 23 05 94 - PRESSURE TESTING OF DUCTED AIR SYSTEMS

16. 23 07 13 - THERMAL INSULATION
    A. Piping:
        1) Fiberglass insulation shall not be used to insulate cold pipes.
        2) Control valves and condensate drain lines shall be insulated.
        3) Underground chilled water piping within the water table shall be pre-insulated with PVC jacketing. All joints shall be closely inspected prior to backfilling trench.

17. 23 08 02 - START-UP OF MECHANICAL SYSTEMS

18. 23 09 33 – ELECTRIC AND ELECTRONIC CONTROL SYSTEM FOR HVAC
    FOOD SERVICE AREA COOLER/FREEZER MONITORING, RECORDING AND ALARM
        1) Provided by School Way Cafe

19. 23 09 33 - VCSD CONTROLS
    A. Thermostat wire shall be a minimum of 18 gauge or larger depending on length of run.
    B. Wireless communications are not allowed.
    C. Refer to Appendix for the VCSD Building Automation System specification.
    D. General:
        1) All systems must be BACnet compatible.
        2) Include sequence of operation on plans and in O & M manual.
        3) Energy Management Systems that do not have a proven track record in the district must be evaluated by the Owner before the system may be specified.
        4) DDC Control System Manufacturers:
            - Kreuter Manufacturing Corp. (KMC) (ABC Systems)
            - Trane (Trane – Orlando)
            - Automated Logic (Carrier – Orlando)
    E. Software
        1) The software shall be Microsoft Windows compatible with VCS operating system and use standard Windows command structure. Software shall backup all devices and data.
        2) Software shall be provided as part of the project. One additional copy needed by offsite

monitoring systems shall also be provided at no additional charge.

3) All software site licenses, dongles, hardware keys, and specialized cards shall be provided with the job.
4) Software shall enable graphic viewing of all commands and status; allow programming, schedule changes and over-ride command without leaving the program shell.

F. Hardware
1) Control device motors (dampers, etc.) shall be 24 volts ac type with all electrical power requirements and service lines/locations clearly noted on the construction drawings. The mechanical engineer shall ensure the drawings are coordinated with electrical.
2) All control wiring shall be in conduit with the exception of concealed ceiling cavity areas where cable (plenum rated if necessary) may be utilized.
3) Fiber optic cabling shall be used to interconnect buildings.
4) Wall Temperature Sensors:
- Shall be user adjustable.
- Shall have software limits.
- Shall provide LED display.
- Shall have override capability.
- Humidity Sensors
- Provide at least one space mounted humidity sensor for each AC unit or AHU.

G. Unit Controls
1) Shall be capable of stand-alone operation.
2) Shall have trunk surge suppression built on board, optical isolation preferred.
3) Shall operate satisfactorily with basic communications cable such as 18/2. Controllers needing low capacitance wire will not be used.
4) Shall provide EEPROM backup (requiring no backup power or battery) to retain programming during extended power loss.
5) Shall be backward compatible to previous revisions of firmware and software.
6) Shall have header plugs that allow easy change out of controllers.
7) Shall have an active status LED as well as a communications status LED for troubleshooting.
8) Shall employ standard networking standards.

H. Project Closeout
1) At the completion of the job, the following items shall be included in the O & M manuals:
- Trending: After substantial completion is awarded, the control system shall trend space temperature (actual and set point) and space humidity levels for two weeks. The engineer shall require the contractor to provide 14 one-day graphs for entire two-week period. Final completion shall not be granted until one week of acceptable space temperature and humidity trends are provided to the Owner.
- Complete set of technical manuals.
- Sequence flow charts and text descriptions of all programming logic.
- Detailed circuit diagrams.
- Verification of a minimum of 8 hours technical training to be provided to the Energy Management department, Facilities Maintenance Technicians and technical staff and a minimum of 8 hours general training for school personnel.
- One complete back-up copy of the User Defined Program.
- Equipment information form shall be completed (see attachments).

20. 23 11 23 - FACILITY NATURAL GAS PIPING

21. 23 11 26 - FACILITY GAS PIPING
A. The installation of natural and liquefied propane lines shall be specified to be performed by a state licensed contractor, certified to install gas line systems. Contractor shall submit certification for approval.

22. 23 21 14 - HVAC PIPING
    A. All chilled and hot water valve actuators shall be specified to be mounted in the vertical position.
    B. Expansion tanks shall be mounted on neoprene isolators.
    C. Steel:
        1) Shall be welded schedule 40 seamless or ERW, black iron pipe conforming to ASTM A53 or A106.
        2) Piping must have the ASTM label and shall be made in the USA.
        3) Underground CHW and HW piping shall be pre-insulated with a PVC jacket.
    D. Copper: Piping 1-1/2" diameter and less can be hard drawn copper, Type "K", ASTM B88. Dielectric unions shall be specified where copper pipes connect to black iron. All copper pipes shall be brazed using 15% silver solder (95% soft solder is not acceptable).
    E. Plastic:
        1) Allowed for condenser water piping only.
        2) SDR 17 is not allowed.
        3) Replacing steel pipe (measured in ID) with plastic pipe (measured in OD) is not allowed. The piping shall be resized based upon the following maximum allowed velocities at peak design flow conditions:
            - 3" (and smaller) pipe: 5 FPS
            - 4" pipe: 6 FPS
            - 6" pipe: 8 FPS
            - 8" (and larger) pipe: 10 FPS
    F. Refrigerant piping:
        1) All refrigerant piping in concealed chases for split DX units shall be soft drawn type K copper. Service fittings for refrigerant lines shall be specified to be concealed, tamperproof or located in a manner to be inaccessible from the public.
        2) Refrigerant line length shall not exceed manufacturer's recommendation. If possible, run refrigerant lines above ground and when passing under sidewalks use an accessible cast iron cover so the lines can be replaced easily at a later date. Also, show complete routing of refrigerate lines on plans.
        3) No solder joints underground under 100 feet minimum.
        4) Identify and label each refrigerant line on both ends when it goes underground.

23. 23 21 23 - HYDRONIC PUMPS
    A. Preferred Manufacturers
        1) Armstrong
        2) B&G
        3) Grundfos
        4) Taco
    B. Install pump motors outward for replacement accessibility.
    C. Vertical pumps are not allowed.
    D. Specify permanently lubricated non-maintenance bearings.
    E. Require laser alignment of flexible coupled pumps.
    F. Follow ASHRAE guidelines for pump support requirements (inertia bases).

24. 23 25 00 - HVAC WATER TREATMENT SYSTEMS
    A. Equipment necessary to provide water treatment chemicals shall be included for all HVAC hydronic systems. Specify all necessary test kits to be provided by contractor.
    B. Contractor shall provide complete water treatment services during 1-year contractor warranty period. Chemicals shall be provided by VCS through separate contract.
    C. HVAC renovations Contractor will coordinate with VCS approved Water treatment contractor to treat with correct amount of chemicals.

25. 23 31 15 - METAL DUCTS
    A. All supply, return, exhaust and outside air branch or run-out ducts shall be provided with

manual dampers for air volume control and adjustment.
B. Permanently mark all balancing dampers to indicate balance position and location in ductwork.
C. Design all ductwork with radius style elbows and tees.
D. Specify insulated supply, return and ventilation air duct access doors within 10’ of the AHU to allow for ductwork inspection.
E. Ductwork shall be sheet metal sealed with high-pressure sealant, wrapped with batt insulation, and sealed with stapled fabric tape and mastic.
F. Maximum flex duct lengths shall be six (6) feet.
G. Dishwasher exhaust duct shall be welded stainless steel and slope back to dishwasher.
H. Permanently label ceiling grid to identify concealed valves, equipment, and access panels Specify access doors for all motorized dampers (i.e.: outside air dampers).
I. Duct liner shall only be used where required for noise attenuation. Liner must have anti-moisture, anti-microbial coating.
J. Flex connectors shall be installed at air handling units.
K. Air transfer grill shall not be used from restroom or custodial rooms to adjacent rooms.
L. Round duct is preferred.
M. Require pressure testing medium velocity ductwork (upstream of terminal boxes).

26. 23 33 00 - AIR DUCT ACCESSORIES

    A. Reserved

27. 23 34 00 - HVAC FANS
    A. Label all emergency exhaust fan switches with a Bake-O-Lite tag directing occupants to open the door upon activation. A switch with an indicator light is preferred.
    B. All exhaust fans shall be provided with back draft dampers or motorized dampers.
    C. Exhaust fans installed over occupied spaces shall be NC-10 or less.
    D. Preferred Manufacturers
        1) Cook
        2) Greenheck
        3) Penn

28. 23 36 00 - AIR TERMINAL UNITS
    A. Specify leaving air temperature sensors for VAV boxes.
    B. Preferred Manufacturers:
        1) Envirotec
        2) MetalAire
        3) Titus
        4) Price
        5) Trane

29. 23 37 13 - DIFFUSERS, REGISTERS AND GRILLES
    A. Intake louvers shall have 1/4” x 1/4” minimum mesh screen.
    B. Aluminum louvered supply diffusers are preferred. Perforated diffusers are not acceptable.
    C. Louvered return grilles are preferred. “Egg crate” or perforated return air grilles are not acceptable.
    D. Do not locate fresh air intake near pollutant sources such as bus loading docks, dumpsters, cooling towers, or exhaust stacks.

30. 23 38 13 - COMMERCIAL KITCHEN HOODS
    A. All grease hoods shall be specified with an integral makeup air system and fire suppression system.
    B. Grease hood exhaust duct to be welded stainless steel.
    C. All makeup air should be bottom discharge as to not blow hot air into conditioned space.

D. Preferred Manufacturers
    1) Greenheck
    2) Grease Master

31. 23 41 00 - Particulate Air filtration
    A. Filters shall be MERV 6 rated and sized with minimal air by-pass.
    B. Provide filter back grilles for all AC units and AHU's larger than 3,000 CFM. Filter back grilles shall have standard sized "poly" filters.

32. 23 52 00 - BOILERS
    A. Preferred Manufacturers
        1) A.O. Smith
        2) Lochinvar
        3) Cleaver Brooks
    B. Electric instantaneous heaters are preferred for kitchen domestic hot water. Size accordingly for need.
    C. Provide proper documentation on state forms with serial numbers for gas fired boilers.

33. 23 55 01 - DUCT HEATERS
    A. Preferred Manufacturers
        1) Redd-I
        2) Brash
        3) Electric Duct Heaters

34. 23 64 16 - WATER CHILLERS - WATER COOLED
    A. Warranty: Specify a ten (10) year complete (parts and labor) product warrantee.
    B. Maintenance Agreement: Specify a ten (10) year complete product maintenance agreement.
    C. Factory performance testing (Virtual Witness Test) for Volusia County School District employees plus the engineer, paid for by the Manufacturer for each chiller to be installed.
    D. Preferred Manufacturers
        1) Carrier
        2) Trane
        3) York
        4) Daikin/McQuay

35. 23 64 26 - WATER CHILLERS - AIR COOLED
    A. Warranty: Specify a ten (10) year complete (parts and labor) product warrantee.
    B. Maintenance Agreement: Specify a ten (10) year complete product maintenance agreement.
    C. Traditional aluminum fin/copper tube condenser coils are preferred.
    D. Condenser Coils shall have protective coatings via a dip and bake process on the assembled coil. Pre-coated fin stock is not acceptable.
    E. Preferred Manufacturers
        1) Carrier
        2) Trane
        3) York
        4) Daikin/McQuay

36. 23 65 10 - CONDENSERS, COOLERS AND COOLING TOWERS
    A. Specify a five-year full maintenance contract on cooling towers.
    B. Tower panels and basin shall be stainless steel.
    C. Cooling towers shall have makeup water meters specified to determine water consumption.

D. Open cooling towers shall be designed to ensure adequate net positive suction at pumps.
E. Cooling tower shall be located a sufficient distance away from ventilation air intakes to prevent contamination of the intake air.
F. Preferred Manufacturers
    1) Marley
    2) Baltimore Aircoil
    3) Evapco
G. Cooling tower shall be provided with ladder, work platform and service door.
H. Motors out of the air stream are preferred.
I. Coordinate with VCS Project Manager if a redundancy cooling tower will be required.

37. AIR HANDLERS
    A. Fan Coil Units:
        1) Fan coil units that are intended to condition more than 10% outside air shall be specified with a preconditioning outside air coil.
        2) Units located inside classrooms shall be specified with float switches that shut down the supply air and close chilled water valves.
    B. Air Handling Units:
        1) Air handling units shall be double wall construction with removable panels. The primary condensate drain pan shall be stainless steel.
        2) Filter access panels shall be sealed with gasketed doors.
        3) Filters shall be MERV 13 rated and sized with minimal air by-pass.
        4) Close outside air intakes with low leakage dampers and de-energize exhaust fans during unoccupied hours.
        5) All identification plates should have stamped or engraved information – ink alone will not be accepted.
        6) Preferred Manufacturers
            - Carrier
            - Trane
            - York
            - Daikin/McQuay
            - Temtrol

38. 23 74 00 - PACKAGED HVAC EQUIPMENT
    A. On all DX units 10 tons and larger, the condenser coils shall be provided with one of the following protective measures:
        1) Blygold treatment
        2) Assembled coil dip and bake epoxy coating.
    B. Hot gas (reheat and bypass) and suction lines shall be insulated separately.
    C. Refrigerant pipe chases shall not have any 90° ELL's in them: i.e. 45° ELL's up to grade.
    D. Condensing units shall be mounted on neoprene vibration isolation pads to isolate the metal from the concrete equipment pad.
    E. Provide refrigerant liquid line filter drier and sight glass for all units.
    F. 15% silver alloy brazing materials shall be used for all copper-to-copper and copper to brass fittings.
    G. "A" or single bank configuration evaporation coils are preferable to "W" coils to facilitate cleaning.
    H. No bipolar ionization systems will be allowed.
    I. 100% Outside Air DX Equipment
        1) Condenser Coils shall have protective coatings via a dip and bake process on the assembled coil. Precoated fin stock is not acceptable.
        2) For units to be installed east of Interstate 95, the evaporator coils shall have a protective coating provided by the equipment manufacturer.
        3) Preferred Manufacturers

- Aaon
- Desert Air
- Des Champs
- Trane

J. Computer Room Packaged AC Systems
   1) Preferred Manufacturers
      - Liebert

K. Unit Ventilators:
   1) Unit ventilators are undesirable and shall not be specified unless they are capable of maintaining 60% RH in the space and can provide consistent temperature throughout the space.

DIVISION 25
INTEGRATED AUTOMATION

1.1 SUMMARY

This section defines the basic materials and methods and minimum equipment and performance requirements for the Building Automation System (BAS) in order to provide the functions necessary for control of the mechanical and other specified systems on this project. The implied and stated intent of the drawings and specifications is to establish minimum acceptable quality standards for device-level integration of material and equipment as well as workmanship and to provide a complete and operable BAS. The drawings are diagrammatic intending to show a workable general arrangement and location of components and are not necessarily complete or rigid in all details.

1.2 BID PROCEDURES – RESTRICTED BAS

A. The existing site BAS manufacturer is:
   1. List existing BAS here.
B. The work occurs on a site with an existing BAS. Therefore, the manufacturer of the existing system is the only acceptable BAS manufacturer.
C. As a prequalification for inclusion on the Volusia County School's acceptable System Integrator list, the SI has pre-negotiated labor and material costs with the VCS.
D. The prime contractor's bid submittal shall include a full breakout of the labor and materials proposed by the SI for use on the project. A summary page shall be included where costs are shown to total the SI contractor's price to the prime contractor. A statement of compliance with the pre-negotiated pricing shall be included and signed by an official of the SI contractor.
E. Failure to submit the required documentation with the bid package may result in bid disqualification.

1.3 BID PROCEDURES – NON-RESTRICTED BAS

A. The existing site BAS manufacturer is:
   1. List existing BAS here.
B. Acceptable manufacturers, listed in 23 09 33, 2.1, may submit bids on the project.
C. Bids from manufacturers other than the existing site BAS manufacturer, are required to include the following ADDITIONAL scope:
   1. Replace all existing hardware and software not being replaced by the scope of the project.
   2. Provide all hardware and software for full off-site remote access and control from the VCSD Maintenance department.
   3. Incorporate ALL existing points and additional points as needed.
   4. Program the new BAS with sequences of operation for ALL equipment onsite currently controlled by the existing BAS. Maintain all existing functionality. Sequences shall be in strict accordance with the construction documents provided when the equipment was originally installed.

1.4 SCOPE – GENERAL

A. The Building Automation System (BAS) is to provide a peer-to-peer networked, stand-alone, distributed control system for building mechanical and electrical systems.
B. The system must be fully integrated and coordinated with mechanical equipment. The intent of the BAS is to integrate all mechanical equipment into one system for global monitoring, control, and alarming associated with the building.
C. The BAS shall be designed such that each mechanical and electrical system will be able to operate under stand-alone control. As such, in the event of a network communication failure, or the loss of any other controller, the control system shall continue to independently operate under control.
D. The System Integrator (SI) Contractor shall refer to the drawings and equipment specifications for coordination of factory installed control equipment in products furnished by others as they relate to this section. It is the SI's responsibility to provide all the design, engineering, and field coordination required to ensure all equipment sequence of operations are met as specified and the designated BAS operators have the capability of managing the building mechanical system to ensure occupant comfort while maintaining energy efficiency.
E. SI Contractor will provide a point to point checklist per design of each system to ensure proper operation with existing systems and new along with four weeks of trend logs as proof of operation.

E. The BAS shall meet BACnet open standard protocol communication standards.

F. Direct Digital Control (DDC) technology shall be used to provide the functions necessary for control of mechanical systems and terminal devices on this project.

G. The BAS shall accommodate simultaneous multiple user operation. Access to the control system data should be limited only by the security permissions of the operator role. Multiple users shall have access to all valid system data. An operator shall be able to log onto any workstation on the control system and have access to all appropriate data.

H. Provide all labor (directly employed or subcontracted), materials, programming and supervision necessary to install a complete Building Automation System (BAS) per the construction documents. Include provisions for the following:
   1. Mounting hardware for all control devices.
   2. Construction supervision.
   3. Startup and verify proper operation of control equipment.
   4. Point verification and testing of hardware and software.
   5. Work in conjunction with the TAB agent to calibrate and adjust devices as required.
   6. Warrantee.

I. The BAS as specified herein shall be provided in its entirety by the SI Contractor. The SI Contractor shall base their bid on the system as specified, the sequence of operation, the point's list (Input/Output Summary) and contract documents. The documentation pertaining to the BAS is schematic in nature. The SI Contractor shall provide equipment and labor not specifically referred to herein or on the plans, that are required to meet the functional intent, shall be provided without additional cost to the owner.

J. The SI shall provide all electrical control and interlock wiring connected to the controls and instrumentation systems.

K. All 110 VAC or greater voltage power wiring to main control panels shall be provided by Division 16 Contractor (Electrical), and coordinated by this Contractor. Failure of this contractor to coordinate requirements with other divisions shall result in the SI contractor being responsible for any non-coordinated items.

L. All 24 VAC control power to operate equipment shall be the responsibility of this contractor.

M. All conduits in connection with the controls and instrumentation system shall be furnished and installed by the BAS Contractor.

N. The Control Contractor shall install all sensing and control components.

O. Provide a comprehensive operator and technician-training program as described herein.

P. Provide as-built documentation, software, and all DDC control logic and all associated support documentation on approved media, which accurately represents the final installed system.

Q. Adjustments of manual balancing devices, as required to obtain design air and/or water flows, shall be by the TAB Contractor. The controls contractor shall provide assistance to the TAB Contractor with control adjustments as required to obtain design flows by:
   1. Providing on-site instruction on the proper interfacing and operation of the equipment.
   2. Providing the necessary software for use with the balancing contractor's personal computer for interfacing with their control equipment. Where proprietary equipment is required, this equipment shall be provided for the Balancing Contractor's use.
   3. Provide 2-hours of onsite for the Balancing Contractor to instruct on proper use of the software and interface with the control system.

R. To ensure compatibility and training standards with the present VCSD Building Automation Systems, the BAS must be fully software certified at the time of installation to provide interoperability and backward compatibility to the BAS systems currently installed by the successful BAS manufacturer. The BAS must use only latest versions of database software and tools for area controllers, configuring the system, and for the present graphical user interface (GUI) which is used by the building operator.

S. Demolition: The controls contractor shall remove all unused controls, including devices, controllers, conduit, control tubing, and wire. VCSD shall have the right of first refusal for all hardware removed. Demolition shall be complete with exposed surfaces and finishes restored to match the surrounding area. Coordinate work with other trades prior to bid.

1.5 SCOPE – CAMPUS-WIDE CONTROL SYSTEM

A. The System Integrator shall provide a complete campus-wide BAS with all materials and labor needed to control the equipment indicated in the Drawings in the manner indicated in the Sequence of Operations.

B. Include all labor and materials to provide the following:

1. Site software.
2. Site hardware.
3. Control database.
4. Graphical interface.
5. Provide new controls (controllers, wiring, sensors, etc.) for all new equipment included in project.
6. All control devices shown on the drawings and required to meet the sequence of operations.
7. Program control sequences.
8. Interconnection to all buildings on campus with equipment or devices to be monitored and/or controlled by the BAS.
9. Interconnection with Owner's Central Building Automation and Control System Department at the VCSD Facilities Building via Owner's Ethernet system.
10. Provide installation and calibration, supervision, adjustments, and fine tuning necessary for complete and fully operational system.

1.6 SCOPE – EXPAND EXISTING CONTROL SYSTEM

A. The System Integrator shall expand the existing campus BAS hardware and software to incorporate equipment indicated in the Drawings and control it in the manner indicated in the Sequence of Operations.

B. The EMS expansion shall include all labor and materials to provide the following:

1. Upgrade existing site software, if required
2. Upgrade existing site hardware, if required.
3. Incorporate new equipment into the existing database.
4. Incorporate new equipment into the existing graphics hierarchy.
5. Provide new controls (controllers, wiring, sensors, etc.) for all new equipment included in project.
6. All controls devices shown on the drawings and required to meet the sequence of operations.
7. Program control sequences.
8. Interconnection to site control system.
9. Interconnect all onsite BAS devices with Owner's central Building Automation and Control System via Owner's Ethernet system.
10. Provide installation and calibration, supervision, adjustments, and fine tuning necessary for complete and fully operational system.

1.7 RELATED DOCUMENTS:

A. Sequence of Operations: Refer to Drawings.

B. Drawings and general provisions of the Contract, including General and Supplementary Conditions.

C. Division-1, General Requirements, of these Specifications.

D. The General Conditions of the Contract, Supplementary Conditions, and General Requirements bound herewith are a part of these Specifications and shall be used in conjunction with this Division as a part of the Contract Documents. Consult them for

further instructions pertaining to this work. Contractors shall be responsible for and be governed by all requirements thereunder.

1.8 ABBREVIATIONS

A. The acronym shown below are abbreviations used or referenced throughout this section of the specification.

1. AGC Application Generic Controller
2. AI Analog Input
3. AMR Automated Meter Reading
4. AO Analog Output
5. API Application Program Interface
6. ASC Application Specific Controller
7. ASP Application Service Provider
8. BAS Building Automation System
9. CAC Custom Application Controller
10. CPU Central Processing Unit
11. DDC Direct Digital Controller
12. DDE Dynamic Data Exchange
13. DI Digital Input
14. DO Digital Output
15. EP Electric-pneumatic
16. FACP Fire Alarm Control Panel
17. FCC Fire Command Center
18. GC Global Controller
19. I/O Input/Output
20. IP Internet Protocol
21. ISS Intelligent Space Sensor
22. KLAN Local Area Network
23. LC Local Controller
24. ODBC Open Database Connectivity
25. PE Pneumatic-electric
26. PID Proportional-Integral-Derivative
27. PLC Programmable Logic Controller
28. PPM Parts per million
29. SI System Integrator
30. SID Supervisory Interface Device (Gateways)
31. SMS Short Message System
32. TCP/IP Transmission-Control Protocol/Internet Protocol
33. TUC Terminal Unit Controller
34. UC Unitary Controller
35. WAN Wide Area Network
36. WET Web-Enabled Technology
37. XIF External Interface File
38. XML Extensible Markup Language

1.9 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. All publications shall be the latest edition that is recognized and accepted by the local governing authorities.

1. Air Movement and Control Association (AMCA)
   a. AMCA 502 – Damper Application Manual
   b. AMCA 610 – Methods of Testing Airflow Measurement Stations for Ratings.
2. American Society of Heating, Refrigeration, & Air Conditioning Engineers, Inc.

a. ASHRAE 114 – Energy Management Control System Instrumentation
b. ASHRAE Guideline 4 – Preparation of Operating and Maintenance Documentation for Building Systems.
c. ASHRAE Guideline 14P – Measurement of Energy and Demand Savings

3. American Society of Mechanical Engineers (ASME)
   a. ASME CSD-1 – Control & Safety Devices for Automatically Fired Boilers
   b. ASME PTC-22 – Digital Systems Techniques
4. American Society for Testing and Materials (ASTM)
5. Institute of Electrical and Electronic Engineers (IEEE)
   a. IEEE std 37.13 – standard for Low- Voltage AC Power Circuit Breakers Used in Enclosures.
   b. IEEE std 37.14 – Standard for Low – Voltage DC Power Circuit Breakers used in Enclosure.
   c. IEEE std 62.22 – Guide for the Application of Metal-Oxide surge arresters for Alternating Circuit Systems
   d. IEEE std 802.3 – Standard for Ethernet
   e. IEEE std 1143 – Guide on shielding Practice for Low-Voltage cable
   f. IEEE std C62.34 – Standard for Performance of Low-Voltage surge Protective Devices
   g. IEEE std C62.36 – Standard Test Methods for surge-protectors used in Low-Voltage AC Power Circuits
   h. IEEE std C62.41 – Recommended Practice on Surge Voltage in Low Voltage AC Power Circuits
   i. IEEE std C62.45 – Guide on Surge Testing for Equipment Connected to Low – Voltage AC Power Circuits.
   j. IEEE std C62.62 – Standard Test Specification for Surge – Protective Devices for Low – Voltage AC Power Circuits
6. The Instrumentation Systems and Automation Society
   a. ISA 575.01 Flow Equation for Sizing Control Valves
7. National Electrical Contractors Association
   a. NECA 101 – Standard for Installing Conduit (Rigid, IMC, EMT)
   b. NECA 1 – Standard for Good Workmanship in Electrical Contracting
8. National Electrical Manufacturers Association (NEMA)
   a. NEMA WC57 – Control Cable
   b. NEMA WD6 – Wiring Devices-Dimensional Requirements
9. Nation al Fire Protection Association (NFPA)
   a. NFPA 70 – National Electrical Code
   b. NFPA 90A – Standard for the Installation of Air Conditioning and Ventilation Systems
   c. NFPA 90B – Standard for the Installation for Warm Air Heating and Air Conditioning Systems
   d. NFPA 92A – Recommended Practices for Smoke Control Systems
10. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
    a. SMACNA – Energy Systems Analysis and Management
    b. SMACNA – HVAC Systems – Applications
    c. SMACNA – HVAC Systems – Commissioning Manual
    d. SMACNA – Indoor Air Quality – A Systems Approach
11. Underwriters Laboratories (UL)

1.10 QUALITY ASSURANCE

A. Products:

1. All products of the BAS shall be provided with appropriate agency approvals. With the submittal documents, verification that the approvals exist for all submitted products shall be provided. Systems or products not currently offering one or more of the following approvals are not acceptable:

a. UL-916; Energy Management Systems
b. UL-873; Temperature Indication and Regulating Equipment
c. UL-864, Subcategories UUKL, UOXX, UDTZ; Fire Signaling and Smoke Control Systems
d. FCC, Part 15, Subpart J, Class A Computing Devices Emissions Requirements

2. Electrical Standards: Provide electrical products that have been tested, listed and labeled by UL and comply with NEMA standards.
3. NEMA Compliance: Comply with NEMA standards pertaining to components and devices for electrical control systems.
4. NFPA Compliance: Comply with NFPA 90A "Standard for the Installation of Air Conditioning And Ventilating Systems" where applicable to controls and control sequences.
5. National Codes: Perform Work in accordance with the Florida Building Code.

B. Manufacturers:
1. Firms regularly engaged in the manufacture of products specified, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

C. System Integrator:
1. The SI Contractor shall provide Licensed Trade Technicians to furnish, engineer, and install the BAS. They shall be skilled and factory trained, certified, and authorized by the manufacturer for debugging, start-up, diagnostics, training, service and repair of all components to ensure interoperability.
2. The SI Contractor shall be designated by the BAS Equipment Manufacturer as a current Authorized Agent for their products in the territory where the equipment is to be installed.
3. The SI shall be regularly engaged in the service and installation of the BAS proposed for the project, and shall have been so for a minimum of three (3) years in central Florida using the current company name. Experience as a company with a different name shall not be considered.
4. The SI shall have an office within 50 miles of Volusia County that is staffed with BAS designers trained in integrating interoperable systems and technicians fully capable of providing BAS instruction and routine emergency maintenance service on all system components of the system to be installed.

D. Software Programmer
1. The SI Contractor shall provide a highly experienced software programmer to oversee the project that is highly experienced in projects with similar size and scope.
2. The SI Contractor shall submit along with project submittal data the qualifications and specific project experience of the programmer intended to be used on the project. If, upon review by the engineer, the programmer is deemed insufficiently experienced, the SI Contractor shall remove the programmer from the project and provide the qualifications and experience of an alternative programmer until an acceptably qualified individual is selected.

1.11 SYSTEM PERFORMANCE

A. Performance Standards. The system shall conform to the following:
1. Graphic Display. The system shall display a quality graphic with the capability for a minimum of 20 dynamic points. All current data shall be displayed within 10 seconds of the request. The graphic shall be intuitive and shall present data in a graphical, not tabular, format.
2. Graphic Refresh. The system shall update all dynamic points with current data within 10 seconds.

3. Object Command. The maximum time between the command of a binary object by the operator and the reaction by the device shall be 10 seconds. Analog objects shall start to adjust within 10 seconds.
4. Object Scan. All changes of state and change of analog values shall be transmitted over the high-speed network such that any data used or displayed at a controller or workstation will be current, within the prior 60 seconds.
5. Alarm Response Time. The maximum time from when an object goes into alarm to when it is annunciated at the workstation shall not exceed 45 seconds.
6. Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 5 seconds. The Contractor shall be responsible for selecting execution times consistent with the mechanical process under control.
7. Performance. Programmable Controllers shall be able to execute DDC PID control loops at a selectable frequency from at least once every 5 seconds. The controller shall scan and update the process value and output generated by this calculation at this same frequency.
8. Multiple Alarm Annunciation. All workstations on the network shall receive alarms within 5 seconds of each other.

1.12 COORDINATION

A. The following products are to be furnished by the controls contractor and installed by others. The controls contractor shall coordinate installation locations.
   1. Hydronic Piping Components:
      a. Control valves.
      b. Immersion wells.
      c. Flow switches.
      d. Temperature sensor wells and sockets.
      e. Gage taps.
      f. Flow meters.
      g. Couplings for flow and pressure switches
   2. Ductwork Components:
      a. Automatic control dampers
      b. Connection of damper end switches.
      c. Airflow meters.

B. The Mechanical Contractor is responsible for providing and installing blank-off plates if needed when the control application requires dampers smaller than duct size. The controls contractor shall coordinate this requirement.

C. The controls contractor shall be responsible for the following:
   1. Coordination of all controls items with other trades.
   2. Coordination of wall space for panels.
   3. Coordination of all wall-mounted sensor locations with furniture.
   4. Coordination of space sensors to avoid diffuser throw patterns.

1.13 SUBMITTALS

A. General:
   1. Pre-Submittal Conference: After award of the Construction Contract, and prior to delivering submittal data to the Engineer, the BAS Contractor shall schedule a pre-submittal conference with the Engineer. The purpose of the pre-submittal conference is to review the proposed system concept and to discuss the sequence of construction activities.
   2. Refer to the specification Division 1 – General Requirements for submittal format.
   3. Coordinate with the Mechanical contractor to determine the number of submittals required. Provide a minimum of five copies of all submittal data.
   4. Product Requirements: Provide shop drawings and other submittals on hardware, software, and equipment to be installed or furnished. Begin no work

until submittals have been approved for conformity with design intent. When manufacturer's cutsheets apply to a product series rather than a specific product, clearly indicate applicable data by highlighting or by other means. Clearly reference covered specification and drawing on each submittal. General catalogs shall not be accepted as cutsheets to fulfill submittal requirements. Select and show in submittal quantities of products appropriate to scope of work. Submittal approval does not relieve Contractor of responsibility to supply sufficient quantities to complete work.

B. The following data/information shall be submitted for review (prior to ordering any hardware or software items):

1. Overall system interconnecting diagrams showing all remote panels (PCs, Field Panels, and LAN devices), and power/surge protection locations and Uninterrupted Power Supply (UPS).
2. Distributed panel locations (site and/or building plan, as appropriate to identify physical locations).
3. Valve and damper schedules showing size, configuration, capacity, Manufacturer and location.
4. Data sheets for all hardware and software control components.
5. Thermostat/sensor locations.
6. A brief written description of the methodology used to keep graphics files on various PC terminals updated and consistent with one another. (Remote computer graphics vs. site computer)
7. A detailed point-to-point diagram of circuitry of all DDC panels. Submit on a per distributed panel basis. Typical are accepted, provided all applicable units are listed and the units are identified.
8. A list of connected data points, including connected control unit and input or output devices.
9. A detailed Sequence of Operations derived from the design intent shown on the Contract Drawings. Retyping the Sequence of Operations in the Contract Drawings is not acceptable.
10. Detailed documentation on the specific field equipment to be supplied by the Controls Contractor shall be submitted and approved prior to installations; including, but not limited to, actuators, valves, temperature sensors, surge protection, and damper operators.
11. The control valve schedule shall include each valve's unique identifier, size, flow coefficient Cv, pressure drop at specified flow rate, actuator size, close-off pressure data, dimensions, and access and clearance requirements data. Valve schedules may be submitted in advance but shall be included in the complete submittal.
12. The damper schedule shall contain each damper's and each actuator's identifier, nominal and actual sizes, arrangement of sections in multi-section dampers, and methods of connecting dampers, actuators, and linkages. The Damper Schedule shall include the maximum leakage rate at the operating static-pressure differential. The Damper Schedule shall contain actuator selection data supported by calculations of the torque required to move and seal the dampers, access and clearance requirements. Damper schedules may be submitted in advance but shall be included in the complete submittal.
13. All schemes and methods proposed to provide lightning protection for the DDC system, entering and leaving each building shall be submitted for review and approval.
14. Complete bill of materials to identify and quantify all devices.
15. Submit a color printout of each graphic. The graphic shall show temperature, status, position and all data points that will appear on the screen. If acceptable to the engineer, the graphics may be submitted on disk in a standard graphic format.

1.14 WARANTEE

A. The entire BAS provided under this contract, including all control devices provided by this Contractor, shall be warranted to be free of defects in workmanship and material for a period of TWO (2) years from the date of Substantial Completion. Any equipment found to be defective during this period shall be repaired and/or replaced without expense to the Owner. The Contractor shall accomplish this work during normal working hours (8 a.m. to 5 p.m., Monday through Friday, excluding holidays).

B. The Contractor shall respond to all warranty items within one working day from when they are reported. Provide a report to the VCSD Maintenance Department identifying the problem, the devices affected and the nature of the repair or replacement.

C. The warranty shall cover all costs for parts, labor, associated travel, any software sequence modifications, and expenses throughout the warranty period.

D. Throughout the duration of the prime contractor's warrantee, all BAS warrantee issues and communications shall be routed through the prime contractor. After the prime contractor's warrantee expires, the SI shall coordinate directly with the VCSD Maintenance department regarding warrantee issues for the duration of the BAS warrantee.

1.15 BAS ACCEPTANCE PROCEDURE

A. The SI shall perform a three-phase commissioning procedure consisting of field I/O calibration and commissioning, system commissioning and integrated system program commissioning. Document all commissioning information on commissioning data sheets, which shall be submitted prior to acceptance testing. Commissioning work, which requires shutdown of system or deviation from normal function, shall be performed when the operation of the system is not required. The commissioning must be coordinated with the owner and prime contractor to ensure systems are available when needed. Notify the operating personal in writing of the testing schedule so that authorized personnel from the owner and prime contractor are present throughout the commissioning procedure.

B. After control devices have been commissioned (i.e., calibrated, tested and signed off), each BAS program shall be put on line and commissioned. The SI Contractor shall, in the presence of the owner's representative and/or engineer, demonstrate each programmed sequence of operation and compare the results in writing. In addition, each control loop shall be tested to verify proper response and stable control, within specified accuracies. System program test results shall be recorded on commissioning data sheets and submitted for record. Any discrepancies between the specification and the actual performance will be immediately rectified and retested.

C. The SI Contractor shall submit printed graphical trend logs of Building Automation System (BAS) points to demonstrate that the HVAC systems are functioning as designed. Trend intervals shall be typically on an hourly basis, and trends shall be run for a minimum of 2 weeks, 24 hours a day. Trended points shall include as a minimum:
   1. All temperature points (air and hydronic) and active setpoints
   2. All relative humidity points
   3. Damper and valve position points
   4. Selected status points.
   5. All ventilation airflow rates and active setpoints

D. A variety of historical data collection utilities shall be provided to manually or automatically sample, store, and display system data for all system points:
   1. Digital Controllers (DC's) shall store point history data for selected analog and digital inputs and outputs:
      a. Any point, physical or calculated, may be designated for trending.
      b. Any point, regardless of physical location in the network, may be collected and stored in each Digital Controller's (DC's) point group.
   2. Each Digital Controller (DC) shall have a dedicated RAM-based buffer for trend data and shall be capable of storing data samples.

3. The Network shall contain sufficient trend storage capacity, either in memory or on hard drive, to retain the last 72 hourly values for every system point shown on the Input/Output Summary, including software points. Trend data shall be displayed at the printer or at any network terminal.

1.16 TRAINING

A. Training sessions shall be provided for Owner's personnel by the SI Contractor's factory trained control engineers and technicians.

B. The SI Contractor shall conduct an 8-hour on-site training course for designated Owner's personnel in maintenance and operation of control system.

1.17 CLOSEOUT PROCEDURES

A. Record Submittals:
   1. Within one week after substantial completion, submit final (as-built) copies of the control drawings modified to reflect all changes during construction.
   2. Provide one full size hardcopy of as-built information plus one digital copy in PDF format.
   3. Provide one digital copy of the final, record submittal data.
   4. Provide O&M data including installation, operation manuals, and maintenance requirements for equipment installed.
   5. Provide supporting software for all third-party hardware and software furnished and installed as part of the system or required for the operation of the system.
   6. All software licenses, warranty certificates and documentation for all hardware and software including third party hardware and software shall be provided.

B. After test and balance and commissioning is completed and reports are accepted, provide one digital copy of the site database with all information needed to restore controllers if loss occurs.

C. Provide pre-programmed access codes to all levels. Subject to Owners approval.

D. Ownership of proprietary material: All project developed hardware and software shall become the property of the Owner. These include but are not limited to:
   1. Project graphic images,
   2. Record drawings,
   3. Project database,
   4. Job-specific application programming code,
   5. All documentation for project hardware and software.

E. Provide the following closeout information:
   1. Operating and maintenance data.
      a. Manufacturer' catalog data and specifications on components used in system.
      b. Detailed instructions for operations of system.
      c. Operator's reference table listing addresses of connected input points and output points. Show settings where applicable.
      d. Programmer's manual including information necessary to perform programming functions.
      e. Language manual including information necessary to perform programming functions.
      f. Flow charts of software programs utilized in DDC system.
      g. Complete program listing file and parameter listing file for programs.
      h. Copy of warranty.
      i. Operating and maintenance cautions and instructions.
      j. Recommended spare parts list.
   2. Owner instruction report.
   3. Performance verification report.
   4. Guarantee letter.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS/SYSTEM INTEGRATORS:
- A. Automated Logic / Carrier Corporation
- B. KMC Controls, Inc. / ABC Controls
- C. Trane / The Trane Corporation

2.2 OPERATOR INTERFACE
- A. Provide Building Operator Web Interface
  1. Manufacturer shall provide a user interface with time-of-day schedules, data collection, dashboards, reports and building summary, system applications, and self-expiring timed overrides. Manufacturer shall provide a published user and applications guide(s) that detail the system application operation, configuration, setup and troubleshooting.
  2. The building operator web interface shall be accessible via a web browser without requiring any “plug-ins” (i.e. JAVA, Adobe Flash, etc.).
  3. User Roles
     - a. The system shall include pre-defined “roles” that allow a system administrator to assign permissions to a user.
     - b. User logon/logoff attempts shall be recorded.
  4. Graphics
     - a. The SI shall create site layout color graphics that form an intuitive dynamic hierarchal graphical interface for displaying data generally configured as follows:
     - b. First Level – Campus-wide data:
       1) Campus site plan with drill-down links to individual buildings.
       2) Campus CHWS and CHWR temperatures for campuses with hydronic hot water systems.
       3) Campus HWS and HWR temperatures for campuses with hydronic hot water systems.
       4) If any space temperature or relative humidity level in a building is in an alarm state, the building graphic shall be displayed in red.
     - c. Second Level – Building specific data:
       1) The second level graphic screen shall provide the building floor plan with the HVAC system ductwork and equipment diagrammatically shown.
       2) Individual space temperatures shall be displayed.
       3) The follow data shall also be displayed, if available.
       4) Relative humidity levels.
       5) HVAC Supply air temperatures.
       6) Operating mode.
       7) For Central Plants, show equipment alarms.
     - d. Third Level – Equipment specific data:
       1) The third level graphic screen shall provide complete data for specific HVAC equipment.
       2) For Central Plants, provide complete system diagrammatically represented with all components. (i.e.: for an air-cooled chiller plant, diagram shall indicate all chillers and pumps connected by piping to represent the complete system. Separate major system onto independent graphic screens, such as chilled water and hot water systems.
     - e. Data shall be displayed on the graphic in the location of actual measurement (i.e.: Chilled water bypass water temperature shall be shown next to a bypass pipe).

f. Refer to the system point I/O summary for data to be displayed. If the I/O summary is not provided, all points required by the sequence of operations shall be displayed to optimize system performance analysis and speed alarm recognition. Provide as a minimum the following graphics.

5. Manual Control and Override
   a. Point Control. Provide a method for a user to view, override, and edit if applicable, the status of any object and property in the system. The point status shall be available by menu, on graphics or through custom programs.
   b. Temporary Overrides. The user shall be able to perform a temporary override wherever an override is allowed, automatically removing the override after a specified period of time.
   c. Override Owners. The system shall convey to the user the owner of each override for all priorities that an override exists.
   d. Provide a specific icon to show timed override or operator override, when a point, unit controller or application has been overridden manually.
6. Scheduling. - The scheduling application shall provide graphical representation of the day, week, month and exception events.
7. Alarm/Event Notification
   a. Alarm/Event Log. The operator shall be able to view all logged system alarms/events from any building operator web interface.
      1) The operator shall be able to sort and filter alarms from events. Alarms shall be sorted in a minimum of 4 categories based on severity.
         1) The operator shall be able to acknowledge and add comments to alarms
         2) Alarm/event messages shall use full language, easily recognized descriptors.
   b. Alarm Suppression. Alarms shall be able to be suppressed based on load/source relationships to present the likely root cause to the building operator as described in ASHRAE Guideline 36. Load/Source relationships shall be configurable by the user through a web interface.
8. Reports and Logs.
   a. The building operator web interface shall provide a reporting package that allows the operator to select reports.
   b. The building operator web interface shall provide the ability to schedule reports to run at specified intervals of time.
   c. The following standard reports shall be available without requiring a user to manually configure the report:
      1) All Points in Alarm Report: Provide an on-demand report showing all current alarms.
         1) All Points in Override Report: Provide an on-demand report showing all overrides in effect.
         2) Commissioning Report: Provide a one-time report that lists all equipment with the unit configuration and present operation.
         3) Points report: Provide a report that lists the current value of all points
         4) ASHRAE Standard 147 Report: Provide a daily report that shows the operating condition of each chiller as required by ASHRAE Standard 147. At minimum this report shall include:
            a) Chilled Water (or other fluid) inlet and outlet temperature
            b) Chilled Water (or other fluid) flow
            c) Chilled Water (or other fluid) inlet and outlet pressures
            d) Evaporator refrigerant pressure and temperature

e) Condenser refrigerant pressure and liquid temperature
f) Condenser water inlet and outlet temperatures
g) Condenser water flow
h) Oil pressure and temperature
i) Oil level (if applicable)
j) Compressor refrigerant discharge temperature
k) Compressor refrigerant suction temperature
l) Manual entry field for addition of refrigerant
m) Manual entry field for addition of oil
n) Manual entry field for vibration levels
o) Motor amperes per phase
p) Motor volts per phase
q) Purge exhaust time or discharge count
r) Ambient temperatures (dry bulb and wet bulb)
s) Date and time Data Logged

2.3 SOFTWARE KEY

A. Where access to the EMS software is limited by security programming, the controls contractor shall provide two (2) EMS software keys (hardware or software keys) for the owner's indefinite use.

2.4 COMMUNICATIONS

A. On-site communications between BAS components shall be accomplished via a dedicated, hardwired Local Area Network (LAN). Individual BAS components shall pass data to the network by the use of directly connection to the network or by passing data through higher level building control units.

B. The BAS shall connect to the existing district-wide peer-to-peer network for remote communications. The contractor shall coordinate with the VCSD MIS department for connection requirements.

C. System Communications

1. Each workstation, building controller, and equipment controller communication interface shall utilize the BACnet protocol with an Ethernet (IEEE 802.3, 802.11), RS485 (EIA-485) physical interface and an appropriate data link technology as defined in ANSI/ASHRAE Standard 135-2012. (e.g. BACnet IP, BACnet IPv6, BACnet MS/TP).
2. All system controllers shall be BTL listed as a BACnet Building Controller (B-BC) as defined in ANSI/ASHRAE Standard 135-2012.
3. All documented status and control points, schedule, alarm, and data-log services or objects shall be available as standard object types as defined in ANSI/ASHRAE Standard 135-2012.
4. Each System Controller shall communicate with a network of Custom Application and Application Specific Controllers utilizing one or more of the interfaces documented within Field Bus Communications below.

D. BACnet Field Bus Communications

1. All equipment and plant controllers shall be BTL listed as a BACnet Application Specific Controller (B-ASC) or a BACnet Advanced Application Controller (B-AAC) as defined in ANSI®/ASHRAE® Standard 135-2012.
2. All communication shall conform to ANSI®/ASHRAE® Standard 135-2012.
3. System Controller shall function as a BACnet router to each unit controller providing a globally unique BACnet Device ID for all BACnet controllers within the system.
4. Communication between System Controller and equipment/plant controllers shall utilize BACnet MS/TP as defined in ANSI®/ASHRAE® Standard 135-2012.

E. Transmission Medium

1. Inside buildings: Fiber optic or single pair of solid 24 gauge twisted, shielded copper cable.
2. Between buildings: Fiber optic run underground and in conduits. If existing communication medium is available that meets these requirements and the Owner provides written approval, the SI may be utilized it for BAS communications. If existing communication medium is not available or usable, the SI shall provide the medium. The minimum conduit size for underground communication shall be one (1) inch diameter. Install two extra spare pairs in each conduit run.

F. Wireless communications are NOT allowed.

G. System shall automatically synchronize controller time clocks daily from an operator-designated controller via the LAN. If applicable, system shall automatically adjust for daylight saving and standard time.

H. System shall be expandable to at least twice the required input and output objects with additional controllers, associated devices, and wiring.

I. Provide updated software on the master host PC located at the central facilities maintenance department and any on-site PC's as necessary for site-based FMT's or administration access as required by the location.

2.5 CONTROL UNITS

A. General: Provide Building Controllers (BC), Advanced Application Controllers (AAC), Application Specific Controllers (ASC), and Smart Actuators (SA) that conform to the following:

B. Communication:
1. Service Port: Each controller shall provide a service communication port for connection to a PC based laptop computer.
2. Signal Management: BC and ASC operating systems shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and to allow for central monitoring and alarms.
3. Data Sharing: Each BC and AAC shall share data as required with each networked BC and AAC.
4. Stand-Alone Operation: Each piece of equipment shall be controlled by a single controller to provide stand-alone control in the event of communication failure. All I/O points specified for a piece of equipment shall be integral to its controller. Provide stable and reliable stand-alone control using default values or other method for values normally read over the network.

C. Environment: Controller hardware shall be suitable for anticipated ambient conditions.
1. Controllers used outdoors or in wet ambient conditions shall be rated for operation at 20°F to 140°F.
2. Controllers used in conditioned space shall be rated for operation at 32°F to 120°F.

D. Enclosures: Controller enclosures shall be of adequate size and style to allow all housed components to be easily serviced.
1. Provide locking type, metal cabinet, with common keying. Panels screwed closed are not acceptable. The enclosures shall have a metal print pocket suitable for storing wiring, service and log information.
2. Indoor panels shall be NEMA 1 enclosures with gaskets.
3. Outdoor panels shall be NEMA 3R.
4. Outdoor panels installed East of US-95 or in cooling tower or chemically treated areas shall be NEMA 4X.
5. Enclosures shall physically isolate 120v power and 24v power and each shall be clearly labeled.

E. Keypad: Provide a local keypad and display for each BC and AAC. Operator shall be able to use keypad to view and edit data. Keypad and display shall require password to prevent unauthorized use. If the manufacturer does not normally provide a keypad and

display for each BC and AAC, provide the software and any interface cabling needed to use a laptop computer as a Portable Operator's Terminal for the system.

F. Real-Time Clock: Controllers that perform scheduling shall have a real-time clock.

G. Serviceability:
   1. Controllers shall have diagnostic LEDs for power, communication, and processor.
   2. Wires shall be connected to a field-removable modular terminal strip or to a termination card connected by a ribbon cable.
   3. Each BC and AAC shall continually check its processor and memory circuit status and shall generate an alarm on abnormal operation. System shall continuously check controller network and generate alarm for each controller that fails to respond.

H. Memory:
   1. Controller memory shall support operating system, database, and programming requirements.
   2. Each BC and AAC shall permanently retain application programming in nonvolatile memory in the event of power loss.
   3. Each ASC and SA shall use nonvolatile memory and shall retain BIOS and application programming in the event of power loss.

2.6 POWER SUPPLIES, LINE FILTERING, AND ELECTRICAL ACCESSORIES

A. Power Line Filtering: Provide internal or external transient voltage and surge suppression for workstations and controllers.
   1. Surge protection shall have:
      a. Dielectric strength of 1000 V minimum
      b. Response time of 10 nanoseconds or less
      c. Transverse mode noise attenuation of 65 dB or greater
      d. Common mode noise attenuation of 150 dB or greater at 40-100 Hz
   2. Surge suppression shall comply at a minimum with manufacturer’s requirements and shall include suppression on all lines entering and leaving each building.
   3. All communication channels between PC, Global and Unitary Controllers whether in conduits or overhead runs, shall have transient suppression networks installed. The transient (Surge) protection must meet IEEE standard C37.90a-1974. The suppression network shall be automatic, self-restoring and be on active duty at all times.

B. Power Supplies: Control transformers shall be UL listed. Furnish Class 2 current-limiting type or furnish over-current protection in primary and secondary circuits for Class 2 service in accordance with NEC requirements. Limit connected loads to 80% of rated capacity.
   1. DC power supply output shall match output current and voltage requirements. Unit shall be full-wave rectifier type with output ripple of 5.0 mV maximum peak-to-peak. Regulation shall be 1.0% line and load combined, with 100-microsecond response time for 50% load changes. Unit shall have built-in over-voltage and over-current protection and shall be able to withstand 150% current overload for at least three seconds without trip-out or failure.
      a. Unit shall operate between 32°F and 120°F. EM/RF shall meet FCC Class B.
      b. Line voltage units shall be UL recognized.
      c. Transformers shall be mounted in an auxiliary panel or other suitable accessible location with disconnecting means. Provide a pilot light for each transformer, to indicate the presence of load power.

C. Controller Wiring Requirements:
   1. Provide all necessary 24 VAC transformers, 24 VAC power distribution wiring, etc. to controllers for a complete operating system.

2. Terminal fittings or insulating bushings shall be used to protect wiring associated with controllers at enclosures, junction boxes, etc.

D. Wiring and Conduit

1. The contractor shall provide all DDC and related control wiring and conduit. Wire and cable shall be pulled from device or control point to the DDC, Auxiliary, or LPI panels. All wire and cable shall be labeled and tagged 4 inches down from the point at which the wire enters the cabinet with the corresponding point number.
2. All indoor exposed control wiring shall be run in EMT; outdoor exposed control wiring shall be run in PVC conduit.
3. All wiring routed in non-exposed (above ceiling) areas shall utilize plenum-rated cabling and be properly supported using J-hooks or cable rings.
4. All cable runs exposed in return air plenums shall be smoke rated for the application and secured to the building structure.
5. Control wiring for 24-volt circuits shall be rated for 300-volt service.
6. All PVC and EMT conduit and outlet boxes shall conform to the requirements specified under Division 26, Electrical.
7. All conductors shall be of stranded copper wire.
8. Conduits shall be sized on a maximum fill of 40% capacity.
9. Data transmission cabling and equipment grounding procedures shall meet the latest FCC guidelines for electromagnetic field generation.
10. All control wiring sizes and types shall meet the equipment manufacturer's recommendations.
11. DDC Wiring and Cable Requirements for New DDC Panels:
    a. Digital Output *Minimum #14 AWG THHN
    b. Digital Input *Teflon jacketed twisted pair #16 -or- #16 AWG THHN minimum
    c. Analog Output *Twisted pair NEC-rated CMP #20 AWG
    d. Analog Input *Twisted pair NEC-rated CMP #20 AWG
    e. Data Transmission *Teflon jacketed twisted shielded pair #24 AWG 12-1/2 pico-ferrad, 6 twists/foot
    f. *Wire sizes listed for lengths up to 750'.
12. All junction boxes and couplings on conduit containing DDC related wiring shall be painted a sky blue color.

2.7 INPUT AND OUTPUT INTERFACE

A. General: Hard-wire input and output points to BCs, AACs, ASCs, or SAs.

B. Protection. Shorting an input or output point to itself, to another point, or to ground shall cause no controller damage. Input or output point contact with up to 24 V for any duration shall cause no controller damage.

C. Binary Inputs: Binary inputs shall monitor the on and off signal from a remote device. Binary inputs shall provide a wetting current of at least 12 mA and shall be protected against contact bounce and noise. Binary inputs shall sense dry contact closure without application of power external to the controller.

D. Pulse Accumulation Inputs: Pulse accumulation inputs shall conform to binary input requirements and shall accumulate up to 10 pulses per second.

E. Analog Inputs: Analog inputs shall monitor low-voltage (0-10 Vdc), current (4-20 mA), or resistance (thermistor or RTD) signals. Analog inputs shall be compatible with and field configurable to commonly available sensing devices.

F. Binary Outputs: Binary outputs shall send an on-or-off signal for on and off control. Building Controller binary outputs shall have three-position (on-off-auto) override switches and status lights. Outputs shall be selectable for normally open or normally closed operation. Separate relays with HOA switches and status lights may be used to meet this requirement.

G. Analog Outputs: Analog outputs shall send a modulating 0-10 Vdc or 4-20 mA signal as required to properly control output devices. Analog outputs shall not drift more than 0.4% of range annually.

H. Tri-State Outputs: Control three-point floating electronic actuators without feedback with tri-state outputs (two coordinated binary outputs). Tri-State outputs may be used to provide analog output control in zone control and terminal unit control applications such as VAV terminal units, duct-mounted heating coils, and zone dampers.

I. Universal Inputs and Outputs: Inputs and outputs that can be designated as either binary or analog in software shall conform to the provisions of this section that are appropriate for their designated use.

2.8 ELECTRONIC SENSORS, INDICATORS, TRANSDUCERS AND COMPONENTS

A. Temperature and Humidity Sensors:

1. Temperature sensor assemblies shall consist of a Resistive Temperature Device (RTD's) with a 4-20 mA 2-wire transmitter and gasketed utility box enclosure. Sensing element shall be platinum with 10K ohms resistance at 32 deg. F. Accuracy shall be +/- 1/2 deg. F over the entire range.
2. Single point duct temperature sensor shall be rigid bulb type with stainless steel (SS) sheath, aluminum tip, and have a calibrated span of 20-120 deg. F or 30-250 deg. F for heating applications.
3. Averaging element duct mounted temperature sensor shall have a SS minimum 25 ft. long continuous element sensor along the entire length, and have a calibrated span of 20-120 deg. F or 30-250 deg. F for heating applications.
4. Rigid averaging element duct mounted temperature sensor shall have a brass case, bendable sheath, continuous element sensor along the entire length, and have a calibrated span of 20-120 deg.
5. Liquid immersion temperature sensors shall have 5 1/2" long probe with SS well, and weather tight enclosure. Transmitters for chilled water shall have a calibrated span of 20-120 deg. F or 30-250 deg. F for heating applications.
6. Approved Manufacturers:
   a. System Integrator’s brand named product.
   b. Hy-Cal
   c. TCS
   d. Siemens
   e. Minco
   f. ACI

B. Outside Air Master Temperature Sensor

1. Single point outside air temperature RTD shall be 1000-ohm thin film platinum resistor sensor with 4-20 mA 2-wire output transmitter with solar shield.
2. Approved Manufacturers:
   a. System Integrator’s brand named product.
   b. Hy-Cal
   c. Viasala
   d. ACI

C. High Precision Temperature Sensors: (for CHWS & CHWR temperature inputs used for BTU calculations)

1. Temperature transmitter with 100 ohm platinum RTD sensor and 4-20 mA 2-wire DC output. Zero and span shall be continuously adjustable. Sensor and transmitter shall be a matched assembly. Accuracy shall be +/- 0.1% of calibrated transmitter span, including combined effects of repeatability, hysteresis and linearity. Calibrated range shall be 20 to 120 deg. F. Both CHWS and CHWR sensor/transmitter assemblies shall have the same span and shall be factory calibrated as a matched pair.
2. Liquid immersion sensors shall have welded stainless steel thermowell. Transmitters shall be of the potted type or shall have a thermally isolated

watertight enclosure. Length of sensor and thermowell shall be selected based on the diameter of the pipe to provide accurate, reliable and homogeneous sensing of the liquid temperature.

3. Approved Manufacturers:
   a. System Integrator's brand named product.
   b. Hycal
   c. TCS
   d. Minco
   e. ACI

D. Humidity Sensors:
1. Sensor element shall be thin film capacitive type or bulk polymer resistance type, accuracy of +/- 3% RH, range of 0-100% RH with 4-20 mA 2-wire linear output. Factory calibrate for maximum accuracy at mid-range of normal operating humidity. All humidity sensors shall be resistant to chlorine and other cleaning agents.
2. Duct Sensors shall have duct probe and mounting plate.
3. Approved Manufacturers:
   a. System Integrator's brand named product.
   b. Siemens
   c. Hycal
   d. TCS
   e. General Eastern
   f. Vaisala

E. Vivarium Temperature and Humidity Sensors: (for wet service)
1. Room temperature RTD shall be 100 ohm platinum sensor with 4-20 mA 2-wire output transmitter. Transmitter shall be waterproof or shall be remote mounted. Cover shall be rustproof, and shall be protected by a SS "U"-shaped guard firmly attached to the wall.
2. Room humidity sensor shall have a 4-20 mA 2-wire output transmitter, 0-100% relative humidity range, accuracy of +/- 2% RH, shall be waterproof, and shall be resistant to chlorine and other cleaning agents. Cover shall be rustproof, and shall be protected by a SS "U"-shaped guard firmly attached to the wall.
3. Combination units shall comply with the above, but shall be mounted in a single, waterproof, rustproof enclosure, and shall be protected by a SS "U"-shaped guard firmly attached to the wall.
4. Approved Manufacturers:
   a. System Integrator's brand named product.
   b. Hy-Cal
   c. Viasala
   d. TCS
   e. General Eastern
   f. Siemens
   g. ACI

F. Pressure and Flow Sensors
1. Air Differential Pressure Transducer:
   a. Variable capacitance type with ranges not exceeding 150% of maximum expected input. Transducer shall have zero and span adjustment. Output shall be 2-wire 4-20 mA with 24 VDC input.
   b. Safe over pressure rating shall be minimum 5 times the range.
   c. Temperature compensated with thermal error of not greater than 0.04% of full scale in temperature range of 40 to 100 deg. F.
   d. Accuracy shall be 1% of full scale.
   e. Approved Manufacturers:
      1) System Integrator's brand named product.
      2) Air Monitor

3) Setra
4) Modus
5) Veris
6) Alta Labs

G. Air Static Pressure Sensors:
1. Duct mounted sensors shall be easily removable for cleaning, have multiple sensing ports, and fabricated of aluminum, copper, or SS. Sensors used in outdoor or condensing environments shall not be copper.
2. Wall or ceiling mounted sensors shall be shielded, suitable for surface or flush mounting, complete with multiple sensing ports, contain a pressure impulse suppression chamber, and fabricated of aluminum, paintable steel, or SS as required.
3. Outside air mounted sensors shall be shielded, complete with multiple sensing ports, maintain sensing accuracy regardless of wind flow direction or pattern, and fabricated of aluminum or SS.
4. Accuracy shall be 1% of actual pressure value.
5. Approved Manufacturers:
a. System Integrator's brand named product.
b. Air Monitor
c. Siemens
d. Dwyer
e. Honeywell
f. Veris
g. Setra
h. Modus

H. Electronic Airflow Sensors:
1. References: UL 873 – Temperature and Airflow Indicating Equipment
2. Qualifications: The company manufacturing the products specified in this section shall have a minimum of five years experience producing products of this type.
3. Special Product Warranty: Provide a manufacturer's parts warranty for 36 months from the date of unit shipment.
4. Description
a. Each measurement device shall consist of one or more sensor probe assemblies and a single microprocessor-based transmitter. Each sensor probe assembly will contain one or more independently wired sensor housings. Multiple sensor housings shall be equally weighted and averaged by the transmitter prior to output. Pitot tubes and arrays are not acceptable. Vortex shedding flow meters are not acceptable.
b. Duct Sensor Probe Assemblies:
1) A single manufacturer shall provide both the airflow/temperature measuring probe(s) and transmitter at a given measurement location.
2) Sensor housings shall be mounted in an extruded 6063 aluminum tube probe assembly.
3) Each sensor probe assembly shall have an integral, U.L. listed, plenum rated cable and terminal plug for connection to a remotely mounted transmitter.
4) The number of sensor housings provided for each location shall be determined by the manufacturer based on the requirements of the application.
5) Probe assembly mounting brackets shall be constructed of 304 stainless steel.
6) Probe assemblies shall be insertion mounted through the side or top of the duct.

7) The operating airflow range shall be 0 to 2,500 FPM unless otherwise indicated on the plans.

c. Transmitters
1) The transmitter shall operate on 24 VAC and shall not require an isolated power source.
2) The operating temperature range for the transmitter shall be -20° F to 120° F. The transmitter shall be protected from weather and water.
3) The transmitter shall be capable of communicating with the host controls via a linear analog output signal: Field selectable, fuse protected and isolated, 0-10VDC and 4-20mA (4-wire)

d. The measuring device shall be UL listed as an entire assembly.

e. The manufacturer's authorized representative shall review and approve placement and operating airflow rates for each measurement location indicated on the plans. A written report shall be submitted to the consulting mechanical engineer if any measurement locations do not meet the manufacturer's placement requirements.

5. Acceptable Products:
a. Ebtron HTx104-PE series

I. Liquid Flow Meters: (Insertion Electromagnetic type)
1.
2. Liquid flow measurement sensor shall be of the electromagnetic flow meter type and shall be bi-directional, microprocessor-based, with insertion style mounting.
3. Product shall be complete with all installation hardware necessary to enable insertion and removal of the meter without system shutdown. Wetted metal components shall be 316 SS. The flow meter shall average velocity readings from two sets of diametrically opposed electrodes.
4. Each flow meter shall be individually wet-calibrated against a primary volumetric standard that is accurate to within 0.1% and traceable to NIST. A certificate of calibration shall be provided with each flow meter.
a. Accuracy shall be within ± 1% of rate from 2-20 ft/s.
b. Overall turndown shall exceed 100:1.
5. Output signals shall be completely isolated and shall consist of the following:
a. (1) analog output; 4-20mA, 0-10V, or 0-5V jumper selectable,
b. (1) scalable dry contact output for totalization
c. (1) high resolution frequency output for use with peripheral devices such as an ONICON display module or Btu meter.
d. FB-3500 for Bi-directional applications shall provide additional contact outputs for direction and flow totalization in each direction.
6. Product: Onicon FB-3500 Series (or approved equal)

J. Pressure to Electronic Transducers
1. Provide transducers to convert linear proportional pressure signals to interface with the Siemens analog input modules. The transducer shall be a panel-mounted device, with input pressure snubber, as required, and gauge. Supply voltage shall be 19-26 VAC. Control signal shall be 4-20 mA. Accuracy shall be 1 percent full scale. Thermal effect shall be less than 1 percent full scale on zero and less than 1 percent of reading on span. Transducer shall have elastomer seals and SS wetted parts.
2. Approved Manufacturers:
a. Siemens
b. Setra
c. Modus
d. ACI
e. Dwyer
f. Veris

K. Carbon Dioxide Sensors:
1. Carbon dioxide sensing cell shall consist of a nondispersive infrared carbon dioxide gas cell that uses a pulsed source and has no free air optical path. Output shall be linearized 4-20 mA for use with 24 VDC input. The unit shall be specifically designed for the wall or duct application specified. Duct aspiration boxes shall be by the manufacturer. Unit shall have span adjustment. The unit shall have no moving parts.
2. Minimum requirements:
   a. Range: 0-2,000 ppm
   b. Accuracy: 3 % of full scale
   c. Repeatability: 1% of full scale
   d. Power Consumption: less than 3 watts
   e. Zero Drift at Constant Temp.: 100 ppm per 24 hrs(random not cumulative)
   f. Max. allowable Drift in 1 year: 20 ppm
3. Unit shall not require calibration for a period of 1 year or more.
4. Approved Manufacturers:
   a. System Integrator's brand named product.
   b. Valtronics
   c. Telaire
   d. Veris

L. Current Sensing Switches
1. Provide a solid-state switch which closes when the current level sensed by the internal current transformer exceeds the trip point. Internal circuits are to be totally powered by induction from the line being monitored.
2. All devices that are not "direct drive" (using flex couplings or belts) shall utilize adjustable threshold current switches to enable detection of changes in motor amp draw upon drive failure.
3. Devices monitoring DC motors shall be specifically designed for DC motor operation.
4. The CS shall be a self-gripping split-core type with optional mounting feet bracket; shall be isolated to 600 VAC rms; and shall have an adjustable mounting bracket for installation flexibility.
5. Output shall be N.O., Solid State, 1.0 A @ 30 VAC/DC with a minimum aperture of 0.52"X0.68" for motor power feed.
6. Approved Manufacturer:
   a. Veris Industries Hawkeye model #H800.

M. Current Transducer
1. Provide a solid-state transducer to monitor current level sensed by the internal current transformer. Internal circuits are to be totally powered by induction from the line being monitored.
2. Size transducer based upon equipment monitored to operate within manufacturer's recommended range.
3. Accuracy: within 2% FSO
4. Output:4-20 mA
5. Mounting: Foot style
6. Approved Manufacturer:
   a. Kele CX

2.9 INTELLIGENT DEVICES
A. Intelligent devices shall be capable of interfacing directly with the RS-485 network.
B. Microprocessor Based Space Sensor
1. A microprocessor based space sensor residing on a RS-485 network shall provide the following field programmable functions:
   a. Space temperature measurement and indication

b. Outside air temperature indication
c. Space temperature setpoint adjustment
d. View the value of any input or output in the system
e. Change the value of any input, output or software point in the system

2. The sensor shall include an RJ11 jack for connection of a PC to the entire LAN network.
3. Approved Manufacturers:
   a. System Integrator's brand named product.

2.10 ELECTRIC COMPONENTS

A. Components shall be Honeywell, Johnson, Siemens, or private labeled by manufacturer of the control system.
B. Low temperature detection thermostats:
   1. Shall be duct type, fixed 5 deg. F differential, range 20 to 60 deg. F. Sensing element shall have a 20-foot long capillary tube responding to the lowest temperature sensed along any 12 inches of bulb length. Switch shall be SPDT 120 VAC, UL listed, rated for 10 amps at 120 VAC full load. Unit shall be manually reset. Provide one thermostat for every 20 square feet of coil surface.
C. High temperature detection thermostats:
   1. Shall be two-position type, range and element shall be suitable for the service, single or double pole, normally open or normally closed as required. Set point shall be adjustable over the full range. Switch shall be UL listed, rated for 10 amps at 120 VAC full load. Unit shall be manually reset.
D. Immersion electric thermostats:
   1. Shall be two-position type, range and element shall be suitable for the service, single or double pole, normally open or normally closed as required, with stainless steel separable well. Set point shall be adjustable over the full range. Switch shall be UL listed, rated for 10 amps at 120 VAC full load.
E. Remote-bulb electric thermostats
   1. Shall be two-position type, range and element shall be suitable for the service, single or double pole, normally open or normally closed as required, with stainless steel separable well as required. Set point shall be adjustable over the full range. Switch shall be UL listed, rated for 10 amps at 120 VAC full load.
F. Wall-mounted electric thermostats:
   1. Shall be two-position type, range and element shall be suitable for the service, single or double pole, normally open or normally closed as required. Set point shall be adjustable over the full range. Switch shall be UL listed, rated for 10 amps at 120 VAC full load.
G. Differential Pressure Switches:
   1. Differential pressure switches shall be furnished as indicated by the sequence for status purposes for either air or water applications.
   2. Provide single pole double throw switch with fully adjustable differential pressure settings. The switch shall have a snap-acting Form C contact rated for the application.
   3. The switch contact shall be rated for 5 amps at 120 volts as a minimum.
   4. Units shall be selected for ranges consistent with the application and shall be submitted for the Engineer's approval.
   5. Pressure rating of switch and connecting tubing:
      a. Fan - Rated for 12 inches WC.
      b. Pump – Maximum deadhead system pressure.
   6. Switches used for safety shutdown applications shall be of the manual reset type.
   7. Approved Manufacturers:
      a. System Integrator's brand named product.
      b. Honeywell
      c. Siemens

d. Dwyer
e. Cleveland Airflow
f. Mamac

H. Control Relays and Contactors:
1. Relays shall be a minimum DPDT, of proper coil voltage, with neon indicator light, and of sufficient rating for specified purpose. Relay base shall be of the screwed terminal type.
2. Contactors shall be definite purpose type, have adequate number of poles, of proper coil voltage, and of sufficient rating for specified purpose. Contactors used for DDC interface control shall contain a Hand-Off-Auto switch.
3. Approved Manufacturers:
a. System Integrator's brand named product.
b. Dayton
c. Siemens
d. Allen-Bradley
e. GE
f. Square D
g. Veris

2.11 AUXILIARY CONTROL DEVICES
A. Automatic Control Dampers
1. Furnish and install, at locations shown on plans, as indicated in schedules, and as required by details control dampers conforming to the following.
2. Manufactured by an ISO 9001 accredited manufacturer.
3. Frames: 6063T5 extruded aluminum hat channel with hat shaped mounting flanges on both sides of the frame.
4. Damper blades: Airfoil type extruded aluminum, 6" depth with integral structural reinforcing tube running full length. Minimum thickness of blade shall be 0.070".
5. Blade edge seals shall be flexible and suitable for -72°F to +275°F mechanically locked in extruded blade slots yet easily replaceable in field. Jamb seals shall be flexible stainless steel, compression type to prevent leakage between the end of the blade and the damper frame. Use of blade end to overlap the frame for jamb seal is not acceptable. Adhesive or clip-on type blade or jamb seals are not acceptable.
6. Bearings: Non-corrosive molded synthetic. Axles shall be 7/16" (Min) plated steel hexagonal shaped and to provide positive locking connection to blade (round axles are not acceptable). Linkage shall be concealed out of airstream, within frame to reduce maintenance.
7. Submittal data shall include leakage, maximum airflow and maximum pressure ratings based on AMCA Publication 500. Damper shall be tested and licensed in accordance with AMCA 511 for Air Performance and Air Leakage. Damper shall meet the leakage requirements of the International Energy Conservation Code by leaking less than 3 cfm/sq. ft. at 1" of static pressure and shall be AMCA licensed as Class 1A.
8. The Control Contractor shall furnish all the controlled for installation by the Sheet Metal subcontractor or the Mechanical contractor.
9. Dampers shall be of the parallel blade design for two- position service and opposed blade design for modulating service.
10. Approved Products:
a. Outside Air (existing ductwork): Tamco Series 1500
b. Outside Air (new ductwork): Tamco Series 1500
c. Return Air: Tamco Series 1500
d. Tamco Series 1500 - Preferred or approval equal

B. 2-way Control Valves (Pressure Dependent)

1. Control valves shall be two-way type for two-position or modulating service as scheduled or shown.
   a. Close-off (differential) Pressure Rating: 200 psi.
2. Water Valves:
   a. Body and trim style and materials shall be per manufacturer's recommendations for design conditions and service shown, with equal percentage ports for modulating service.
   b. Sizing Criteria:
      1) Two-position service: Line size.
      2) Two-way modulating service: Pressure drop shall be equal to twice the pressure drop through heat exchanger (load), 50% of the pressure difference between supply and return mains, or 5 psi, whichever is greater.
      3) Valves 1/2" through 2" shall be bronze body or cast brass ANSI Class 250, spring loaded, Teflon packing, quick opening for two-position service. Two-way valves to have replaceable composition disc, or stainless steel ball.
      4) 2-1/2" valves and larger shall be cast iron ANSI Class 125 with guided plug and Teflon packing.
   c. Acceptable Manufacturer:
      1) Belimo
      2) Bray
      3) Delta
      4) Product by Specified Control System Manufacturer (with prior approval on each project only)

C. 3-way Control Valves
1. Control valves shall be three-way type for two-position or modulating service as scheduled or shown.
   a. Close-off (differential) Pressure Rating: 200 psi.
2. Water Valves:
   a. Body and trim style and materials shall be per manufacturer's recommendations for design conditions and service shown, with equal percentage ports for modulating service.
   b. Sizing Criteria:
      1) Two-position service: Line size.
      2) Three-way Modulating Service: Pressure drop equal to twice the pressure drop through the coil exchanger (load), 5 psi maximum.
      3) Valves 1/2" through 2" shall be bronze body or cast brass ANSI Class 250, spring loaded, Teflon packing, quick opening for two-position service. Two-way valves to have replaceable composition disc, or stainless steel ball.
      4) 2-1/2" valves and larger shall be cast iron ANSI Class 125 with guided plug and Teflon packing.
   c. Acceptable Manufacturer:
      1) Belimo
      2) Bray
      3) Product by Specified Control System Manufacturer (with prior approval on each project only)

D. Electronic Valve And Damper Operators
1. Description:
   a. The actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator.
   b. Where shown, an internal mechanical, spring return mechanism shall be built into the actuator housing.

c. All rotary spring return actuators shall be capable of both clockwise and counter clockwise spring return operation. Linear actuators shall spring return to the retracted position.
d. Proportional actuators shall accept a 0-10 VDC or 0-20 ma control signal and provide a 2-10 VDC or 4-20 ma operating range.
e. All 24 VAC/DC actuators shall operate on Class 2 wiring and shall not require more than 10 VA for AC or more than 8 W for DC applications.
f. All non-spring return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring return actuators with more than 60 in-lb. torque capacity shall have a manual crank for this purpose.
g. All modulating actuators shall have an external, built-in switch to allow the reversing of direction of rotation
h. Actuators shall be provided with a conduit fitting and a minimum 1m electrical cable and shall be pre-wired to eliminate the necessity of opening the actuator housing to make electrical connections.
i. Actuators shall be Underwriters Laboratories Standard 873 listed.
j. Actuators shall be designed for a minimum of 60,000 full stroke cycles at the actuator's rated torque.

2. Special Warrantee: Provide a 5-year materials warrantee.
3. Acceptable Manufacturers:
   a. Belimo
   b. Product by Specified Control System Manufacturer (with prior approval on each project only)

PART 3 EXECUTION

3.1 EXAMINATION
A. Verify equipment is installed and prepared for controls connections.
B. Verify conditioned power supply is available to control units and to operator workstation.
C. Verify field end devices, and wiring is installed prior to installation proceeding.

3.2 INSTALLATION
A. General:
1. Install Work in accordance with the Florida Building Code.
2. Remove any unused items that are part of renovations or demolition, including, but not limited to: conduit, wire, tubing, controllers, controlled devices, relays, enclosures, etc. Do not abandon in place.
3. Locate all control components and accessories such that they are easily accessible for adjustment, service and replacement.
4. The control system shall be completely installed and ready for operation.
5. Dielectric isolation shall be provided where dissimilar metals are used for connection and support.
6. Penetrations through and mounting holes in the building exterior shall be made watertight. Penetrations through fire and smoke rated assemblies shall maintain fire and/or smoke rating.
7. Devices mounted in or on piping or ductwork, on building surfaces, in mechanical/electrical spaces, or in occupied space ceilings shall be installed in accordance with manufacturer's recommendations and as shown. Control devices to be installed in piping and ductwork shall be provided with required gaskets, flanges, thermal compounds, insulation, piping, fittings, and manual valves for shutoff, equalization, purging, and calibration.
8. Where control devices are installed on insulated piping or ductwork provide standoff brackets or thermal wells sized to clear insulation thickness. Provide

extended sensing elements actuator or linkages, and other accessories as required.

9. Install control systems and materials in accordance with manufacturer's instructions, industry standards, rough-in drawings, and detail drawings. Install electrical components complying with the requirements of Division-26. Mount all control panels at convenient locations and heights.
10. Thermostats or sensors mounted on outside walls shall be mounted on 1" minimum thickness, rigid fiberglass insulating base (or equal).
11. All thermostat bulbs in water lines shall be installed inseparable wells, packed with heat conductive compound.
12. All controllers, relays, transducers, etc., required for stand-alone control shall be housed in NEMA and UL listed enclosures with a lockable door. The type of NEMA enclosure shall be based upon environmental requirements outlined in the specifications or on the drawings for this project.
13. DDC components that are to be factory mounted shall be provided by the SI Contractor and shipped to the equipment manufacturer for installation. Coordination of the factory installation shall be the responsibility of the SI Contractor. Proper operation of factory installed components shall be the responsibility of the SI Contractor.

B. Communication and signal wire installation requirements:
1. Install all exposed wiring external to control panels, including low-voltage wiring, in EMT. Wiring shall be installed without splices between control devices and DDC panels.
2. Plan and coordinate routing with other disciplines.
3. Do not interfere with equipment access.
4. Provide flexible metallic conduit where equipment mounting is flexible.
5. Seal penetrations into air moving equipment including inside conduit.

C. Enclosures
1. Provide NEC compliant separation between high voltage and low voltage wiring and components inside enclosures.
2. Use panduit straps and/or cover plates in each control panel to organize and conceal all wiring.
3. Fuse all transformers.
4. Control panels shall be clearly identified by labels (2" lettering).
5. Provide and install as-built wiring diagrams to indicate the control points on all equipment.
6. Provide laminated point lists in all control panels.

D. Control Units
1. Install control units and other hardware in position on permanent walls where not subject to excessive vibration.
2. Install software in control units and in operator workstation. Implement features of programs to specified requirements and appropriate to sequence of operation. Refer to Sequence of Operations.
3. Provide 120 volt, 15 amp dedicated power circuit to each programmable control unit.
4. Provide surge suppressor at each programmable control unit.
5. Install electrical material and installation in accordance with appropriate requirements of Division 16.

E. Temperature and Humidity Sensors
1. Install space temperature and humidity sensors where shown on drawings.
2. Where sensors may be affected by diffuser throw patterns, coordinate with engineer to determine acceptable location.
3. Strap-on temperature sensing elements shall not be used.

F. Outside Air Master Temperature Sensor
1. Coordinate with Owner to determine location.

2. Anchor securely to structure.

G. High Precision Temperature Sensors
1. Install sensors in locations with adequate distance from mixing points to ensure complete mixing.

H. Pressure and Flow Sensors
1. Install in locations that ensure accurate sensing.
2. Avoid areas that will interfere with maintenance access.

I. Air Static Pressure Sensors
1. Install where shown on drawings or 2/3 airway distance down main duct.
2. Sensors should be installed with adequate “straight” duct upstream to ensure accuracy.

J. Air flow Sensors
1. Install where shown on drawings and per manufacturer’s instructions.
2. Sensors shall have straight duct upstream and downstream per manufacturer’s recommendations. Coordinate with duct installer. Notify Engineer in writing if required straight duct has not been provided.

K. Liquid Flowmeters
1. Flowmeters shall be installed with at least 10 diameter of straight pipe length upstream and five diameter of straight pipe length down stream.

L. Current Switch
1. Motor Status: The contractor shall provide and install a Current Sensing switch on any motor required to have motor status. One phase of the motor power feed shall be routed through the aperture of the current sensing switch.

M. Automatic Control Dampers
1. Permanently mark shaft as to indicate damper position.
2. Install in accordance with manufacturers written instructions, rough-in drawings, and detail drawings.

N. Control Valves and Actuators
1. Install control valve actuator vertically (above the pipe) whenever possible.
2. Valves installed such that the actuator is below a horizontal position will not be accepted.
3. Provide ample maintenance access.
4. Permanently mark shaft as to indicate valve position
5. Install in accordance with manufacturers written instructions, rough-in drawings, and detail drawings.

O. Damper Operators
1. Actuators shall be installed so that their action shall seal the damper to the extent required to maintain leakage at or below the specified rate and shall move the blades smoothly.
2. Actuators shall not be mounted in the air stream unless installed within an air handling unit.
3. Multiple actuators operating a common damper shall be connected to a common drive shaft.

3.3 VERIFICATION

A. After control components have been installed and connected, test, adjust and re-adjust as required all control components in terms of function, design, systems balance and performance.

B. Control devices, linkages and other control components shall be calibrated and adjusted for stable and accurate operation in accordance with the design intent and to obtain optimum performance from the equipment controlled.

C. All control valves shall be stroked and spring ranges verified and set.

D. All dampers shall be stroked to verify proper and smooth operation.

E. Cause every device to automatically operate as intended to ensure its proper functionality. Make systems ready for acceptance tests.

3.4 DEMONSTRATION

A. Demonstrate complete and operating system to Owner's representative.

DIVISION 26
ELECTRICAL

1. Provide appropriate number of spare lamps, fuses, etc. commensurate with scope of work.

2. Provide three (3) sets of Operating and Maintenance (O & M) manuals covering all systems and equipment.

3. On renovation projects, engineer shall require certification of disposal per Florida Statute 403.7186 for mercury containing lamps and devices.

4. All empty/spare conduits shall have pull strings with labeling tags at each end and sealed.

5. Surge protection shall be included on service entrance and all line voltage panels with breaker. Devices to be UL1449, 3rd Edition, and installed per the "Typical Surge Protection Device (SPD) Panel Installation" sketch (see Attachments section of this manual).
   A. Use a voltmeter to check all voltages to ensure correct SPD.
   B. If unit has Flush Mount option, refer to Flush Mount installation instructions following.
   C. If SPD has dry contact, pre-plan its installation.
   D. Remove power for panel. Confirm panel is deenergized.
   E. Identify breaker location and SPD location.
   F. Remove an appropriately sized knockout from panel.
   G. Mount SPD, use appropriate weatherproofing equipment as needed.
   H. Connect conductors as appropriate – short and straight as possible (note that Hi-Legs are Phase B).
   I. Label or mark conductors as appropriate (neutral: white, ground: green, energized: black, hi-leg: orange).
   J. Make sure system is bonded per NEC and is clear of hazards or faults before energizing (N-G bonding not per NEC will fail SPD: #1 cause of SPD failures).
   K. Energize and confirm proper operation of indicators and/or options.
   L. A sealing O-ring is provided. SPD can be chase-nipple mounted (nut is provided).
   M. Note that any conduits must be installed correctly.

6. Surge protection shall be included on all low voltage system cables entering/exiting buildings that connect to electronic equipment.

7. Lightning protection shall be evaluated for all buildings including Physical Education (PE) pavilions per FBC Section 423.

8. The specifications shall require a pre-construction existing condition check of all equipment and system affected by a construction project. The contractor shall provide a written report to the owner noting all the deficiencies. The contractor shall be responsible for all subsequent deficiencies not noted in the report.

9. BASIC METHODS AND MATERIALS
   A. All conductors and buss bars shall be copper and made in USA.
   B. All raceways shall have an insulated copper equipment-grounding conductor sized per NEC.
   C. Conduit fittings shall be steel and made in USA.
   D. Flexible metallic conduit shall be steel.
   E. Electrical nonmetallic conduit (ENT) shall not be used.
   F. Nonmetallic surface raceway shall not be used for power or fire alarm wiring.
   G. Branch circuit conduit home runs shall be 3/4-inch minimum.
   H. The conduit systems and junction boxes in nonpublic or concealed spaces shall be color coded as follows:

Color Code for Junction Boxes	**Paint Color**
System Emergency 277 / 480 volt	Orange
System Emergency 120 / 208 volt	Black
Fire Alarm	Red

Color Code for Junction Boxes (panel & circuit ID's on painted cover)	**Paint Color**
Normal Power 277 / 480 volt	Brown
Normal Power 120 / 208 volt	Black
Fiber Optics	Purple
Sound System	Yellow
Clock	Light Blue
Intercom	Blue
Computer/Data	Gold
TV	White
Security / CCTV	Beige
HVAC Controls	Violet
Paint bands shall be 4" in length spaced at 10 ft. intervals.	

I. Coastal areas (East of US 1) shall use PVC or PVC coated rigid conduit and NEMA 4X enclosures for exterior exposed locations. PVC shall not be used where subject to physical damage.
J. Expansion fittings shall be provided in exposed conduit runs over 100 feet, at building expansion joints and in conduit runs between buildings.
K. No splices shall be made in underground/flush in-grade pull boxes without approval by the Owner.
L. Underground conduit shall be a minimum of 24" below grade.
M. All trenching at existing facilities shall be done by hand unless approved as otherwise by the Owner.
N. Conduit shall not be run on roofs without approval by the Owner.
O. Wall plates shall be brushed stainless steel or nylon.
P. Designated computer outlets shall be black.
Q. Devices shall be specification grade 20 amps rated minimum.
R. Exterior terminal cabinets shall have lockable covers.
S. "MC" CABLE NOT PERMITTED; exception may be made by Owner. Six-foot (6') factory made whips only. No Field-cut lengths.
T. Use Liquid Tight Steel Flex with appropriate fittings for motors in wet or damp locations.
U. General purpose outlets in a classroom shall all be on the same circuit.
V. Conduit or wiring shall not be allowed to run exposed across any roof.
W. All junction boxes shall be labeled with panel and circuit designations.
X. Limit use of floor outlets.
Y. Provide appropriate access to all equipment for servicing.
Z. No Romex.

10. SERVICE AND DISTRIBUTION
    A. Main service and distribution panels shall have a minimum of twenty percent (20%) spare capacity, with twenty percent (20%) spare breakers. Spares are for Owner's use only, not the electrical contractors. Provide volt/amp meter on all main service panels.
    B. Engineer shall show load calculation and panel schedules on plans.
    C. Equipment shall be limited to Square "D", General Electric, Seimens and Cutler Hammer.
    D. Design consideration shall be given to accommodations for non-linear loads including "K4" (minimum) rated transformers and oversized feeder neutrals. In multi-wire branch circuits that serve computers or other non-linear loads, a separate neutral conductor shall be installed for each circuit. The neutral shall be the same wire size as the branch circuit conductor. 20 Amp branch circuit conductors shall be sized as follows: lengths of 0-100 feet shall be #12 AWG, lengths of 101-175 feet shall be #10 AWG. All lengths are total length from circuit breaker to first outlet.
    E. Panel directories shall be typed for new installations or when circuits are added to existing panels.
    F. For new schools, the engineer shall provide one 120/208 volt, 400 amp 3 pole circuit breaker with a 4-inch conduit stub-out for future portable classrooms. The breaker and conduit stub-out

should be located as close to portable site as practical. This is not part of spare service capacity and should be included in service calculation as a load.

G. All sources of strong electro-magnetic fields shall be located to minimize exposure in normally occupied space.
H. Generator installations shall include battery charging system. Diesel fuel is preferred, with an automatic transfer switch, exerciser and phase loss monitor.
I. Provide generator power to all MDF/IDF locations per Premise Distribution section of these guidelines and fire alarm / intercom systems.
J. Generator rooms should be provided with a battery powered light fixture.
K. Generator installation shall include an amp meter located in the same room as the transfer switch.
L. Provide isolation pads between generator legs and concrete to prevent rust.
M. Protect generator against wind debris damage.
N. All transformers to have copper windings.

12. LIGHTING

A. Interior lighting shall be LED type with Magnetek electronic ballasts and T8, 4100K, 80 CRI lamps or equal made in the USA.
B. Fixtures shall be 2'X4'.
C. Exit lights shall be LED type.
D. Exterior lighting shall be LED type.
E. Exterior lighting shall be controlled by the Building Automation System (BAS).
F. Multiple switches should be provided in all classrooms: one switch to control 50% of all fixtures and one switch to control remaining fixtures. Occupant sensor shall turn lights off when room is unoccupied. Daylight Harvesting system per ASRAE 90.1
G. Fixture lens shall be acrylic prismatic type unless matching existing conditions or otherwise directed by the Owner.
H. Athletic fields: Musco lighting is preferred. Provide remote ballasts and a separate circuit for each pole. Athletic fields shall be LED Type with average 50 fc on field and 30 fc on track.
I. Contractor, at his option, may use UL listed flexible wiring system for lighting fixture branch circuitry above accessible lay-in ceilings. All homeruns, connections to light switches, and branch circuitry for all other ceiling conditions shall be in a conventional raceway system per specifications.
J. See “Aluminum Canopy Light Fixture Installation” sketch in the Attachments section of this manual.

13. FIRE ALARM

A. Fire alarm control panels shall be limited to Notifier NFS 320 or Edwards EST3.
    1) All fire alarm work shall be done by a factory authorized engineered systems distributor within fifty (50) miles of Facilities Services.
B. All wiring shall be color coded as follows:
    1) Initiating - yellow and brown
    2) Indicating - blue and red
    3) Control Relays - orange
    4) Door Holders - gray
    5) 24 Volt Power - black and white
C. Pull stations shall be double action, non-break glass, DC operated.
D. Provide interface with security transmitter for remote monitoring of alarm conditions.
E. Provide fully addressable system with fiber optic backbone (fiber optic between buildings).
F. Fire alarm operated gas line solenoids shall have key operated reset switches located to assure control by supervisor of service area.
G. Control panel shall include a key operated HVAC shutdown by-pass and a key operated gas solenoid by-pass for use by service personnel.
H. On new schools, engineer shall include a terminal cabinet with designated initiating and indicating zone wiring for future portable classrooms. It should be located as close as practical to portable site and include one 1 1/2" conduit stub out.

I. Exterior unprotected horn/strobe units shall be installed with a “Safety Technology International” 1200 series weatherproof protective cover.
J. Install “Hazmat” control switch for fire alarm. Provide key switch on remote enunciator in main office to shut down all air handlers currently tied to system and close all fire doors controlled by the fire alarm system. This will not cause an audible alarm in the buildings and will not activate the fire alert to Security.
K. Install UL listed surge protection and approved grounding at all control panels.
L. Install smoke detector above fire alarm panel.
M. Notifier Fire Alarm Guide
    1) Fiber Optic Cable
        a) Fiber type: 62.5/125 micrometers (multimode)
        b) Maximum link loss is 8dbm with 62.5/125 NM fiber.
        c) Connectors: ST style
        d) Bend radius not less than 15 times the cable diameter.
        e) Provide fiber termination cabinet (i.e.: Corning WCH-02P-1215T with 6 ST style connector or more as required).All fiber strands shall be termination cable (spare or future use)
        f) Fiber patch cable (from fiber term cabinet to fiber module) shall be ST to ST multimode duplex patch cable length as required.
    2) Systems Software
        a) Provide all software and firmware required for end user (Owner) technicians to fully program fire alarm panel(s) and all support devices.
        b) Software shall be “open architecture” version(s) and upgraded versions shall be made available to the Owner, as released by manufacturer of notifier equipment.
        c) Software password shall remain factory default only.
        d) A fire alarm documents box shall be provided with all documents and Program provided and a flash drive. Mounted in close proximity to the NCA or Node 1.
N. All projects that include removing any fire alarm “Reacceptance testing” and documentation. Reference: NFPA 72 Section 14.4.2.1 (2022 Edition)

14. INTERCOM
    A. Equipment shall be limited to those systems manufactured by Rauland or Bogen.
    B. Normal line voltage power shall be provided by emergency service.
    C. Uninterruptible power supply (UPS) shall be provided.
    D. Microprocessor based systems only.
    E. Underground cable shall be West Penn “Aqua Seal” or approved exact equal.
    F. On new schools, engineer shall include a terminal cabinet with wiring for 10 portable classrooms. It should be located as close as practical to portable site and include one 2" conduit stub out.
    G. Provide fiber backbone between all buildings.
    H. Administration phones to be used for all areas as required for elementary, middle and high schools.
    I. Provide outside speakers for adequate coverage of all outside playground and courtyard areas in addition to parent pick up and bus loop areas.

15. It is desired that three-phase equipment shall have a three-phase loss protection monitor to automatically shut down the motor upon loss or reversal of any phase and reset automatically after a delay when normal conditions are restored.

16. Networking equipment requires a 120-volt 30 amp circuit installed with a NEMA L5 30p twist lock connector. This shall be located in the network equipment room at the rack.

17. The language below shall be included in the Electrical Division of the specifications as a separate Electrical Section entitled “TESTS – VERIFICATION - GROUNDING”; number to coordinate with the Electrical Division.

TESTS – VERIFICATION – GROUNDING

Part 1 – GENERAL - N/A

Part 2 – PRODUCTS - N/A

Part 3 - EXECUTION

3.1 TESTS

A. System

1. General: After installation of all conductors, and before final acceptance, make required tests to determine proper functioning of all circuits. Furnish all necessary instruments required to make tests and correct any deficiencies found. Prior to energizing, circuits shall be “rung-out” to verify opens, intentional and non-intentional grounds, continuity and detect short circuits by accepted constant “megger”.

2. Procedure
   a) All wires in conduit that are shorted or unintentionally grounded shall be replaced.
   b) Insulation resistance of all feeder conductors and all conductors AWG #1 and larger shall be tested. This is to include all new conductors and/or all existing conductors that are connected and/or extended. Each conductor shall have its insulation resistance tested after the installation is completed and all splices, taps and connections are made except connection to source and point of final termination at distribution or utilization equipment. All testing per ANSI/NETA ATS-2009.
   c) Insulation resistance of conductors that are to operate at 600 volts or less shall be tested by using AVO Biddle (or accepted equal) Megger at not less than 1000 volts dc. Resistance shall be measured from conductor to conduit (ground). Testing methodology shall conform to short-time or spot-reading procedural recommendations of AVO Briddle Instruments for specific megger being used. Acceptable insulation resistance of conductors rated at 600 volts shall not be less than one (1) megohm.
   d) Conductors that do not satisfy test requirements (c) above shall be removed, replaced and testing repeated on the new cable at no additional cost to the Owner. All tests shall be performed by licensed electrician trained in the use of test instruments. Contractor shall furnish all instruments and personnel required for tests shall tabulate readings observed and complete “Conductor Insulation Resistance Test” form (attached) and submit five (5) copies to Engineer for acceptance. Test shall be witnessed by Owners representative and Engineer (if so desired). Final acceptance data is to be submitted in O&M Manual.
   e) Test reports shall identify each feeder conductor tested, date, time, result of test, weather conditions, range, test voltage and serial number of the megger instrument used. Any conductor or splice that is found defective shall be promptly removed and replaced; additional test shall be performed.
   f) Observe all safety instructions set by testing equipment manufacturer. Application of voltage testing involves risk of electric shock and sparking.
3. Take readings of voltage and amperage at building main disconnect switch and at main for each panel, at primary and secondary side of each transformer and at the end of the longest branch circuit at each panel. The above readings shall be taken (1) “no load” conditions and (2) “full load” conditions with all equipment using electricity. Tabulate readings, complete Voltage & Amperage Readings - Tabulated Data” form (see Forms section of this manual) and submit five (5) copies to the Engineer for acceptance. Final accepted data is submitted in the O&M Manual.

B. Grounds

1. Test each raceway for raceway continuity.
2. Test each grounding system used in the project.
3. Submit “Ground Test Information” form (see Forms section of this manual) for each and every grounding system in the project including but not limited to: each ground rod installation; each water pipe and ground installation (test water pipe to ground and test water pipe to building service equipment); and each building steel ground connection (test building steel to ground and test building steel to building service equipment).
4. Grounding resistance shall be as called for in “Conductor Insulation Resistance Test” form (see Forms section of this manual).
5. Testing shall be three (3) point method in accordance with IEEE.
6. Provide ground ring encircling each building and connected to each building periodically.

C. Ground Resistance

1. Main Electrical Service (to each building) and Generator Locations
   a) Grounding resistance measured at each main service electrode system and at each generator electrode system shall not exceed 5 ohms.
2. Other locations
   a) Resistance to ground of all non-current carrying metal parts shall not exceed 5 ohms measured at motors, panels, busses, cabinets, equipment racks, light poles, transformers and other equipment.
   b) Lightning Protection system ground locations shall not exceed 5 ohms for the Franklin system measured at ground electrode.
3. Resistance called for above shall be maximum resistance of each ground electrode prior to connection to grounding electrode conductor. Where ground electrode system being measured consists of two (2) or more ground rod electrodes then the resistance specified above shall be the maximum resistance with two (2) or more rods connected together but not connected to the grounding electrode conductor.

D. Install additional rod electrodes as required to achieve specified resistance to ground (specified ground resistance is for each ground rod location prior to connection to ground electrode conductor). Depending on soil condition, etc of ground rod locations it has been found that the ground rod lengths required to achieve the specified resistance may range from the minimum specified length to up to 80 feet or more in length.

E. Provide grounding well with cover at each rod location. Install grounding well top flush with finished grade.

F. Verify that final backfill and compaction has been completed before driving rod electrodes.

G. Install ground rods not less than 1 foot below grade level and not less than 2 feet from structure foundation.

18. The language below shall be included in the Electrical Division of the specifications as a separate Electrical Section entitled “REGULATORY REQUIREMENTS”; number to coordinate with the Electrical Division.

REGULATORY REQUIREMENTS

Part 3 - EXECUTION

3.1 Regulatory Requirements

A. Conform to all applicable requirements of the following codes, standards, guidelines, etc. If there should be conflicting requirements between these codes, standards, guidelines, etc., the more or most stringent requirement shall apply that does not violate any codes or laws.
   1. Standards and Miscellaneous Codes / Regulations (comply with latest edition or notice available unless otherwise adopted by Authority having Jurisdiction)
      a) Americans with Disabilities Act (ADA)
      b) American National Standards Institute (ANSI)
      c) American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
      d) American Society of Mechanical Engineers (ASME)
      e) American Society for Testing and Materials (ASTM)
      f) Concrete Reinforcing Steel Institute (CRSI)
      g) Department of Community Affairs (DCA)
      h) Electronics Industries Association / Telecommunications Industry Association (EIA/TIA)
      i) Institute of Electrical and Electronics Engineers (IEEE)
      j) Illumination Engineering Society (IES)
      k) Local Power Company Requirements (LPCR)
      l) Lightning Protection Institute (LPI)
      m) Local Telephone Company Requirements (LTCR)
      n) National Energy Conservation Policy Act (NECPA)
      o) National Electrical Safety Code (NESC)
      p) National Electrical Manufacturers' Association (NEMA)
      q) National Fire Protection Association (NFPA) Codes and Standards as adopted by Authority having Jurisdiction including the National Electrical Code (NEC)
      r) The Occupational Safety and Health Act (OSHA)
      s) Sheet Metal and Air Conditioning Contractors (SMACNA)
      t) Underwriter's Laboratories Inc. (UL)
      u) Applicable Florida Statutes and Referenced Codes / Standards
      v) All Federal, State, Local Codes, Laws and Ordinances as applicable
      w) Florida Building Code 2007 Edition
   2. Local School Board Requirements
      a) School Board of Volusia County Florida
         1) Guidelines for the Design and Construction of Educational Facilities for Volusia County Schools (current edition).
         2) Volusia County Schools Television System Standards
         3) Volusia County Schools Security System Standards

SECURITY / INTRUSION DETECTION

1. The criteria below apply to new construction, renovations, and redevelopment projects. Electrical Engineer shall coordinate work with VCS Facilities Communications Department and Construction Project Manager.

2. Elementary schools– provide motion detectors in first floor perimeter rooms with doors or windows, all entrances and all hallways, administration, media center, cafeteria, and computer labs. Isolate buildings by zone.

3. Middle and High Schools – provide motion detection in areas of circulation and access with particular attention to identified spaces: gymnasium, labs, administration, media center, cafeteria, and computer labs.

4. On any new security installation or new construction, sufficient capacity shall be provided in the security system control panel that more spaces can be added over the life of the campus.

5. Provide peepholes and doorbell in kitchen / food service exterior rear doors with adequate exterior lighting. The doorbell shall be audible in the Kitchen Manager's Office.

6. Contractors working on an existing school site shall have a plan established to address security emergencies, which may occur. This should include lock-downs of the campus, fire alarms, vandalizing and severe weather.

7. The contractor, subcontractors and all personnel shall abide by the School Board of Volusia County Florida security procedures while on site.

8. See Article 9, this section, for wiring and conduit requirements.

9. G. E. equipment shall not be specified.

PRODUCTS / PRODUCT NOTES

1. SECURITY SYSTEM CONTROL PANEL

   A. The security system contractor shall furnish and install equipment specifically designed and programmed as a complete operating security system base on a Notifier NFS-640 system, no substitutions.
   B. Each device shall announce individually and distinctly at the control panel. System shall have up to 32 zones of annunciation to the RTU.
   C. Unit shall be complete with enunciator driver board (32 contacts) which shall interface to the radio transmitter described below.
   D. Unit shall be provided with a minimum 5 amp power supply with backup battery and charging circuit.
   E. Hand set and speaker shall be in a common area (office or section of the office)
   F. Security panel shall have clearly identified spares for portables areas and future buildings.
   G. Each building shall have 2 clearly identified spare zones for home runs.
   H. Security panel shall have a 20 Amp 120v AC dedicated circuit.
   I. Every zone from the security panel to the radio unit (including grounds) shall be clearly identified.
   J. All security panels and sub panels shall have terminal blocks not phone or scotch blocks
   K. All sub panels shall be grounded.
   L. All sub panels shall have battery backup.
   M. All sub panels shall have terminal blocks, not phone blocks.

2. RADIO TRANSMITTER

   A. Contractor shall provide and install two way radio system which communicates with like units by way of coded FM signals
   B. Radio unit shall be Motorola ACE3600 Remote Terminal Unit
   C. Unit shall be capable of monitoring and control of discrete or analog functions and shall be interfaced to the security system control panel.
   D. Unit shall include a 115 volt power supply with a 5 ampere-hour backup lead-acid battery. The power supply shall provide for 7amp/15 volt load battery charger, AC power failure detection, low battery detection, battery disconnect mechanism and a 30 second time-out timer during power outage.
   E. Radio unit may be located next to security panel**,** in a mechanical room or another systems room; they do not have to be in the Main Office.
   F. All radio units shall be grounded
   G. All radios shall have a polyphaser
   H. All radio units shall be tested for SWR reading, antenna power output and radio specs. Coordinate testing with Facilities Communications Department.

3. MOTION DETECTORS

A. Provide motion detectors where shown on plans.
B. Detectors shall be dual microwave / PIR type, a combination of microwave and passive infrared technologies, Duel Tech DT-7450c or approved equal.
C. Detectors shall have Fresnel lens and multi-segmented PIR mirror. Additional lens shall be provided to block outer PIR zones for narrow application.
D. Detector shall have automatic temperature compensation.
E. An addressable interface module shall be provided at each detector to interface with the security system data loop.
F. Every building shall have its own internally located power supply unit to provide power for motion detectors
G. Motion detectors shall be mounted 7'6" AFF or as specified for that motion detector.
H. Long range motion detectors shall face hallways, or areas designated for protection as to achieve maximum coverage.
I. All motion detectors that are in high risk areas (gym, locker rooms, etc) shall be protected by cage.
J. Door contacts, if required, shall be Form "C" contacts
K. Window contacts, if required, shall be Form "C" contacts

4. SECURITY CAMERA SYSTEM / IP (Internet Protocol) Cameras

A. Security cameras are to be installed in new facilities in the allocations outlined below; coordinate locations with the Facilities Safety and Security Department.
   1) Elementary Schools: 30
   2) Middle Schools: 60
   3) High Schools: 80
   4) Kitchen: number dependent on the school - provide in kitchen manager's office, back door, dry storage, cooler, freezer and points of sale (POS). Exact areas to be determined by School Way Café Department

B. Security Camera Specifications
   1) Cameras shall be Meraki security cameras with local solid state hard drive or approved equal.
   2) Cameras shall be compatible with the Meraki Dashboard, a Video Management System (VMS).
   3) MV Cameras are powered by Power over Ethernet (PoE) via the ethernet cable – 6A. The consumption for indoor cameras is within the 802.3af standard (PoE). The outdoor camera MV71 requires 802.3at (PoE+).
   4) Provide conduit and junction boxes as necessary for all buildings.

4.16 CAFETORIUM

A. Architect, Owner and Curriculum Specialist shall develop production area square footage and design.

B. Completion and approval of preliminary design with a theatrical A/E.

C. Acoustical treatment for walls, ceiling and floor in the facility to be determined by A/E.

D. A lighting plan shall be provided by the A/E and implemented by the electrical contractor. The contractor will be responsible for lighting, lighting system, grid, fixtures, studio curtain and rigging. Also special needs considerations as well as emergency lighting. Any changes in the plan must be approved by the Owner.

E. Special safety equipment shall be provided by the contractor. Example: fire curtain stair lights ramp emergency lighting.

F. Special equipment and furniture shall be Owner provided.

G. A sound system capable of meeting the needs of the uses of the facility. Cluster versus surround systems as per needs basis.

4.17 FINE ARTS FACILITY

A. Architect, Owner and Curriculum Specialist shall develop production area square footage and design.

B. Meeting with A/E to determine the following criteria:
   1) Acoustic design of building with consideration for minimal large flat surfaces that would need acoustic treatment. The roof specification to minimize rain or outside noise influence.
   2) Lighting needs that will vary on the stage size and seating capacity. Consideration to rental use from outside sources should be considered.
   3) Lighting equipment should be approved by the Owner.
   4) Special needs requirements are to be approved in the design stage.
   5) Emergency lighting with consideration to stairs and isle lighting.
   6) Audio delivery system can be cluster system or surround sound. The sound booth is to be exposed to the hall sound, not enclosed as is the control booth. They are separate in their use.
   7) Rigging and stage curtains that will be required. This includes a screen for a media delivery system.

C. Completion and approval of preliminary design of Fine Arts Facility.

D. The acoustic properties of the materials used should be under the recommendation if the A/E.

E. Audio needs: generally speaking a 32-channel audio board is a good start for the audio system. The microphone jacks need to be shown on the plans as well as a spare conduit for growth. It has also been suggested that a minimum of 4 wireless microphones with belt packs be installed. A UHF system is required for this application. Hard wired head set communication should also be provided for stage production crew.

F. Lighting needs: this will vary as to the stage size and distance to the first lighting bar. The lighting board and delivery system (dimmer rack) must be approved by Volusia County Schools, Facilities Services. The size of the console will support at least a 48/96 channel. The number of ellipsoid will vary but about 46 fixtures with the degree specified by the lighting contractor. The fresnel type of lighting about 25 with a good mix of 6” and 8”. The lighting that is required for the cyclorama or backdrop screen needs to have at least 3 quad packs. To light the backdrop with various colors. The addition of side lighting needs to be factored in which will require lighting outlets on the house walls as per design. Pole lighting is to be included. All stage lighting should be on electric winches for safer operation. Training and warranty to be provided to approved persons. Electronic equipment should be purchased within the year that it is to be installed (if not you get 3-year old equipment at the installation time). A minimum of a 2-year service contract is required. A supply of 10% of the light bulbs installed for spare stock is recommended.

G. Special needs requirement needs are to be reviewed by Facilities Communications Department to see if equipment meets our standards. Example seating, stage access, emergency escape route.

H. Rigging and stage layout is to be approved by Facilities Communications Department. If a pit cover is to be installed it must meet building code requirements.

I. Media delivery system: the system will provide for projection to the stage screen from the rear of the theatre but have that option to work from the front of the stage (for presentations with speaker in front) or be controlled by the person in the control booth. Television outlets and video outlets will be installed according to design placement. An open conduit (2") to the inside wall of the orchestra pit is requested. A monitoring system to the back stage area should be included in the design.

4. TESTING

   A. All systems installed shall be tested for compliance with VCS standards by contractor and the VCS Facilities Communications Department; coordinate with the Construction Project Manager.

CLOSED CIRCUIT TELEVISION SYSTEMS, K-12
TECHNICAL SPECIFICATIONS

1. Pre-Construction Design Process

   A. Prior to system design, an initial meeting will take place between the Facilities Communications supervisor, the architect, and the engineer. At this meeting the Facilities Communications supervisor will be provided with information regarding the scope of the project.
   B. Following the initial meeting, the Facilities Communications supervisor will provide the architect and engineer with up-to-date system information, conduit routing, specifications, Owner provided equipment options and drawings as needed for the project.
   C. The preliminary design shall be submitted to the Facilities Communications supervisor for acceptance. This design will include:
      1) Cable routing and footage for each run.
      2) Type of cable to be used on all runs.
      3) Conduit layouts and riser diagrams.
      4) Input and output levels of all devices.
      5) Manufacturer's specifications for all contracted equipment.
      6) Architect's Closed Circuit Television Specifications.
   D. The Facilities Communications supervisor will review the preliminary design, and return the approved/corrected version to the architect or engineer.
   E. If corrections are necessary, the Facilities Communications supervisor will repeat the review process above. When the design is approved, the architect may submit the specifications to the School Board.
   F. All equipment submittals shall be sent to the Facilities Communications supervisor for review and approval prior to construction. All changes to these specifications shall be included with the submittals.

2. The technical specifications below shall be considered base minimum for all projects, architect/engineer may modify to reflect actual project but any modifications shall be coordinated with the Owner.

Section 16780
School Closed Circuit Television Systems, K-12

Part 1 - General

1.01 Summary

   A. School Closed Circuit Television systems shall be included in construction of instructional areas, and in accordance with the current issue of Technical Specifications – Closed Circuit Television Systems, K-12.

1. Television reception shall be provided in all instructional areas, in administrative, and conference areas as requested.
2. All headends shall be located in the work core of the school media center.
3. When construction includes a new or renovated media center, a new CCTV headend will be included.

1.02 Section includes

A. These specifications call for the furnishing of all equipment, materials and services necessary to provide a complete and operating television distribution system for a school of the School Board of Volusia County. Omission of minor items in these specifications does not relieve the contractor of any responsibility for providing a complete and operable system. Work shall be done in a professional manner in compliance with all Federal, State, and local laws, codes and regulations, VCS-project manuals and drawings, and these specifications.
   1. Electronic equipment shall be specified "Professional Grade" from "Blonder Tongue Laboratories, Inc."
   2. Each system shall be designed to perform in the following manner:
      a. Be capable of transmitting RF modulated signals from the headend on selected CATV channels (1.6).
      b. Deliver a minimum of +5 dBmV and a maximum of +12 dBmV signal level on CATV Channels (55-550 MHz) to each receiving outlet from the school headend.
      c. Be designed to pass sub-band return frequencies (5-30 MHz).
      d. Provide local origination needs on a per project basis (1.04.B).
      e. Meet all detailed requirements of contract system drawings and schematics.
   3. These specifications shall become part of the Project Manual, Contract or Purchase Order.
   4. Information contained within these specifications is as accurate as possible; however it is the contractor's responsibility to verify all performance.

1.03 Technical Specifications

A. Technical Specifications – Closed Circuit Television Systems, K-12, specify requirements for design and installation of a full or partial television distribution system. Each system shall be capable of delivering a signal on all channels of +5 dB to +12 dB @ 75 ohms to all receiving outlets.
   1. Design guidelines:
      a. Low Output Modulators (40 dB).
      b. (Rack mount) channel combiner.
      c. (Rack mount) distribution amplifier.
      d. Amplifier inputs (headend or field distribution) will be attenuated, and/or equalized to provide 15 dB on all channels.
      e. Maximum signal slope allowed will be 7 dB.
      f. Amplifiers will operate at 44 dB @ 550 MHz (Ch. 78), 40 dB @ 212 MHz (Ch. 13), and 37 dB @ 55MHz (Ch. 2).
      g. No more than one field amplifier is allowed on any one trunkline.
      h. All CCTV distribution runs from building to building will be made with .500 cable or larger.

1.04 Inspection, Testing and Documentation

A. Upon completion of the system in each school, and prior to the inspection and approval of the system, the contractor shall send a complete set of "as-built drawings" to the Owner. The design schematic shall include, but not be limited to:
   1. Cable routing and lengths.
   2. Cable size and cable transition information.
   3. All active and passive components and their locations.
   4. Amplifier input and output levels.
   5. Tap values and levels at each CCTV outlet.

6. Manufacturer's schematics and service information.
7. The contractor may use the sample as-built form to record the classroom receiving outlet tap values and signal levels.

B. The site shall be cleaned prior to the CCTV System Test. All CCTV terminal cabinets, headend counters, drawers, shelves, and surface mounted raceways shall be cleaned, dusted, and free of all debris and contamination.

C. The contractor/installer shall execute a CCTV system test in the presence of the Facilities Communications supervisor, or designee. The contractor shall furnish equipment necessary for the Proof of Performance. Required test equipment:
1. 1 each DVD player.
2. 1 each portable color receiver/monitor.
3. 1 each calibrated signal level meter.
4. DVD player with color bars and tone or color bar generator.
5. Required cables and adapters.

D. A one-year warranty of equipment, cable and installation is required. The warranty period begins after the Facilities Communications supervisor has completed the Systems Test inspection, and has documented that the system is substantially complete. This transmittal shall be sent to the Owner.

E. Deviations from the current issue of Technical Specifications – Closed Circuit Television Systems, K-12, without prior approval from the Facilities Communications supervisor shall not be accepted.

1.05 CCTV Headend Channel Assignments

A. Elementary Schools

Channel T9-4	field origination modulator
Channel 5	TV production modulator
Channel 8	ITV signal processor
Channel 10	headend modulator tuners must have digital and analog inputs (DVD players or tuner boxes) for the input of the modulators
Channel 12	headend modulator tuners must have digital and analog inputs (DVD players or tuner boxes) for the input of the modulators
Channel 13	headend modulator & 550 MHz test tuners must have digital and analog inputs (DVD players or tuner boxes) for the input of the modulators

B. Middle Schools

Channel T9-4	field origination modulator
Channel 5	TV production modulator
Channel 10	headend modulator tuners must have digital and analog inputs (DVD players or tuner boxes) for the input of the modulators
Channel 11	headend modulator tuners must have digital and analog inputs (DVD players or tuner boxes) for the input of the modulators
Channel 12	headend modulator tuners must have digital and analog inputs (DVD players or tuner boxes) for the input of the modulators
Channel 13	headend modulator & 550 MHz test tuners must have digital and analog inputs (DVD players or tuner boxes) for the input of the modulators

C. High Schools

Channel T9-4	field origination modulator
Channel 5	TV production modulator
Channel 7	headend modulator tuners must have digital and analog inputs (DVD

	players or tuner boxes) for the input of the modulators
Channel 10	headend modulator tuners must have digital and analog inputs (DVD players or tuner boxes) for the input of the modulators
Channel 11	headend modulator tuners must have digital and analog inputs (DVD players or tuner boxes) for the input of the modulators
Channel 12	headend modulator tuners must have digital and analog inputs (DVD players or tuner boxes) for the input of the modulators
Channel 13	headend modulator & 550 MHz test tuners must have digital and analog inputs (DVD players or tuner boxes) for the input of the modulators

PART 2 - Products

2.01. Amplifiers, Modulators and Processors
NOTE: Since amplifier and modulator models are constantly being revised, the list below represents a design ideal for estimating purposes only. Equipment submittals are considered critical to the success of the project, therefore the Facilities Communications supervisor shall be the sole authority on acceptable CCTV and CATV components.

A. Headend Distribution Amplifier – Used to amplify headend modulators and processors.
Specifications:

Hybrid technology: power doubling

Frequency range: 50-550 MHz
Gain: 33 dB (full gain, 0 slope)

Output level (max.): +44
Gain control range: 15
Slope control range: 10
Composite triple beat: >60 dB (at rated output)

Mounting: rack mount

Blonder-Tongue, RMDA 550-30P, or approved equal.

B. Broadband Distribution Amplifier #1 (30 dB) – Used as a CATV amplifier or as a CCTV amplifier in a Television Terminal Cabinet (TVTC).
Specifications:

Hybrid technology: power doubling

Frequency range: 5 to 30 & 45-550 MHz

Gain: 32 dB (full gain, 0 slope)

Output level (max.): +44
Gain control range: 10
Slope control range: 10
Composite triple beat: >58 dB (at rated output)

Mounting: surface

Blonder-Tongue, BIDA 55A-30P, or approved equal.

C. Broadband Distribution Amplifier #2 (43 dB) – Used as a CATV amplifier, or as a CCTV amplifier in a TVTC.
Specifications:

Hybrid technology: power doubling

Frequency range: 5-30 & 47-750 MHz

Gain: 50 dB (full gain, 0 slope)
Noise figure: 7.0
Output level (max.): +44
Gain control range: 10
Slope control range: 10
Composite triple beat: >58 dB (at rated output)
Mounting: surface
Dimensions (WxHxD): approximately 7.14 x 11.5 x 2.6

Blonder-Tongue, BIDA 75A-43P, or approved equal.

D. Frequency Agile Modulator #1 – Used at the headend to modulate the output of a TV tuner and to test the system to 550 MHz.

The unit shall provide an audio and video modulated carrier on any channel in the 50 to 550 MHz range, and have a SAW filter on the output. FCC Docket 21006 aeronautical frequency offset requirements will be met (+/- 5 KHz video carrier accuracy.) The RF output shall be 40 dB, or greater. Output channels shall be field selectable via front panel controls. The video input connector shall be a BNC. (Rack mount).

Blonder-Tongue, AM-40-550 w/Option 02, or approved equal.

E. Frequency Agile Modulator #2 – Used in the field to modulate A/V sources into a sub-band channel, and deliver the signal to the headend for processing.

The unit shall provide an audio and video modulated carrier on any channel in the 7 to 450 MHz range, and have a filter on the output. FCC Docket 21006 aeronautical frequency offset requirements shall be met (+/- 5 KHz video carrier accuracy.) The RF output will be 40 dB or greater. Output channels shall be field selectable via front panel controls. The sub-band output shall be 7 to 50Mhz. The video input connector shall be a RCA connector. (Rack mount).

Blonder-Tongue, AM-40-450 with w/Option 04, or equal.

F. Audio-Video Modulator – Used at the headend to modulate the output of a TV tuner.

The unit shall provide an audio and video modulated carrier on a pre-selected sub-band channel, or CATV band up to 404 MHz, and have a SAW filter on the output. FCC Docket 21006 aeronautical frequency offset requirements will be met (+/- 5 KHz video carrier accuracy.) The RF output will be 40 dB or greater. The channel output will be fixed. (Rack mount).

Blonder-Tongue, MAVM Channelized Series, or approved equal.

G. Frequency Agile CATV Processor – Used at the headend to select and process the Instructional Television Cable TV, or off-air signal, for CCTV distribution.

The unit shall process CATV signals up to 550 MHz, and have a minimum output level of 40 dB. Channels will be selectable via front panel controls. (Rack mount).

Blonder Tongue, AP-40-550, or approved equal.

H. Frequency Agile Sub-band Processor – Used at the headend in a sub-band return system to convert the sub-band signal from the field to a CCTV channel.

The unit shall have an input range of -18 to +30 dB, and a minimum output level of 40 dB. Channels will be selectable via front panel controls. (Rack mount).

Blonder Tongue, AP-60-550 w/Option 17, or approved equal.

I. Headend Combiner – Used at the headend to combine the outputs of multiple modulators and processors.

Minimum isolation requirements between adjacent ports -32 dB, or between any ports -42 dB. (Rack mount).

Blonder Tongue, OC Series, or approved equal.

J. VHF/Sub-channel Diplexer (2) – Used at the headend, and in the field to separate, or combine the 5 to 30 MHz (sub-band) with the 50 to 1000 MHz (CATV). Impedance: 75 ohms. Return Loss: 14 dB.

Blonder-Tongue, DSV #4375, or approved equal.

K. Audio-Video Distribution Amplifier – Used at the headend to distribute A/V for videotape duplication.

This unit shall have one input and six outputs. The input shall be looping.

Technical Necessities, MDA-6, or approved equal.

2.02. Drop Passive Devices

A. Splitter/Combiners – Splitters/combiners shall have a zinc die cast housing and provide better than 100 dB EMI isolation. The bandwidth shall be 5-600 MHz. The “F” ports shall be 1/2” machined. The input and output ports shall be vertical. Surface mount.

1) (2-way, 3-way, 4-way, 8-way):
Toner, horizontal XGVS-* Series;
Regal, horizontal Red Label Series;
or, approved equal.

B. Directional Couplers – Directional couplers will have 1, 2 or 4 tap ports and shall have zinc alloy housing and provide better than 90 dB EMI isolation. The bandwidth shall be 5-600 MHz. The “F” ports shall be 1/2" machined. Surface mount.

1) DCs (assorted values)

Regal, RDCT6-* Series;
Blonder-Tongue, CRT Series;
or, approved equal.

C. CCTV Receiving Outlets

1) Permanent classrooms (looping distribution) – Receiving outlets for permanent classrooms shall be single output, enclosed directional coupler, with -80 dB EMI radiation or better. The outlet shall be flush mounted with “F” type connectors on tap input and output ports. The bandwidth shall be 5-900 MHz.

Blonder-Tongue, M-3889, or approved equal.

2) Permanent classrooms (DC-trunk/drop distribution) – Receiving outlets for permanent classrooms shall be single outlet flush. The outlet shall be a “through” type with no isolation.

Blonder-Tongue, TF-GF-FT w/75 ohm terminator, or approved equal.

3) Portable classrooms – Receiving outlets for portable classrooms shall be single outlet flush mounted. It shall be a "through" type with no isolation.

Blonder-Tongue, TF-GF-FT w/75 ohm terminator, or approved equal.

D. Jumpers – The contractor/installer shall provide pre-made jumper cables for each of the following:

1) Classroom receiving outlet (permanent and portable) –
Three RG6 cable assemblies shall be provided for each outlet. One cable shall be installed from the CCTV outlet to the channel tuner. The last cable assembly shall be signed over to a school administrator associated with the project. The cable assembly will have the following characteristics:

Cable type: RG6

Length: 8 feet

Connector: "F" (2 ea.)
Adapter (2 ea.): Screw-on "F" to push-on "F".

PART 3 - Execution

3.01 Installation, Locations and Workmanship

A. The contractor and/or sub-contractor shall install a complete CCTV system in accordance with the VCS approved project manuals and drawings, and these specifications. All materials used in the CCTV system shall be new, and the proper materials for the job.

B. Electrical grounding, bonding and surge suppression shall be provided and installed in accordance with VCS, Division 16 specifications.

C. Equipment rack wiring shall utilize a wire management system for neat, well organized wire installation.

3.02 Conduit Installation – General

A. Exposed interior and exterior cable runs shall be in conduit, excluding equipment harnesses which are to be tie-wrapped.

B. In new construction, renovations and additions, the trunk/feeder cable(s) shall be in conduit. The trunk routing will be determined by the Facilities Communications supervisor and given to the architect. All conduits from building to building will be 3" in diameter.

C. Refer to the Electrical Section of the VCS-Project Manual for information regarding the use of Wiremold products, rigid conduit, PVC and EMT.

D. All conduits, including spares, shall be labeled to indicate the exact location of the other end as follows: "TO BUILDING #, ROOM #."

E. All conduits shall terminate in a box, cabinet or pedestal.

F. Spare and future conduits shall appear on the as-built drawings.

G. All conduits for future cable runs shall contain a nylon pull line, and shall be capped at both ends.

H. In new construction, a 3” conduit for the CATV drop shall be installed from the media center headend TVEC, to a site determined by the local Cable Company Construction Coordinator.

This conduit shall have a minimum of 24” sweeps and 500 lb. pulling line installed for cable company use.

A stake and flag shall mark the end of the conduit. The stake shall be marked "CATV" followed by the depth of the conduit.

If the total length of the conduit is greater than 1,200', an intermediate above ground pull box shall be established in an electrical room along the conduit path. An electrical duplex outlet shall be provided along with appropriate grounding and bonding for the cable. The box shall be a minimum of 24" x 36" x 8” (WHD), and the base shall be 12" AFF.

I. In new construction, 1" conduits shall be installed from the media center headend TVEC to the Intercom Room, Telephone Room and main Computer Room.

J. In new construction and renovations, 0ne, 3” conduit shall be installed for a future satellite interconnect. The conduit shall begin at the TVEC and shall terminate in an area which will allow the antenna to have a clear view of the west/southwest. The termination point will be selected by the Facilities Communications supervisor.

K. Portable area(s) shall be connected to the CCTV system by one, 2" conduit. This conduit shall begin at the TVTC nearest the portable site(s), and shall terminate at the designated portable systems terminal area. The conduit will be labeled, “CCTV TO PORTABLES.” The conduit shall stub-up 6" above grade, and placed inside of an enclosure. A nylon pulling line shall be installed.

3.03 CCTV Cable Installation – General

A. All runs of cable shall be continuous lengths except for interfacing with equipment items listed in Part - 2 of these specifications. DO NOT SPLICE CABLES.
   1) Grounding blocks shall be used for cable type changes only, and shall be noted on the as-built drawings.

B. Cable runs from building to building will be .500 cable. All other cables shall be type RG6 or RG11. The type and specification dependent on application.

C. All trunk runs shall use flooded cable, and shall be in conduit.

D. All exposed cable shall be in conduit, excluding equipment harnesses, which shall be tie-wrapped.

E. All cable not in conduit shall be supported in cable trays, wiring duct, or by bridle rings. Free cable shall not go unsupported more than 4 feet.

F. All buildings under construction shall incorporate a Television terminal Cabinet (TVTC) to house amplifiers and passives. All TVTCs shall be 18” x 24” x 6” (WHD). All TVTCs shall have an electrical duplex outlet.

G. A service loop is required on all cables entering and exiting a TVTC. Store cables neatly around the perimeter of the cabinet.

H. The female threads of all “F” connectors shall be treated with a light coating of silicone lubricant before the male portion is attached. The outside connector and cable shall be free of silicone. Silicone is not permitted to contact the center conductor or dielectric.

3.04 CCTV Cable Installation – Expansion and Renovations

A. New trunklines to additional buildings shall home-run to the headend, or nearest TVTC.

B. When new trunklines are added, the signal levels to the existing system shall not change more than 1.0 dB.

C. Before the architect designs a CCTV expansion, the Facilities Communications supervisor shall be notified that the headend or building signals need to be verified. The Facilities Communications supervisor will document the signal level readings and transmit the results to the architect.
   1) Connections to the existing CCTV system shall be made at the headend or TVTC by means of a directional coupler-tap. The tap shall have less than 1dB thru loss.
   2) When the connection is made at the headend, the directional coupler-tap shall be installed at the output of the main distribution amplifier, or the modulator/combiner.
   3) When the connection is made at an existing TVTC, the directional coupler-tap shall be installed at the output of the distribution amplifier, or spliced into trunk/feeder cable if there is no amplifier.

3.05 CCTV Cable Installation – Portables

A. In new construction, the CCTV signal shall be extended to the portable system terminal site from the nearest building TVTC. At the building TVTC, a DC shall be tapped into the CCTV trunkline. An amplifier shall be connected to the tap port of the DC to serve the portables. An RG11 flooded cable shall be connected to the amplifier and shall terminate at the portable system site area.

3.06 Headend Cable and Wire Installation

A. The audio, video and RF lines to and from electronics and passives shall be cut to length. The cables shall be neatly organized and tied with black plastic ties.

B. All solder points shall be completely defluxed.

C. The audio, video and RF lines shall be marked with their equipment/connector identifiers (label or tag).

D. Self-laminating vinyl or polyester wire markers shall be used for headend equipment labeling. Video and RF markers shall have a 1" x 3/4" white background with a clear wrap. Audio markers shall have a 1/2" x 1/2" white background with a clear wrap.

E. Plastic ties are not permitted inside of raceways.

3.07 CCTV Equipment Location

A. All headend equipment shall be mounted as shown on the diagrams attached and/or in the project drawings.

B. All unused ports shall be terminated.

C. The Television Entrance Cabinet (TVEC) entrance box shall be a minimum of 24” x 36” x 8” (WHD), and positioned to allow semi-rigid cable to be pulled through the box. The TVEC base shall be 12" AFF.

D. All TVTC and origination cabinets shall be capable of mounting and easily accessing amplifiers, passives and electrical outlets. All cabinets shall have lockable, full-front doors. The cabinet dimensions shall be a minimum of 18” x 24” x 6” (WHD).

E. All exterior splitters, taps, grounding blocks and line extenders not mounted in headend equipment racks are to be mounted in weatherproof enclosures.

3.08 CCTV Receiving Outlets

A. In new construction and renovations of instructional areas when TV wall mounts are used, receiving outlets shall be installed 80” AFF no more than 16” from an AC outlet, which is also 80” AFF. The outlets shall be on or adjacent to the front wall of all classrooms and other instructional areas, on the right, or left side of the chalkboard/tackboard.

B. In new construction and renovations of instructional areas when TV wall mounts are not used, receiving outlets shall be installed to match the existing outlet height, and be no more than 16” from an AC outlet. The outlets shall be on or adjacent to the front wall of all classrooms and other instructional areas, on the right or left side of the chalkboard.

C. Receiving outlets in administrative areas shall be installed 16” AFF and no more than 16” from an AC outlet and 36" from a computer outlet.

D. Cafetorium, gymnasium, and auditorium distribution system designs may vary for elementary, middle and high schools. Specific design information for these areas will be given to the architect and engineer by the Facilities Communications supervisor following the initial meeting.

3.09 Origination Outlets

A. Two types of origination systems are used in Volusia County Schools – home-run and sub-band return.

B. Home-run origination points shall be used in renovations of facilities that have an existing home-run origination system. Origination outlet locations shall be determined by the Facilities Communications supervisor and provided to the architect and engineer following the initial meeting.

C. Cafetorium, gymnasium, auditorium and classroom origination system designs vary for elementary, middle and high schools. Specific design information will be given to the architect and engineer by the Facilities Communications supervisor following the initial meeting.

D. When home-run origination points are used, the origination cabinet shall be flush mounted 16” AFF. The cabinet shall be 12 x 18 x 6 (WHD), with a full-front, hinged, key lockable door.

E. Sub-band return origination systems shall be used in new construction and renovations here sub-band systems are existing.

3.10 Electrical Outlets

A. Electrical outlets shall be installed inside of all TVTCs and origination cabinets. Electrical power shall be provided to meet equipment requirements.

B. Electrical outlets shall be installed within 16" of the CCTV outlet.

C. Electrical outlets for the headend racks shall be in flexible conduit originating from the headend TVEC.

3.11 Special Outlets

A. In new construction of media centers, a CATV receiving outlet shall be installed from the headend to the students' multimedia workstation. The outlet shall be floor mounted, and labeled "CATV SERVICE."

3.12 CATV Signal

A. In new construction of media centers, it is the Contractor's responsibility to meet with the local Cable Company Construction Coordinator to verify the location of the 3" CATV conduit. At the meeting, the Contractor shall communicate the following CATV signal requirements to the Construction Coordinator – MINIMUM +6 dB to 750 MHz, FLAT.

B. In renovation or additions of media centers, the Contractor shall contact the Cable Company Construction Coordinator to verify placement of a new CATV conduit and cable. Extension of the existing CATV cable drop is not permitted.

3.13 CCTV Headend – Expansion or renovation of existing.

A. Expansion and renovation specifications for headends will be compiled on a job specific basis. These specifications may be obtained through the office of the Facilities Communications supervisor.

3.14 TELEVISION PRODUCTION STUDIO AND CLASSROOM – High Schools

A. Architect, Owner and Curriculum Specialist shall develop studio square footage and design

B. Completion and approval of preliminary design of studio and adjacent classroom.
1) Heating and air conditioning: TV studio shall have separate heating and cooling controls.
2) Acoustical treatments for walls, ceiling and floor in the studio to be determined by A/E.
3) Studio lighting plan shall be provided by the A/E and implemented by the electrical contractor. The contractor will be responsible for lighting, studio lighting system, grid, fixtures, studio curtain and rigging. Any changes in the plan must be approved by Facilities.
4) Special safety equipment in the studio shall be provided by the contractor.
5) TVP classroom shall be adjacent to the studio.

C. Special equipment and furniture for the studio and classroom shall be Owner provided.

3.15 VIDEO PRODUCTION AREA – Elementary and Middle Schools

A. Architect, Owner and Curriculum Specialist shall develop production area square footage and design

B. Completion and approval of preliminary design of video production area.
1) Heating and air conditioning: Video production are shall have separate heating and cooling controls.
2) Lighting plan shall be provided by the electrical contractor after consultation with the Facilities designee. Specialty lighting fixture shall be Owner provided. Any changes in the plan must be approved by the Facilities designee.
3) Curtains and track in the video production area shall be Owner provided.

C. Special equipment and furniture for the video production area shall be Owner provided.

3.16 CAFETORIUM

A. Architect, Owner and Curriculum Specialist shall develop production area square footage and design.

B. Completion and approval of preliminary design with a theatrical A/E.

C. Acoustical treatment for walls, ceiling and floor in the facility to be determined by A/E.

D. A lighting plan shall be provided by the A/E and implemented by the electrical contractor. The contractor will be responsible for lighting, lighting system, grid, fixtures, studio curtain and rigging. Also special needs considerations as well as emergency lighting. Any changes in the plan must be approved by the Owner.

E. Special safety equipment shall be provided by the contractor. Example: fire curtain stair lights ramp emergency lighting.

F. Special equipment and furniture shall be Owner provided.

G. A sound system capable of meeting the needs of the uses of the facility. Cluster versus surround systems as per needs basis.

3.17 FINE ARTS FACILITY

A. Architect, Owner and Curriculum Specialist shall develop production area square footage and design.

B. Meeting with A/E to determine the following criteria:
   1) Acoustic design of building with consideration for minimal large flat surfaces that would need acoustic treatment. The roof specification to minimize rain or outside noise influence.
   2) Lighting needs that will vary on the stage size and seating capacity. Consideration to rental use from outside sources should be considered.
   3) Lighting equipment should be approved by the Owner.
   4) Special needs requirements are to be approved in the design stage.
   5) Emergency lighting with consideration to stairs and isle lighting.
   6) Audio delivery system can be cluster system or surround sound. The sound booth is to be exposed to the hall sound, not enclosed as is the control booth. They are separate in their use.
   7) Rigging and stage curtains that will be required. This includes a screen for a media delivery system.

C. Completion and approval of preliminary design of Fine Arts Facility.

D. The acoustic properties of the materials used should be under the recommendation if the A/E.

E. Audio needs: generally speaking a 32-channel audio board is a good start for the audio system. The microphone jacks need to be shown on the plans as well as a spare conduit for growth. It has also been suggested that a minimum of 4 wireless microphones with belt packs be installed. A UHF system is required for this application. Hard wired head set communication should also be provided for stage production crew.

F. Lighting needs: this will vary as to the stage size and distance to the first lighting bar. The lighting board and delivery system (dimmer rack) must be approved by Volusia County Schools, Facilities Services. The size of the console will support at least a 48/96 channel. The number of ellipsoid will vary but about 46 fixtures with the degree specified by the lighting contractor. The fresnel type of lighting about 25 with a good mix of 6” and 8”. The lighting that is required for the cyclorama or backdrop screen needs to have at least 3 quad packs. To light the backdrop with various colors. The addition of side lighting needs to be factored in which will require lighting

outlets on the house walls as per design. Pole lighting is to be included. All stage lighting should be on electric winches for safer operation. Training and warranty to be provided to approved persons. Electronic equipment should be purchased within the year that it is to be installed (if not you get 3-year old equipment at the installation time). A minimum of a 2-year service contract is required. A supply of 10% of the light bulbs installed for spare stock is recommended.

G. Special needs requirement needs are to be reviewed by Facilities Communications Department to see if equipment meets our standards. Example seating, stage access, emergency escape route.

H. Rigging and stage layout is to be approved by Facilities Communications Department. If a pit cover is to be installed it must meet building code requirements.

I. Media delivery system: the system will provide for projection to the stage screen from the rear of the theatre but have that option to work from the front of the stage (for presentations with speaker in front) or be controlled by the person in the control booth. Television outlets and video outlets will be installed according to design placement. An open conduit (2") to the inside wall of the orchestra pit is requested. A monitoring system to the back stage area should be included in the design.

AUDIO ENHANCEMENT
Classroom

1. Basis of Design - Optimum System

2. Teaching Wall Layout

VOICE / DATA

1. HORIZONTAL DISTRIBUTION

A. Horizontal distribution of voice and data shall consist of (**or approved equivalent**):
   1) **Standard Voice/Data:** One (1) 4-pair Category 6a unshielded twisted pair cabling.
   2) **Wireless Access Points (WAP):** Two (2) 4-pair Category 6a unshielded twisted pair cabling.
   3) **Cable Management:** For every 24-ports of terminated cabling in the MDF/IDF one Allen Tel part number AT55WMP-MR2 will be mounted in the rack with 2U spacing between:



a
b Where space permits alternate CPI 30130-719 & 30095-703 may be substituted.
c Recommended two rolls of SPEEDWRAP® HOOK AND LOOP TAPE – 25 YD. (75') part number SWRL .5X25 1/2" x 25 yards (75ft) per MDF/IDF for cable management.
d For space constrained areas such as network cabinets: Middle-Atlantic HCM-1 1-Space Horizontal Cable Manager, Micro-Clip Style.

Methodology: Cables shall originate at horizontal patch panels located in the respective MDF/IDF and terminate at jacks installed at workstation locations. The system shall be a generic system in which any particular horizontal port/cable can be used for either voice or data. System shall be wired utilizing 568B

wire configuration. Cables shall be routed above accessible ceilings on JHooks spaced 48 to 60 inches on center. Cables above inaccessible ceilings shall be routed in conduit.

1. COMMUNICATION OUTLET PLACEMENTS
   A. General Classrooms
      1) **Teacher's Desk (Ethernet Connectivity):** One (1) communications outlet with two ports (one type 2P outlet) for teacher's computer and VOIP telephone handset (total of two CAT6a wired connections for teacher). Locate this outlet near the teacher's desk.
      2) **Teacher's Desk (Video Projection):** Provide one (1) single gang outlet box with blank plate and one-inch (1") conduit to ceiling space adjacent to teacher's communications outlet for routing of future cabling of voice and video enhancements. Locate this outlet near the teacher's desk.
      3) **Classroom Wireless Access Point:** Provide Two (2) terminated category 6a ethernet cables. Locate cables as close to center of room as possible with minimum of 5 feet of slack for final positioning of wireless access point in ceiling. A power outlet is not required for the wireless access unit.
         e If the ceiling is above twelve (12) feet from the floor, place type 2P outlet for the wireless on the wall at eight (8) to ten (10) feet off the floor and within ten (10) to twelve (12) feet from the door opening to the room. Place outlet in an open area of wall as not to be obstructed by other equipment or furniture.

   B. Standard Single Person Office
      1) **Standard Voice/Data:** Provide one (1) communication outlet with two (2) ports (one type 2P outlets) for occupant's computer and VOIP telephone handset (total of two CAT6a wired connections).

   C. Group Offices and Work Areas
      1) **Standard Voice/Data:** Provide two (2) ports of CAT6a connectivity per person or no less than 4 ports per room. Ports may be provided as type 2P outlets or 4P outlets as indicated by room arrangement. This shall include but not be limited to the following areas: Teacher's Lounges, Conference Rooms, and Work Rooms.
      2) **Wireless Access Points (WAP):** In Teacher's Lounges, Conference Rooms, Work Rooms and Group Offices Provide Two (2) terminated category 6a ethernet cables. Locate cables as close to center of room as possible with minimum of 5 feet of slack for final positioning of wireless access point in ceiling. A power outlet is not required for the wireless access unit.
         a If the ceiling is above twelve (12) feet from the floor, place type 2P outlet for the wireless on the wall at eight (8) to ten (10) feet off the floor and within ten (10) to twelve (12) feet from the door opening to the room. Place outlet in an open area of wall as not to be obstructed by other equipment or furniture.

   D. Main Office Front Desk Area
      1) **Standard Voice/Data:** Provide one (2) communications outlets with two (2) ports (type 2P outlet) for front desk phone, computer, visitor sign-in computer and printer. (total of four CAT6a wired connections)
      2) **Wireless Access Points (WAP):** Provide Two (2) terminated Ethernet Category 6a cables. Locate cables as close to center of room as possible with minimum of 5 feet of slack for final positioning of wireless access point in ceiling. A power outlet is not required for the wireless access unit. .

   E. Custodial and Maintenance Office
      1) **Standard Voice/Data:** Provide one (1) communications outlets with two (2) ports (two type 2P outlets) for occupant's computer and VOIP telephone handset (total of four Ethernet Category 6a connections).

2) **Wireless Access Points (WAP):** Provide Two (2) terminated Ethernet Category 6a cables. Locate cables as close to center of room as possible with minimum of 5 feet of slack for final positioning of wireless access point in ceiling. A power outlet is not required for the wireless access unit.

Media Centers (or any room with ceiling above 12'0")

1) **Standard Voice/Data:** For general computer and phone connectivity provide two (2) communications outlets each with four (4) ports (two type 4P outlet) at circulation desk for computer, network printer and VOIP telephone handset(s).
2) **Presentation Connectivity:** At each presentation area provide one (1) communications outlet with two (2) category 6a Ethernet ports (type 2P outlet).
3) **Overhead Projection and WAP:** Coordinate placement of this outlet with optimal set back distance of anticipated projection unit. Provide Two (2) terminated Ethernet Category 6a cables with minimum of 5 feet of slack for final positioning of wireless access point in ceiling. Provide power outlet on ceiling for projection unit adjacent to projection unit.
4) **Wireless Access Points (WAP):** Space evenly across media center up to eight (8) communication outlets each with two (2) ports (one type 2P outlet) for a total of sixteen (16) CAT6a wired connections for wireless.

F. Multipurpose / Cafeteria
   1) Place one (1) communications outlet with two (2) ports (type 2P outlet) close to each point of sale (POS) computers.
   2) Place one (1) communications outlet with two (2) ports (type 2P outlet) in kitchen area for time clock network system. For exact location of point of sale computers and time clocks please contact the School Way Café Department.
   3) Place one (1) communications outlet with four (4) ports (type 4P outlet) in the cafeteria manager's office.
   4) If the room has a stage, place a minimum of one type 2P outlet on both side walls of the stage behind curtain.
   5) Place eight (8) communication outlets each with two (2) ports (one type 2P outlet) for a total of sixteen (16) CAT6a wired connections for wireless.

G. Auditorium
   1) In the stage area, place a minimum of one (1) type 2P outlet on both side walls of the stage behind curtain.
   2) Place eight (8) communication outlets each with two (2) ports (one type 2P outlet) for a total of sixteen (16) CAT6A wired connections for wireless. Place two (2) each 2P outlets spaced evenly on the north, south, east and west at eight (8) to ten (10) feet off the floor. The two (2) - 2P outlets should be placed as evenly along the north, south, east and west wall as possible.

H. Gym
   1) Place eight (8) communication outlets each with two (2) ports (one type 2P outlet) for a total of sixteen (16) CAT6a wired connections for wireless. Place two (2) each 2P outlets spaced evenly on the north, south, east and west at eight (8) to ten (10) feet off the floor. The two (2) - 2P outlets should be placed as evenly along the north, south, east and west wall as possible.

I. Communication Outlet General Requirements
   1) Communication outlets shall utilize angled faceplates in four (4) port (single gang) and eight (8) port (double gang) styles. Plates and jacks shall be white.
   2) Sufficient power shall be provided within twelve inches (12") (6 inches preferred) of each communications outlet. Each communications outlet shall have a one-inch (1") conduit stubbed into an accessible location in the ceiling cavity.

J. Horizontal Connectivity

1) System shall be specified as a complete EIA/TIA Category 6a and 6a Premise Distribution System (PDS) with a minimum 20-year warranty for the entire system. The basis of design is the Commscope with Systems by Hubbell and Panduit as approved substitutions. Specifications shall limit products to these three manufacturers as VCS does not have warehouse space available to maintain additional inventories of spare parts that would be required to support installations of other manufacturer's products.

Description Code	Description
MGS400-262	GigaSPEED XL® MGS400 Series Category 6a U/UTP Information Outlet, white
M10LW-262	Wall Mount Telephone, one port white
M20AP-262	M20 Dust Cover for M-Series Faceplates and Outlets, white
M102SMB-B-262	M102 Type Surface Mount Box, dual port white
M106SMB-262	M106 Type Surface Mount Box, six port white
MGS600-262	GigaSPEED X10D® MGS600 Series Information Outlet, white
CPP-UDDM-M-1U-24	Discrete Distribution Module Panel, M-series, UTP, 1U, 24 port
CPP-UDDM-M-2U-48	Discrete Distribution Module Panel, M-series, UTP, 2U, 48 port
M14AS-262	Angled Flush Mounted Faceplate, white
UNP-6a-DM-1U-24	Distribution Module Panel, Cat 6a, UTP, 1U, 24 port
UNP-6a-DM-2U-48	Distribution Module Panel, Cat 6a, UTP, 2U, 48 port
UNP-6A-DM-2U-48	Distribution Module Panel, Cat 6A, UTP, 2U, 48 port
UNP-6A-DM-1U-24	Distribution Module Panel, Cat 6A, UTP, 1U, 24 port
M12LE-262	LE Type Flush Mounted Faceplate, two port white
M14LE-262	LE Type Flush Mounted Faceplate, four port white
M16LE-262	LE Type Flush Mounted Faceplate, six port white
CS34R BLU C6 4/23 U/UTP CPK 1KFT	CS34R ETL Verified Category 6 U/UTP Cable, non-plenum, blue jacket,
CS44R YEL C6A 4/23 U/UTP CPK 1KFT	CS44R ETL Verified Category 6A U/UTP Cable, non-plenum, yellow jacket,

Note: part numbers above are frequently subject to change by manufacturers; they must be confirmed and updated for each project.

3. BACKBONE DISTRIBUTION

A. Fiber Optic

1) From MDF provide one (1) 12 pair 24 strand Fiber 50/125 um multimode fiber optic cable OM3 and OM4 compatible to each IDF (50 um multimode fiber may be used for new construction of entire school only. Fiber optic cables that run underground shall be loose tube get filled type. Fiber optic patch panels shall have LC type connectors. Fiber optic products shall be limited to products manufactured by, Corning Cable Systems. *Note: increased utilization of fiber by other trades, i.e. HVAC etc., may facilitate adding more fiber between MDF and IDFs.*

B. Copper (Emergency Phones & Elevator)

1) From MDF provide one 6 pair Category 3 copper cable to each IDF (Intermediate Distribution Frame) locations, on the school campus. This pair count is sufficient for almost all locations as VCS utilizes VOIP (Voice Over IP) for the majority of their telephones. Copper cable that runs underground shall be gel filled PE89 type cables. Provide multi-pair protectors

Avaya 489A (188 style 110 in/110 out) fully populated with 4C1S protector modules at each end of any cable running between buildings.

2) From the building entrance terminal in each IDF, provide one 25 pair category 3 cable to each 24-port RJ45 voice patch installed in the rack. Terminate each pair on pins 4 and 5 of all 24RJ45 ports existing in the voice patch panel, leaving pair 25 unused.
3) Provide one 25 pair Category 3 copper cable from Telephone company demarcation point to MDF if the telephone company's demarcation point is located outside of the MDF location.
4) A minimum of one (1) wall should be covered with rigidly fixed (3/4 trade size) A-C plywood preferably void free, 8 ft. high, capable of supporting attached equipment. Plywood should be fire rated and covered with two coats of fire-retardant paint. More "wood wall" area may be needed for other types of equipment. An approved power source ground must be provided at the telecommunications backboard location. Electrician to run properly sized per TIA 607-B stranded copper green insulated ground wire from the main electrical distribution panel power ground conductor to the properly sized ground bus in the communication room.

C. Backbone Pathway (Need to rework) Patch Panels per rack

1) Four (4) 2-inch (2") conduits with long sweep ells shall be provided from MDF to each IDF for routing of Premise Distribution System Site Backbone Cabling. One (1) 2-inch (2") conduit shall contain fiber optic cable, one (1) 2-inch (2") conduit shall contain Cat 3 copper cable and the other two (2) 2-inch (2") conduits shall be empty spares with pull strings for future use.

D. Telephone Entrance Pathway

1) On new facilities or where a new campus telco demarc is established at an existing facility a minimum of two (2) 4-inch (4") conduit should be provided from the property line to the telco demarc point. An additional 4-inch (4") conduit to the demarc shall be run from the property line, however this line should be at a different ingress point. The location will be determined by Technology Services during the preliminary site review meetings.
2) The 4-inch (4") conduits should contain at two (2) 4" 3cell inner ducts per conduit. MaxCell fabric inner duct or equivalent is acceptable inner duct for the conduits.
3) A 200 lb. test pull wire should be placed in all telecommunication entrance conduits for proofing and pulling purpose. Also a stake should be placed at the end of the conduit to facilitate locating the end of the entrance conduit at the property line.

2. EQUIPMENT ROOMS

A. MDF (new names) Main Distribution Frame

1) Secure dedicated room with its own cooling system for exterior/outdoor access MDF/IDF. The access door shall be a minimum of 36-inches (36") wide and 80-inches (80") high and shall be fitted with a lock. Exterior access to the MDF is preferable. The size of this should be a minimum of 10'x20', with final dimensions determined by the amount of equipment and rack space needed. This space will also accommodate a workspace for a networking manager. Floors, walls and ceiling shall be treated to eliminate dust. Floor should be treated with sealant to reduce dust build up.
   Finishes on wall and ceiling shall be light in color to enhance room lighting.
2) Freestanding 19-inch (19") equipment rack(s) with sufficient space for network electronics. For network electronics allow a minimum of two rack units per 24CO ports plus an additional 12 rack units.
3) In addition to the above racks a separate 4-post rack must be provided for mounting servers and other like devices. A minimum of forty-two inches (42") of clearance around all four sides of data rack assemblies; i.e. multiple racks are connected into one rack assembly in MDF and IDF's location at the sides. Provide a 30 amp 120 volt outlet for the UPS that will power the main VOIP equipment (receptacle type for UPS would be NEMA L5-30R located behind the rack and no more than six feet (6') from center rack), as well as a minimum of two (2)

dedicated 20A, 120V AC duplex electrical outlets, each a separate circuit. All the above outlets MUST be fed from the generator at facilities that have a generator. The Vender shall provide and install at least 1-6 outlet surge protected 1U rack mounted power strip with fifteen foot (15') cord, UL1449/330 rated per rack installed (use Wiremold part #R8BZ-15 or equivalent). There should be additional duplex outlets every six feet around perimeter of the room.

B. IDF Intermediate Distribution Frame
   1) Secure dedicated room with its own cooling system. In existing facilities where a dedicated secure room is not possible the rack shall be installed in a freestanding locking enclosure.
   2) Freestanding 19-inch (19") equipment rack(s) with sufficient space for network electronics. For network electronics allow a minimum of two rack units per 24CO ports plus six (6) additional rack units.
   3) Provide 2-20 amp 120-volt outlets for the UPS that will power the VOIP switches. These outlets should be fed from the generator at facilities that have a generator. If IDF is servicing the main office of the school, then generator power is a MUST at facilities that have a generator. The Vender shall provide and install at least 1-6 outlet surge protected 1U rack mounted power strip w/15' cord, UL1449/330 rated per rack installed (use Wiremold part #R8BZ-15 or equivalent).

3. PATCH CORDS

   A. Patch cords will be provided by Owner.

4. LABELING

   A. All ports, cables, terminations, etc. shall be labeled. Communications outlets shall be labeled using the following scheme:
      1) &&-@@@-(A-H)
      2) && = Building Number
      3) @@@ = Room Number
      4) (A-H) = Port Identifier

   B. Outlets shall be numbered around the room clockwise with the outlet to the right of the primary entry door as number 01. The port in the upper left corner of a faceplate shall be port A.

5. TESTING AND QUALITY ASSURANCE

   A. Fiber Optic
      1) Each fiber in every backbone interbuilding and intrabuilding cable run shall undergo a Bi-directional Optical Time Domain Reflectometer (OTDR) test. Test Results to include a record of:
         a) Wavelength
         b) Fiber type
         c) dB Loss
         d) Continuity
         e) Attenuation specification
         f) Bandwidth specification
         g) Fiber and cable number
         h) Measurement direction
         i) Test equipment model and serial numbers
         j) Date
         k) Reference setup

l) Operator (crew members)
m) Cable length

2) All fibers shall be tested at both 850 nm and 1300 nm.
3) Test equipment shall have a current certificate of calibration from the manufacturer's authorized service center. A copy of the certificate shall be included in the closeout documents.
4) All OTDR test results shall be included in the closeout documents in both hard copy (three copies) and software (three copies of complete file on CD) versions.

B. Copper UTP Cable Testing
1) Every wire and connector pin for each horizontal cable run from an IDF, CC or MDF to a CO shall be tested per TIA standards for Category 6 out to a minimum of 350 MHZ. Testing shall include:
a) Continuity
b) Resistance
c) Correct pin-pair orientation (Wire Map)
d) Near end crosstalk (NEXT value)
e) PSNEXT
f) Far end crosstalk (FEXT value)
g) PSFEXT
h) ELFEXT
i) PSELFEXT
j) dB loss (attenuation)
k) Delay Skew
l) Return Loss (RL)
m) Attenuation to Crosstalk Ratio (ACR)
n) PSACR
o) Cable length
2) Every wire run between IDF's, CC's, CP's and/or CER's shall be tested for continuity. Selected circuits shall be tested to demonstrate Level III/Category 3 transmission capability.
3) Testing of copper cable shall be accomplished using a Fluke Versiv Digital Cable Analyzer or accepted equivalent. Test equipment shall have a current certificate of calibration from the manufacturer's authorized service center. A copy of the certificate shall be included in the closeout documents.
4) All UTP test results shall be included in the closeout documents in both hard copy (three copies) and software (three copies of complete file on CD) versions.

VOLUSIA COUNTY SCHOOLS

"LEADING WITH GRACE AND RESPECT"

ADDITIONAL REQUIREMENTS

FACILITIES SERVICES

CUSTODIAL ROOM REQUIREMENTS

1. CUSTODIAL CLOSETS

   A. The door shall always open outward to provide usable space within the room.
   B. The floor sink should be located in a corner tight to walls with mop hangers affixed over the floor sink, if possible. Provide 4'-0" pill hose on faucet.
   C. Two (2) shelves at least four (4) feet long.
   D. 110-V electrical outlet with ground fault protection. This is needed because the auto scrubbers operate on two (2) twelve-volt (12-V) batteries, total 24 volts (24-V), which need to be charged each evening.
   E. The closets need to be vented because the batteries are being charged and omitting gas.
   F. The minimum size of the closet: sixty (60) square feet.
   G. Do not provide hot water heaters in custodial closets.

2. HEAD CUSTODIAN / RECEIVING

   A. Recommended size: one thousand four hundred (1400) square feet.
   B. Emergency eyewash station and shower where cleaning chemicals are mixed.
   C. Ceiling to floor shelving at least twelve (12) feet long.
   D. Four (4) electrical outlets with ground fault protection spaced around room.
   E. 6A Duplex computer outlet for a workstation desk.

3. FMT AREA WITHIN CUSTODIAN / RECEIVING BUILDING

   A. 6A Duplex computer outlet for a workstation desk.
   B. Separate FMT area from rest of room with a chain link fence. Floor to ceiling with one (1) thirty-six inch (36") wide gate / door. Gate / door to have lever handle doorknob / lock.
   C. One (1) electrical outlet (separate circuit not required).

SCHOOL KITCHEN REQUIREMENTS

1. SOLID SURFACE FLOOR

    A. Quarry tile, nonslip with epoxy grout.

2. HOSE REELS

    A. Minimum of two (2) with hoses long enough to clean kitchen, can wash and serving areas, mixing valve and hot and cold water (consider females using hoses without the upper body strength of males so more reels may be necessary – consider pressure washer)

3. WALK-IN COOLER

    A. Molded plastic shelving with lifetime warranty (preferred manufacturer: Fermod)
    B. Location near delivery door
    C. Eight feet (8') to nine feet (9') ceiling preferred
    D. Review size requirement
    E. Lighting - LED
    F. Consider at rear

4. WALK-IN FREEZER

    A. Molded plastic shelving with lifetime warranty and 60/40 ratio freezer to cooler (preferred manufacturer: Fermod)
    B. Locate near delivery door
    C. Eight feet (8') to nine feet (9') ceiling preferred
    D. Review size requirement
    E. Lighting - LED
    F. Consider at rear

5. SECURE PAPER STORAGE AREA

    A. Dunnage racks (future dish room)
    B. Molded plastic shelving with lifetime warranty (preferred manufacturer: Fermod)

6. SECURE STOCKROOM

    A. High density shelving, dunnage racks and track rolling rack
    B. Molded plastic shelving with lifetime warranty (preferred manufacturer: Fermod)

7. SECURE LAUNDRY ROOM

    A. Washing machine and dryer, laundry tub, shelving and locking chemical cabinet

8. SERVING LINES

    A. Electrical outlets - prefer overhead power
    B. All serving lines and snack bars that are apart form main serving lines to have overhead power cords with twist-lock release for hotbox
    C. Roll-through coolers and heated cabinets behind the serving lines with glass fronts when built-in.
    D. POS cash register at every serving line with both power and CAT-6A communication lines through ceiling, each communication line home run to closest IDF room.
    E. Elementary schools: two (2) serving lines
    F. Middle schools: three (3) to four (4) main serving lines, based on population, snack bar in "dish room" paper storage area, two (2) snack lines in dining room
    G. High schools: four (4) to six (6) main serving lines, based on population (4 non-traditional lines, 2 walk-up lines), two (2) to three (3) snack bar lines on opposite side of dining room that opens both

into the cafeteria and to the outside of the building (outside opening to have overhang to protect from the elements) and roll down security gate to close off serving area from dining room

9. SIGNAGE

   A. Provide outlets and data ports at each meal viewer menu board location. Total number of boards and location determined by SWC Department.
      1. Electrical outlet and 6A data port – wall mounted at each menu board location.
      2. Each snack bar to have single panel menu board located in same manner.

10. CAN WASH AREA

    A. Provide hose reel and shelf, recessed floor sink with spray head and wall controls for interior installations.

11. Employee restroom and lounge area with built-in lockers and table and chairs

    A. Prefer two (2) toilet rooms off lounge – one (1) female and one (1) male

12. HOOD SYSTEM

    A. Floor drains running the entire length of the hood on each side
    B. Water filter (Never Scale type) on water line coming to equipment under hood
    C. Prefer self cleaning hoods as appropriate

13. Pot filler located in proximity to mixers at proper height

14. Kitchen and Snack Bar Doorways

    A. Air curtains to prevent insect intrusion at kitchen delivery door
    B. Air curtains at dining room doors if open directly to exterior.

15. SINKS

    A. All schools: one (1) 2-compartment sink and one (1) 3-compartment sink with drying rack
    B. Secondary schools: one (1) additional 3-compartment sink with drying rack
    C. Hand washing sinks in kitchen and serving areas: two (2) minimum in elementary schools, four (4) minimum in secondary schools
    D. Remote snack bars to have additional hand washing sink
    E. Locate hand washing sink near serving line
    F. Provide paper towel dispenser at sinks

16. KITCHEN BACKDOOR

    A. Oversized or double door, solid, with peephole, doorbell, exterior light and air curtain.

16. MANAGER'S OFFICE

    A. Window(s) viewing kitchen area
    B. Multiple access electric outlets located at intervals around perimeter of room
    C. Secondary schools: automated money counting machine

17. WORK TABLES

A. Stainless steel with stainless steel under-shelves, legs and bullet feet or casters
B. One cooks table with pot and pan rack
C. One baker's table
D. One receiving table (work table)
E. Additional work tables

18. REACH-IN COOLERS & FREEZERS

    A. Preferred manufacturer – Trulsen

19. Replace kettles with skillets

    A. Ensure proper drainage – (preferred manufacturer – Groen)

20. COMBI-OVEN – (preferred manufacturer – Alto Sham_

21. CONVECTION OVEN - preferred manufacturer – Blodgett

22. SERVING LINES – preferred manufacturer – Delfield (black finish)

23. HOT BOX (heating cabinet) – preferred manufacturer – Alto Sham

24. MILK BOX – preferred manufacturer – Trulsen

25. TWO-EYE BURNER – preferred manufacturer - Vulcan
    A. Electric or gas (when available)

26. ICE MACHINE – preferred manufacturer - Manitowoc

SCHOOL FUNDED SHED INSTALLATION

1. SELECTING SHED LOCATION

    A. Sixty feet (60') from any structure. VCS Project Manager and school will decide. (Shed may be closer than sixty feet (60') if constructed of non-combustible materials.)
    B. Level location. VCS Project Manager and school will decide.
    C. High and dry location. VCS Project Manager and school will decide.
    D. Accessibility for delivery of portable shed. VCS Project Manager and school will decide.

2. PROJECT DRAWINGS AND SPECIFICATIONS

    A. Site plan showing location of portable shed; to scale, show dimension from existing buildings as provided by Owner.
    B. Plan with dimensions, design and wind load of portable shed. Shed company will provide.
    C. Anchor plan and details. Shed company will provide.
    D. Note on plan or letter that states these buildings meet the wind requirements of the Florida Building Code and the ASCE standard ASCE 7. Shed company will provide.
    E. All drawings / letters shall be signed and sealed by a Florida Registered Engineer; shed company will provide.

3. OBTAINING BUILDING PERMIT

    A. Complete "Building Permit Application" blue form number "2A, 2B, and 2C". School will complete with the assistance of the VCS Project Manager.
    B. Two (2) sets of complete project drawings signed and sealed by Registered Florida Engineer. Shed company will provide.
    C. For sheds over 250 sq. ft., company / persons installing sheds and tie downs will need a copy of state contractor's license, and liability and Workman's Compensation Insurance to receive permit.
    D. Send Building Permit Application and two (2) sets of project drawings to VCS Project Manager. School will send. VCS Project Manager will turn in application and drawings to Building Department.
    E. After plan review the VCS Project Manager, school and the shed company will receive notice of corrections needed or if all information submitted is satisfactory a building permit will be issued.
    F. No delivery or installation of a shed shall be done prior to the issuing of a building permit.

WIND SPEED

TABLE 1604.5 (VCS MODIFIED)
RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES

RISK CATEGORY

I. Not applicable to VCS facilities or structures

II. Not applicable to VCS facilities or structures

III. Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to:

- All Volusia County Schools facilities and structures.
- Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than three hundred (300).
- Buildings and other structures containing elementary school, secondary school or day care facilities with an occupant load greater than two hundred fifty (250).
- Buildings and other structures containing adult education facilities, such as colleges and university, with an occupant load greater than five hundred (500).
- Group I-2 occupancies with an occupant load of fifty (50) or more resident patients but not having surgery or emergency treatment facilities.
- Group I-3 occupancies.
- Any other occupancy with an occupant load greater than five thousand (5,000) [a].
- Power-generating stations, water treatment facilities for potable water, waste water treatment facilities and other public utility facilities not included in Risk Category IV.
- Buildings and other structure not included in Risk Category IV containing sufficient quantities of toxic or explosive substances to be dangerous to the public if released.

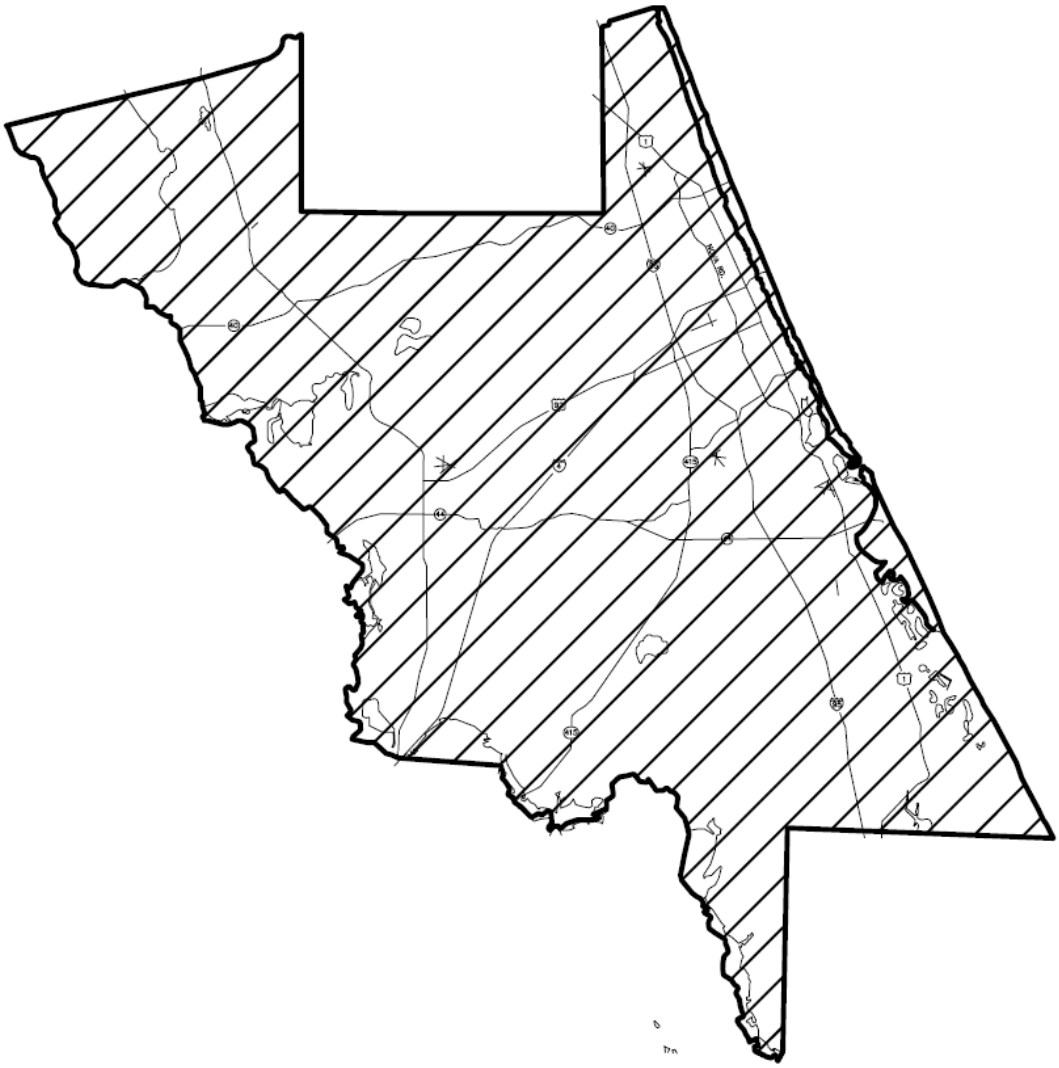
IV. Buildings and other structure designated as essential facilities, including but not limited to:

- All Volusia County Schools facilities and structures.
- Group I-2 occupancies having surgery or emergency treatment facilities.
- Fire, rescue, ambulance and police stations and emergency vehicle garages.
- Designed earthquake, hurricane or other emergency shelters.
- Designated emergency preparedness, communications and operations centers and other facilities required for emergency response.
- Power-generating stations and other public utility facilities required as emergency backup facilities for Risk Category IV structures.
- Structures containing highly toxic materials as defined by Section 307 where the quantity of the material exceeds the maximum allowable quantities of Table 307.1(2).
- Aviation control towers, air traffic control centers and emergency aircraft hangars.
- Building and other structures having critical national defense functions.
- Water storage facilities and pump structures required to maintain water pressure for fire suppression.

[a] For purposes of occupant load calculation, occupancies required by Table 1004.5, Florida Building Code, to use gross floor area calculations shall be permitted to use net floor areas to determine the total occupant load.

Eighth Edition (2023) Florida Building Code - Building

Florida Building Code wind speed maps and tables have been modified for Volusia County School District property.



Volusia County

Figure 1609.3 (2) (VCS modified)

VCS Ultimate Design Wind Speed, Vult

155 MPH AND WINDBORNE
DEBRIS PROTECTION
THROUGHOUT THE COUNTY AT
ALL VCS FACILITIES

Eighth Edition (2023)
Florida Building Code - Building

VOLUSIA COUNTY SCHOOLS

"LEADING WITH GRACE AND RESPECT"

FORMS

FACILITIES SERVICES

DESIGN GUIDELINES
CONFORMANCE STATEMENT

SCHOOL BOARD OF VOLUSIA COUNTY FLORIDA

This document shall be signed by the Architect / Engineer of record and provided with the construction document submittal to the Owner.

School / Facility Name: _____

Project Name: _____

VCS Project No.: _____ A/E Project No.: _____

VCS Project Manager: _____

I do hereby certify that I am the Architect / Engineer of record for the above indicated project and I have reviewed the School Board of Volusia County Florida design guidelines and have incorporated the requirements of those guidelines into the construction documents unless indicated otherwise below.

		I have complied:		
Guideline Section		**Yes**	**No**	**Exception**
Introduction				
General Information / Design Elements				
Division 0	Bidding Requirements, Contract Forms, Conditions of the Contract			
Division 1	General Requirements			
Division 2	Site Work			
Division 3	Concrete			
Division 4	Masonry			
Division 5	Metals			
Division 6	Wood & Plastics			
Division 7	Thermal & Moisture Protection			
Division 8	Doors & Windows			
Division 9	Finishes			
Division 10	Specialties			
Division 11	Equipment			
Division 12	Furnishings			
Division 13	Not Used			
Division 14	Elevators			
Division 22	Plumbing			
Division 23	Heating, Ventilation and Air Conditioning (HVAC)			
Division 25	Integrated Automation			
Division 26	Electrical			

	I have complied:		
Additional Requirements	**Yes**	**No**	**Exception**
Custodial Room Requirements			
School Kitchen Requirements			
School Funded Shed Installation			
Volusia County Wind Speed			

	I have complied:		
Forms	**Yes**	**No**	**Exception**
Design Guidelines Conformance Statement			
Division 23 and 25 Conformance Statement			
Voltage & Amperage Readings – Tabulated Data			
Ground Test Information			
Conductor Insulation Resistance Test			
Suggested Changes / Modifications Form			
Asbestos Free Documentation			

	I have complied:		
Attachments	**Yes**	**No**	**Exception**
2023 List of Invasive Plant Species			
Gate / Fence Details			
Heavy Duty Cantilever Slide Gate			
Panel Wall Joint Detail #11			
Thermal Spray Foam Detail – Roof Detail #1			
Typical Parapet – LWIC Detail #5			
Elementary School Storage “Cubbies” Detail			
AD-400 Networked Wireless Electronic Lock			
NDE Mobile Enabled Wireless Cylindrical Lock			
Typical Classroom Teaching Wall			
Interior Signage Requirements			
Bronze Dedication Plaque (example)			
Aluminum Canopy Light Fixture Installation			
Typical Surge Protection Device (SPD) Panel Installation			

Architect / Engineer Name

Signature

Firm Name

Date

DIVISION 23 AND 25
CONFORMANCE STATEMENT

This document shall be signed by the engineer of record and provided with the construction document submittal to the Owner.

School / Facility Name: _____

Project Name: _____

VCS Project No.: _____ Eng. Project No.: _____

VCS Project Manager: _____

I do hereby certify that I am the engineer of record for the above-indicated project and I have reviewed the School Board of Volusia County Florida Design Guidelines and have incorporated the requirements of those guidelines into the construction documents unless indicated otherwise below.

		I have complied:			
		N/A	Yes	No	Exception
	Division 23 HVAC				
01 91 00	Commissioning				
21 13 13	Fire Protection Systems				
21 23 00	Wet Chemical Fire Extinguishing Systems				
22 11 18	Building Services Piping				
23 01 30	HVAC Air Duct Cleaning				
23 03 01	Use of Mechanical Systems During Construction				
23 05 01	Mechanical General Requirements				
23 05 13	Common Motor Requirements for HVAC				
23 05 14	Variable Frequency Drives				
23 05 29	Hangers and Supports for HVAC Piping and Hardware				
23 05 48	Vibration Controls for HVAC Piping and Hardware				
23 05 54	Mechanical Identification				
23 05 93	Contractor Assisted Testing, Adjusting and Balancing for HVAC				
23 05 93.2	Owner Furnished Testing, Adjusting and Balancing for HVAC				
23 05 94	Pressure Testing of Ducted Air Systems				
23 07 13	Thermal Insulation				
23 08 021	Start Up of Mechanical Systems				
23 09 33	Electric and Electronic Control System for HVAC Food Service Area Cooler/Freezer Monitoring, Recording and Alarm				
23 09 33	VCSD Controls				
23 11 23	Facility Natural Gas Piping				
23 11 26	Facility Gas Piping				
23 21 14	HVAC Piping				
23 21 23	Hydronic Pumps				
23 25 00	HVAC Water Treatment Systems				
23 31 15	Metal Ducts				
23 33 00	Air Duct Accessories				
23 34 00	HVAC Fans				
23 36 00	Air Terminal Units				

		I have complied:			
		N/A	**Yes**	**No**	**Exception**
23 37 13	Diffusers, Registers and Grilles				
23 38 13	Commercial Kitchen Hoods				
23 41 00	Particulate Air Filtration				
23 52 00	Boilers				
23 55 01	Duct Heaters				
23 64 16	Water Chillers – Water Cooled				
23 64 26	Water Chillers – Air Cooled				
23 65 10	Condensers, Coolers, and Colling Towers				
	Air Handlers				
23 74 00	Packaged HVAC Equipment				
	Division 25 – Integrated Automation				
1.1	Summary				
1.2	Bid Procedures – Restricted BAS				
1.3	Bid Procedures – Non-Restricted BAS				
1.4	Scope – General				
1.5	Scope – Campus-Wide Control System				
1.6	Scope – Expand Existing Control System				
1.7	Related Documents				
1.8	Abbreviations				
1.9	References				
1.10	Quality Assurance				
1.11	System Performance				
1.12	Coordination				
1.13	Submittals				
1.14	Warrantee				
1.15	BAS Acceptance Procedure				
1.16	Training				
1.17	Closeout Procedures				
2.1	Acceptable Manufacturers System Integrators				
2.2	Operator Interface				
2.3	Software Key				
2.4	Communications				
2.5	Control Units				
2.6	Power Supplies, Line Filtering, and Electrical Accessories				
2.7	Input and Output Interface				
2.8	Electronic Sensors, Indicators, Transducers and Components				
2.9	Intelligent Devices				
2.10	Electric Components				
2.11	Auxiliary Control Devices				
3.1	Examination				
3.2	Installation				
3.3	Verification				
3.4	Demonstration				

Legend:
N/A = This requirement does not apply to this project.
Yes = All requirements in this section have been incorporated into the construction documents.
No = One or more requirements in this section are not incorporated into the construction documents and I have attached a written request for an exception.
Exception = Reference to the attached written exceptions.

Engineer Name	Signature
Firm Name	Date

VOLTAGE & AMPERAGE READINGS
TABULATED DATA

SCHOOL BOARD OF VOLUSIA COUNTY FLORIDA

SCHOOL/FACILITY NAME: _____

SWITCHGEAR / PANEL BOARD _____

FULL LOAD AMPERAGE READINGS

DATE: _____

TIME: _____

PHASE A _____

B _____

C _____

N _____

GROUND _____

FULL LOAD VOLTAGE READINGS

DATE: _____

TIME: _____

PHASE A TO N _____ A TO B

B TO N _____ A TO C

C TO N _____ B TO C

VOLTAGE AT THE END OF THE LONGEST BRANCH _____

TYPE OF LOAD _____

NO LOAD VOLTAGE READINGS

DATE: _____

TIME: _____

PHASE A TO N _____ A TO B

B TO N _____ A TO C

C TO N _____ B TO C

_____ _____

CONTRACTOR'S REPRESENTATIVE DATE

_____ _____

ENGINEER'S REPRESENTATIVE DATE

_____ _____

OWNER'S REPRESENTATIVE DATE

GROUND TEST INFORMATION

SCHOOL BOARD OF VOLUSIA COUNTY FLORIDA

SCHOOL/FACILITY NAME: _____

GROUND TYPE: _____

TEST BY: _____

DATE OF TEST: _____

GROUND LOCATION: _____

GROUND TYPE: _____
(Rod, Water Pipe, etc.)

PRIOR TO CONNECTION TO SYSTEM

GROUND: _____ (OHMS)

AFTER CONNECTION TO SYSTEM

GROUND: _____ (OHMS)

WEATHER CONDITIONS (Wet/Dry): _____

SOIL CONDITIONS (Wet/Dry): _____

_____ _____
CONTRACTOR'S REPRESENTATIVE DATE

_____ _____
ENGINEER'S REPRESENTATIVE DATE

_____ _____
OWNER'S REPRESENTATIVE DATE

CONDUCTOR INSULATION RESISTANCE TEST

SCHOOL BOARD OF VOLUSIA COUNTY FLORIDA

SCHOOL/FACILITY NAME: _____

CONDUCTOR FROM: _____ TO: _____

SIZE: _____

INSULATION TYPE: _____

INSULATION VOLTAGE RATING: _____

DATE: _____ TIME: _____

WEATHER CONDITIONS: _____

TEST VOLTAGE (DC): _____

RANGE: _____

MEGGER INSTRUMENT / SERIAL NUMBER: _____

TESTING METHODOLOGY: _____

_____

INSULATION RESISTANCE MEASUREMENT
(ACCEPTABLE MEASUREMENT NOT LESS THAN 1 MEGOHM): _____

PHASE A TO GROUND: _____

PHASE B TO GROUND: _____

PHASE C TO GROUND: _____

NEUTRAL TO GROUND: _____

ISOLATED GROUND TO GROUND: _____

_____ _____
CONTRACTOR'S REPRESENTATIVE DATE

_____ _____
ENGINEER'S REPRESENTATIVE DATE

_____ _____
OWNER'S REPRESENTATIVE DATE

DESIGN GUIDELINES
SUGGESTED CHANGES / MODIFICATIONS
FORM

SCHOOL BOARD OF VOLUSIA COUNTY FLORIDA

Change Recommended by: _____

Company: _____

Address: _____

Telephone: _____

Date: _____

Division: _____

Page No: _____

Recommendation:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Please submit all recommendations to:
Facilities Design & Construction
3750 Olson Drive
Daytona Beach, Florida 32124

ASBESTOS FREE DOCUMENTATION

Facility/Project Name:
Project Number:
Building Number(s):

Building Certification

I have reviewed all building materials used in this project and attest and confirm no asbestos products were used on this project in accordance with Florida Statutes Title XVIII, Section 255.40 – *Prohibition on Use of Asbestos Building Materials.*

1.) Construction Manager / General Contractor:

Print Name:
Signature:

Date:
License #:
Expiration Date:

2.) Architect / Engineer:

Print Name:
Signature / Seal:

Date:
License #:
Expiration Date:

VOLUSIA COUNTY SCHOOLS

"LEADING WITH GRACE AND RESPECT"

ATTACHMENTS

FACILITIES SERVICES

FISC List Definitions*:

Native—A species that occurs naturally in Florida.

Nonnative—A species that does not occur naturally in Florida.

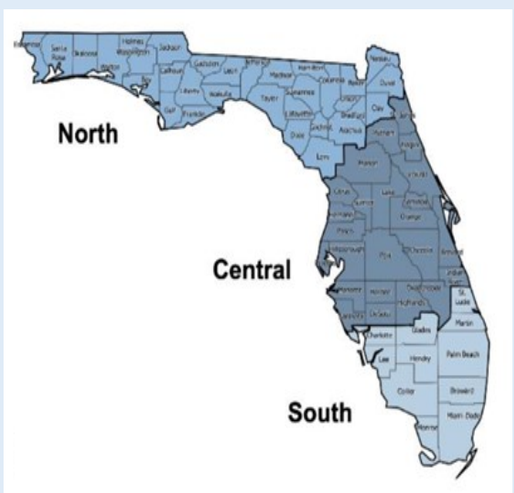
Invasive—A species that (a) is nonnative to Florida, (b) was introduced by humans (intentionally or unintentionally), and (c) does or can cause environmental harm.**

*adapted from: Iannone III, B. V., et al. (2020). Invasive Species Terminology: Standardizing for Stakeholder Education. Journal of Extension, 58(3), 27.

**for the purposes of this list, economic and human harm were not considered.

Category I—Invasive plants that are altering native plant communities by displacing native species, changing community structures or ecological functions, or hybridizing with natives. This definition does not rely on the economic severity or geographic range of the problem, but on the documented ecological damage caused.

Category II— Invasive plants that have increased in abundance or frequency but have not yet altered Florida plant communities to the extent shown by Category I species. These species may become Category I if ecological damage is demonstrated.



Zone: In the list, **N** = north, **C** = central, **S** = south, referring to each species' general distribution in regions of Florida (not its potential range in the state).

Map courtesy of UF IFAS Assessment

Florida Invasive Species Council

Formerly

Florida Exotic Pest Plant Pest Council (FLEPPC)

For more information on invasive plants including links to related web pages, visit:

floridainvasivespecies.org

FISC also publishes a *Watch List* which can be found on the website

The 2023 list was prepared by the FISC Plant List Committee

Dennis Giardina, Chair, 2017-2023, Florida Fish and Wildlife Conservation Commission, dennis.giardina@myfwc.com

Alan Franck, University of Florida Herbarium, francka@floridamuseum.ufl.edu

Roger L. Hammer, Retired Naturalist and Author, kaskazi44@comcast.net

Mark Kiser, Florida Forest Service, mark.kiser@fdacs.gov

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Veronica Runge, City of Sanibel, veronica.runge@mysanibel.com

Dexter Sowell, Florida State University, FNAI, dsowell@fnai.fsu.edu

Jessica Spencer, US Army Corps of Engineers, jessica.e.spencer@usace.army.mil

Elena Suarez, Broward County Florida Parks and Recreation, casuarez@broward.org

Richard P. Wunderlin, Professor Emeritus, University of South Florida, rwunder@cas.usf.edu

Florida Invasive Species Council's 2023 List of Invasive Plant Species

The mission of the Florida Invasive Species Council is to reduce the impacts of invasive plants in Florida through the exchange of scientific, educational, and technical information.

Note: The FISC List of Invasive Plant Species is not a regulatory list. Only those plants listed as Federal Noxious Weeds, Florida Noxious Weeds, Florida Prohibited Aquatic Plants, or in local ordinances are regulated by law.

Purpose of the List

To provide a list of plants determined by the Florida Invasive Species Council to be invasive in natural areas of Florida and routinely update the list based upon information of newly identified occurrences and changes in distribution over time. Also, to focus attention on:

- Adverse effects invasive plants have on Florida's biodiversity and native plant communities,
- Habitat losses in natural areas from Invasive plant infestations,
- Impacts on endangered species via habitat loss and alteration,
- Needs for invasive plant management,
- Environmental impacts of these plants (e.g. increased wildfires or flooding in certain areas),
- Changes in the severity of different invasive plant infestations over time,
- Providing information to help managers set priorities for research and control programs.

www.floridainvasivespecies.org

Citation example: FISC 2023 List of Invasive Plant Species. Florida Invasive Species Council. https://www.floridainvasivespecies.org/.

FISC Category I [1]

Scientific Name	Common Name	Zone
Abrus precatorius	rosary pea	C, S
Acacia auriculiformis	earleaf acacia	C, S
Albizia julibrissin	silktree; mimosa	N, C
Albizia lebbeck	woman's tongue	C, S
Ardisia crenata	coral ardisia; scratchthroat	N, C, S
Ardisia elliptica	shoebutton ardisia	C, S
Asparagus aethiopicus	Sprenger's asparagus-fern	N, C, S
Bauhinia variegata	orchid tree; mountain ebony	C, S
Bischofia javanica	Javanese bishopwood	C, S
Calophyllum antillanum	santa maria; galba; Antilles calophyllum	S
Casuarina equisetifolia	Australian-pine; horsetail casuarina	N, C, S
Casuarina glauca	gray sheoak; suckering Australian-pine	N, C, S
Cenchrus purpureus (Pennisetum purpureum)	elephantgrass; napiergrass	N, C, S
Cinnamomum camphora	camphortree	N, C, S
Colocasia esculenta	wild taro; dasheen; coco yam	N, C, S
Colubrina asiatica	latherleaf; Asian nakedwood	C, S
Cupaniopsis anacardioides	carrotwood	C, S
Cyperus blepharoleptos*	**Cuban bulrush**	**N, C, S**
Deparia petersenii	Japanese false spleenwort	N, C
Dioscorea alata	white yam; winged yam; water yam	N, C, S
Dioscorea bulbifera	air-potato	N, C, S
Dolichandra unguis-cati (Macfadyena unguis-cati)	catclaw vine	N, C, S
Eichhornia crassipes	common water-hyacinth	N, C, S
Eugenia uniflora	Surinam cherry	C, S
Ficus microcarpa [2]	Indian laurel fig	C, S
Heptapleurum actinophyllum (Schefflera actinophylla)	Australian umbrella tree; octopus tree	C, S
Hydrilla verticillata	waterthyme; hydrilla	N , C, S
Hygrophila polysperma	Indian swampweed; green hygro	N, C, S
Hymenachne amplexicaulis	trompetilla; West Indian marshgrass	N, C, S
Imperata cylindrica	cogongrass	N, C, S
Ipomoea aquatica	water-spinach	N, C, S
Jasminum dichotomum	Gold Coast jasmine	C, S
Jasminum fluminense	Brazilian jasmine; jazmin de trapo; corky-stemmed jasmine	C, S
Lantana strigocamara (Lantana camara)	lantana; shrubverbena	N, C, S
Ligustrum lucidum	glossy privet	N, C
Ligustrum sinense	Chinese privet	N, C, S
Lonicera japonica	Japanese honeysuckle	N, C, S
Ludwigia peruviana	Peruvian primrosewillow	N, C, S
Lumnitzera racemosa	lumitzera	S
Luziola subintegra	Tropical American watergrass	S
Lygodium japonicum	Japanese climbing fern	N, C, S
Lygodium microphyllum	small-leaf climbing fern; Old World climbing fern	N, C, S
Manilkara zapota	sapodilla	S
Melaleuca quinquenervia	punktree; melaleuca	C, S
Melinis repens	rose natalgrass	N, C, S
Microsorum grossum (Phymatosorus scolopendria)	serpent fern; wart fern	S
Microstegium vimineum	Nepalese browntop; Japanese	N
Mimosa pigra	black mimosa; catclaw mimosa	C, S
Nandina domestica	sacred bamboo; heavenly bamboo	N, C
Nephrolepis brownii	Asian sword fern	C, S
Nephrolepis cordifolia	tuberous sword fern	N, C, S
Neyraudia reynaudiana	Burma reed; silkreed	S
Nymphoides cristata	crested floatingheart	C, S
Paederia cruddasiana	sewervine	S
Paederia foetida	skunkvine	N, C, S
Panicum repens	torpedograss	N, C, S
Pistia stratiotes	water-lettuce	N, C, S
Psidium cattleianum	strawberry guava	C, S
Psidium guajava	guava	C, S
Pueraria montana var. lobata	kudzu	N, C, S
Rhodomyrtus tomentosa	rose myrtle; downy rose-myrtle	C, S
Ruellia simplex	Britton's wild petunia; Mexican petunia	N, C, S
Salvinia minima	water spangles	N, C, S
Scaevola taccada	beach naupaka	N, C, S
Schinus terebinthifolia	Brazilian pepper	N, C, S
Scleria eggersiana*	**Eggers nutrush**	**S**
Scleria lacustris	Wright's nutrush; lakeshore nutrush	C, S
Scleria microcarpa	Tropical nutrush	C, S
Senna pendula var. glabrata	Christmas cassia; valamuerto	C, S
Solanum tampicense	wetland nightshade; aquatic soda apple	C, S
Solanum viarum	Tropical soda apple	N, C, S
Sporobolus jacquemontii	West Indian dropseed; giant smutgrass	N, C, S
Syngonium podophyllum	arrowhead vine; American evergreen	N, C, S
Syzygium cumini	Java plum	C, S
Tectaria incisa	incised halberd fern	S
Thelypteris opulenta (Ambloventum opulentum)	jeweled maiden fern	S
Thespesia populnea	portia tree; seaside mahoe	C, S
Tradescantia fluminensis	small-leaf spiderwort	N, C, S
Tradescantia spathacea*	**Moses-in-the-cradle; oyster-plant; boatlily**	**C, S**
Triadica sebifera (Sapium sebiferum)	popcorntree; Chinese tallow tree	N, C, S
Urena lobata	caesarweed	N, C, S
Urochloa mutica	paragrass	N, C, S
Vitex rotundifolia	beach vitex; roundleaf chastetree	N, C

FISC Category II [1]

Scientific Name	Common Name	Zone
Adenanthera pavonina	red beadtree; red sandalwood	S
Agave sisalana	sisal hemp	C, S
Alstonia macrophylla	deviltree	S
Alternanthera philoxeroides	alligatorweed	N, C, S
Antigonon leptopus	coral vine; queen's jewels	N, C, S
Ardisia japonica	Japanese ardisia	N
Aristolochia elegans (Aristolochia littoralis)	elegant dutchman's-pipe; calico flower	N, C, S
Asystasia gangetica	Chinese violet; Ganges primrose	C, S
Begonia cucullata	wax begonia; club begonia	N, C, S
Broussonetia papyrifera	paper mulberry	N, C, S
Bruguiera gymnorhiza	large-leafed orange mangrove	S
Callisia fragrans	basket plant; inch plant	C, S
Casuarina cunninghamiana	river sheoak	C, S
Cecropia palmata	trumpet tree	S
Cenchrus polystachios (Pennisetum polystachion)	West Indian pennisetum; missiongrass	C, S
Cenchrus setaceus (Pennisetum setaceum)	fountaingrass	N, C, S
Cestrum diurnum	dayflowering jessamine	C, S
Chamaedorea seifrizii	bamboo palm	C, S
Clematis terniflora	sweet autumn virginsbower; sweet autumn clematis	N, C
Cocos nucifera	coconut palm	S
Crassocephalum crepidioides	redflower ragleaf	N, C, S
Cryptostegia madagascariensis	Madagascar rubbervine	C, S
Cyperus involucratus	umbrella plant	N, C, S
Cyperus prolifer	dwarf papyrus; miniature flatsedge	C, S
Dactyloctenium aegyptium	Durban crowfootgrass	N, C, S
Dalbergia sissoo	Indian rosewood; sissoo	C, S
Dalechampia scandens	spurgecreeper	C, S
Distimake tuberosus (Merremia tuberosa)	Spanish arborvine; yellow morning-glory; wood rose	C, S
Dracaena hyacinthoides (Sansevieria hyacinthoides)	bowstring hemp; mother-in-law's tongue	C, S
Elaeagnus pungens	silverthorn; thorny olive	N, C, S
Elaeagnus umbellata	silverberry; autumn olive	N
Epipremnum pinnatum	golden pothos	C, S
Eulophia graminea	Chinese crown orchid	N, C, S
Ficus altissima	council tree	C, S
Flacourtia indica	Governor's plum	S
Hemarthria altissima	limpograss	C, S
Heteropterys brachiata	Beechey's withe; redwing	S
Hyparrhenia rufa	jaragua	N, C, S
Ipomoea carnea subsp. fistulosa	bush morning-glory	C ,S
Kalanchoe pinnata	cathedral bells; life plant	C, S
Kalanchoe x houghtonii	mother-of-millions	N, C, S
Koelreuteria elegans subsp. formosana	flamegold rain tree	N, C, S
Landoltia punctata (Spirodela punctata)	dotted duckweed	N, C, S
Leucaena leucocephala	white leadtree	N, C, S
Limnophila sessiliflora	Asian marshweed	N, C, S
Livistona chinensis	Chinese fan palm	C, S
Macroptilium lathyroides	wild bushbean	N, C, S
Melaleuca viminalis (Callistemon viminalis)	bottlebrush	C, S
Melia azedarach	Chinaberrytree	N, C, S
Melinis minutiflora	molassesgrass	C ,S
Mikania micrantha	mile-a-minute	S
Momordica charantia	balsampear	N, C, S
Murraya paniculata	orange jessamine	S
Myriophyllum spicatum	Eurasian watermilfoil	N, C, S
Passiflora biflora	twolobe passionflower	S
Phoenix reclinata	Senegal date palm	C, S
Phyllostachys aurea	golden bamboo	N, C
Pittosporum pentandrum	Taiwanese cheesewood	S
Platycerium bifurcatum	staghorn fern	C, S
Praxelis clematidea	praxelis	C
Pteris tripartita*	**giant brake**	**C, S**
Pteris vittata	Chinese ladder brake	N, C, S
Ptychosperma elegans	Alexander palm; solitaire palm	S
Richardia grandiflora	largeflower Mexican clover	N, C, S
Ricinus communis	castorbean	N, C, S
Rotala rotundifolia	dwarf rotala; roundleaf toothcup	S
Ruellia blechum	Browne's blechum; green shrimp plant	N, C, S
Selenicereus pteranthus*	**princess-of-the-night**	**C, S**
Sesbania punicea	rattlebox	N, C, S
Sida planicaulis	flatstem sida; mata-pasto	C, S
Solanum diphyllum	twoleaf nightshade	N, C, S
Solanum torvum	turkeyberry	N, C, S
Spermacoce verticillata [3]	shrubby false buttonweed	N, C, S
Sphagneticola trilobata (Wedelia triloba)	creeping oxeye; wedelia	N, C, S
Stachytarpheta cayennensis	nettleleaf velvetberry	S
Syagrus romanzoffiana	queen palm	C, S
Syzygium jambos	Malabar plum; rose apple	N, C, S
Tabebuia heterophylla*	**pink tabebuia; white cedar**	**S**
Taliparitiliaceum var. tiliaceum	sea hibiscus; mahoe	C, S
Terminalia catappa	West Indian almond; tropical almond; sea almond	C, S
Terminalia muelleri	Australian almond	C, S
Thelypteris dentata (Christella dentata)*	**downy maiden fern; downy shield fern**	**N, C, S**
Tribulus cistoides	burr nut; Jamaican feverplant; puncture vine	N, C, S
Urochloa maxima (Panicum maximum)	Guineagrass	N, C, S
Vernicia fordii	tung oil tree	N, C, S
Vitex trifolia	simpleleaf chastetree	C, S
Washingtonia robusta	Washington fan palm	C, S
Wisteria sinensis	Chinese wisteria	N, C
Xanthosoma sagittifolium	arrowleaf elephant's ear	N, C, S

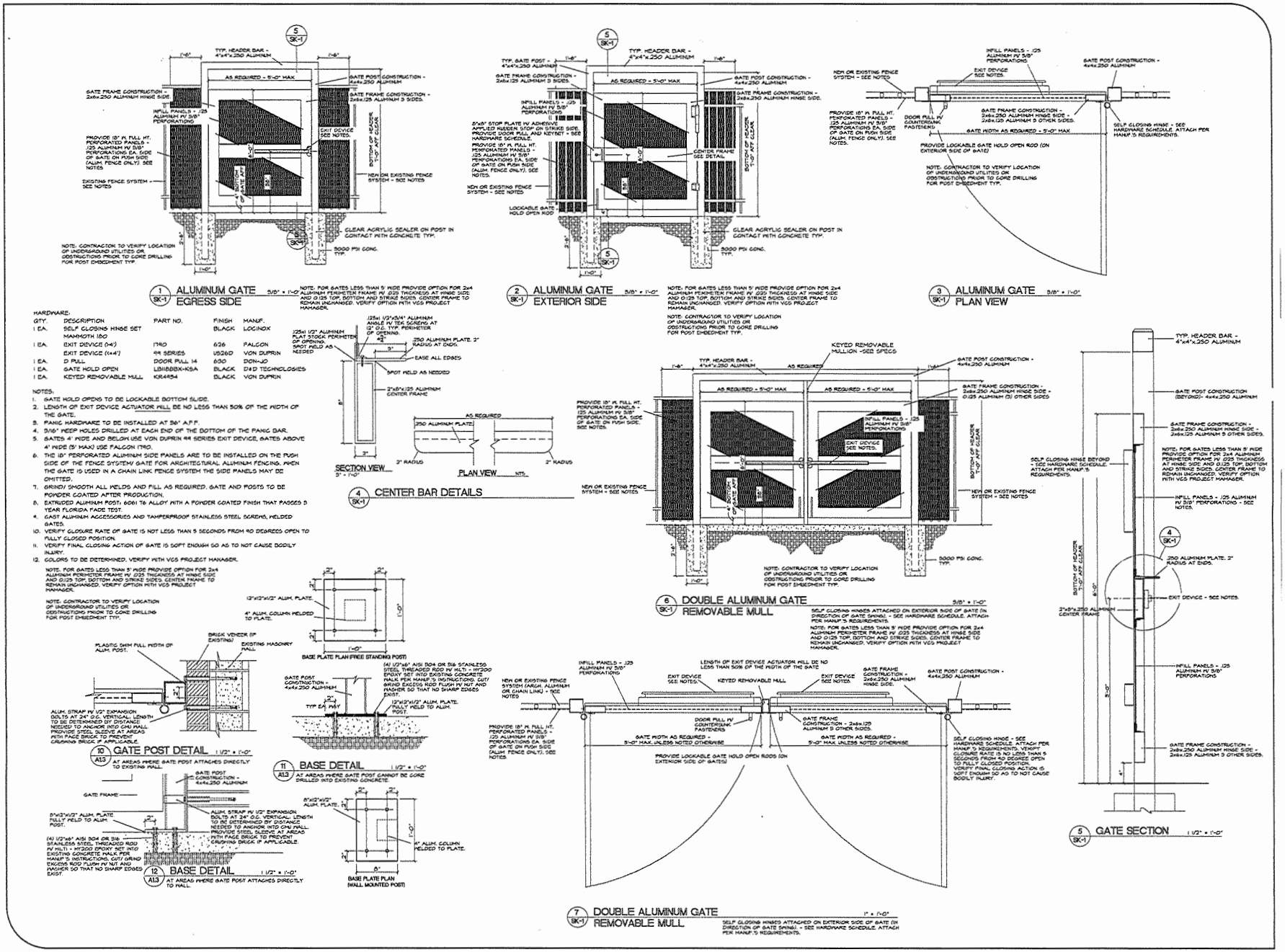
[1] Plant names are those published in the Atlas of Florida Plants on 3/4/23 (http://florida.plantatlas.usf.edu/). Some frequently used common names are added.

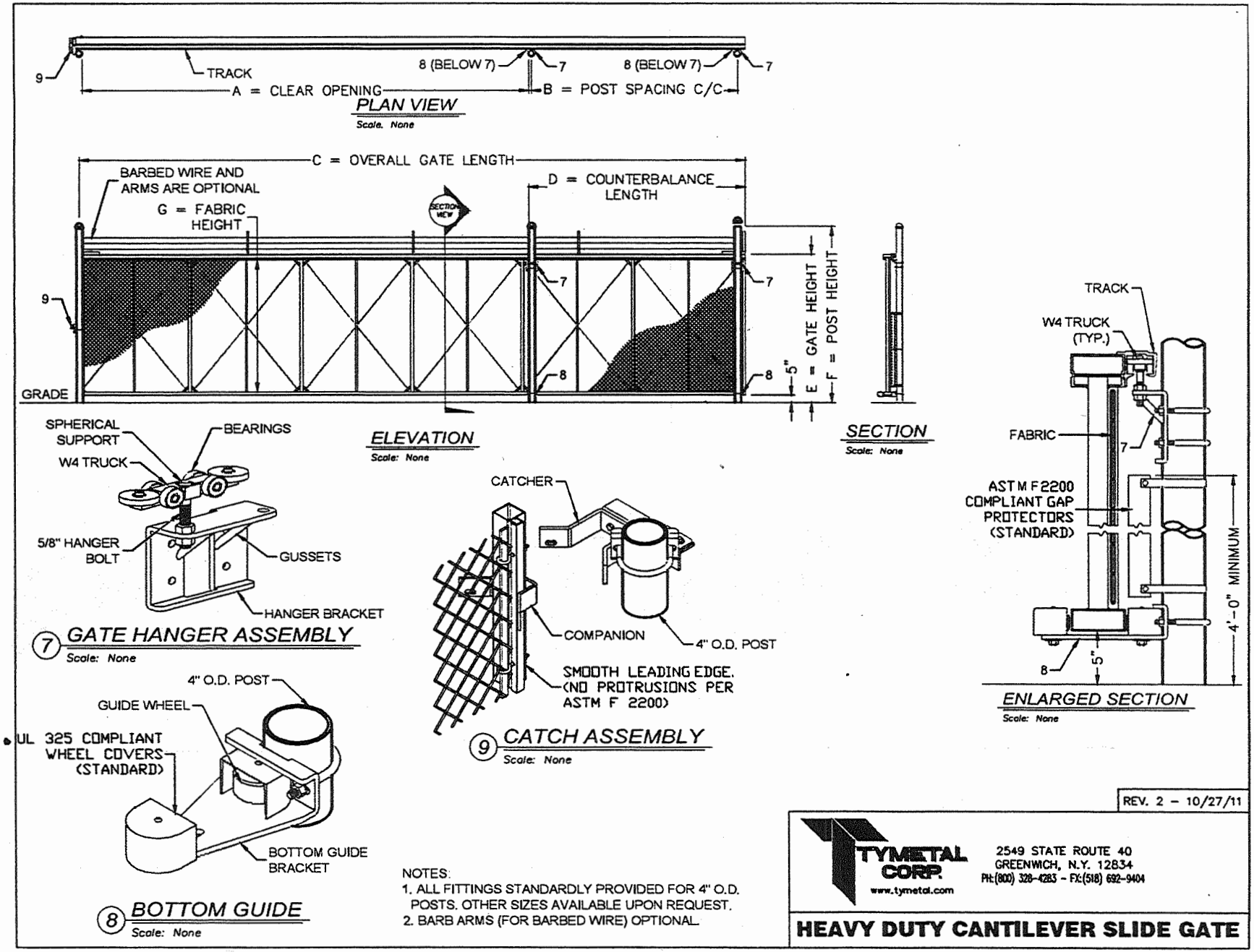
[2] Does not include *Ficus microcarpa* subsp. *fuyuensis* , which is sold as "green island Ficus"

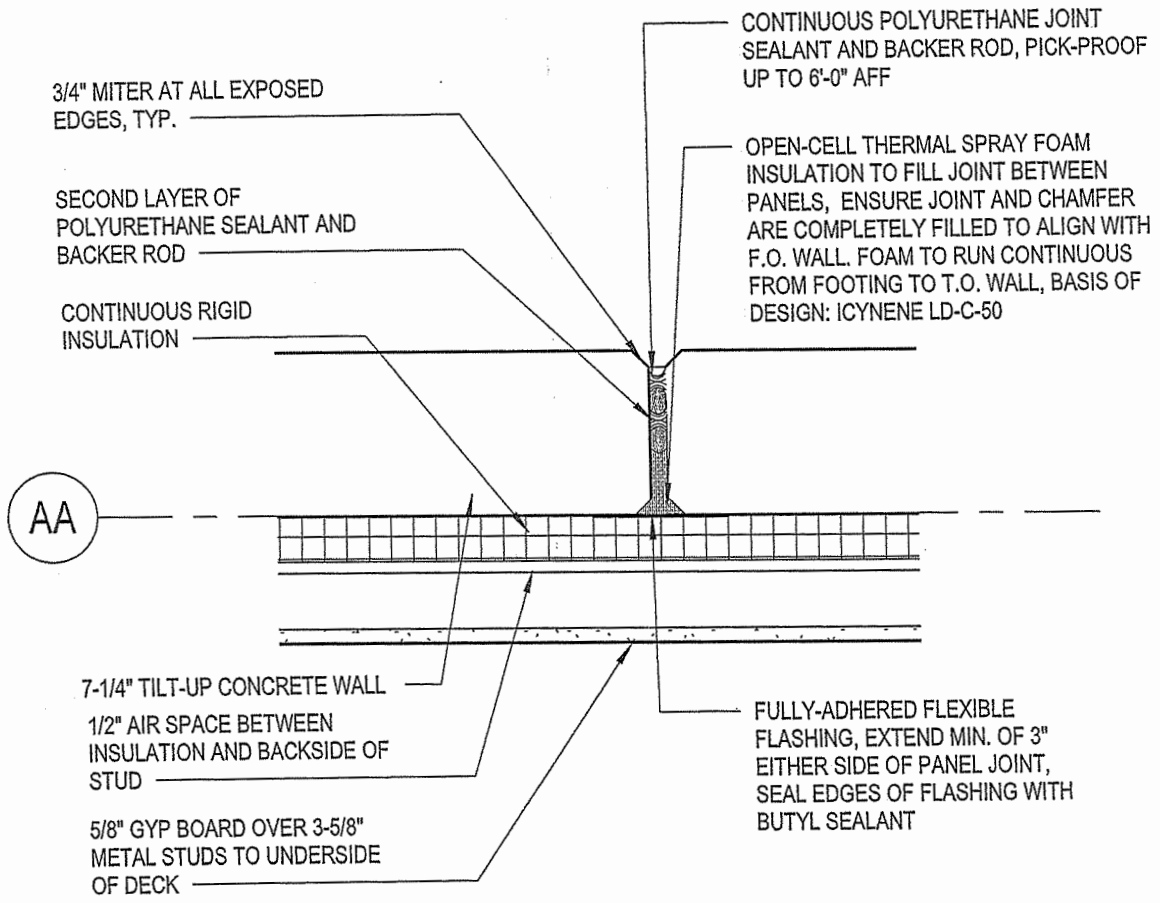
[3] Does not include the native endemic *Spermacoce neoterminalis* .

* Plants added to the FISC List of Invasive Plant Species in 2023 are in bold print.

Gate / Fence Details



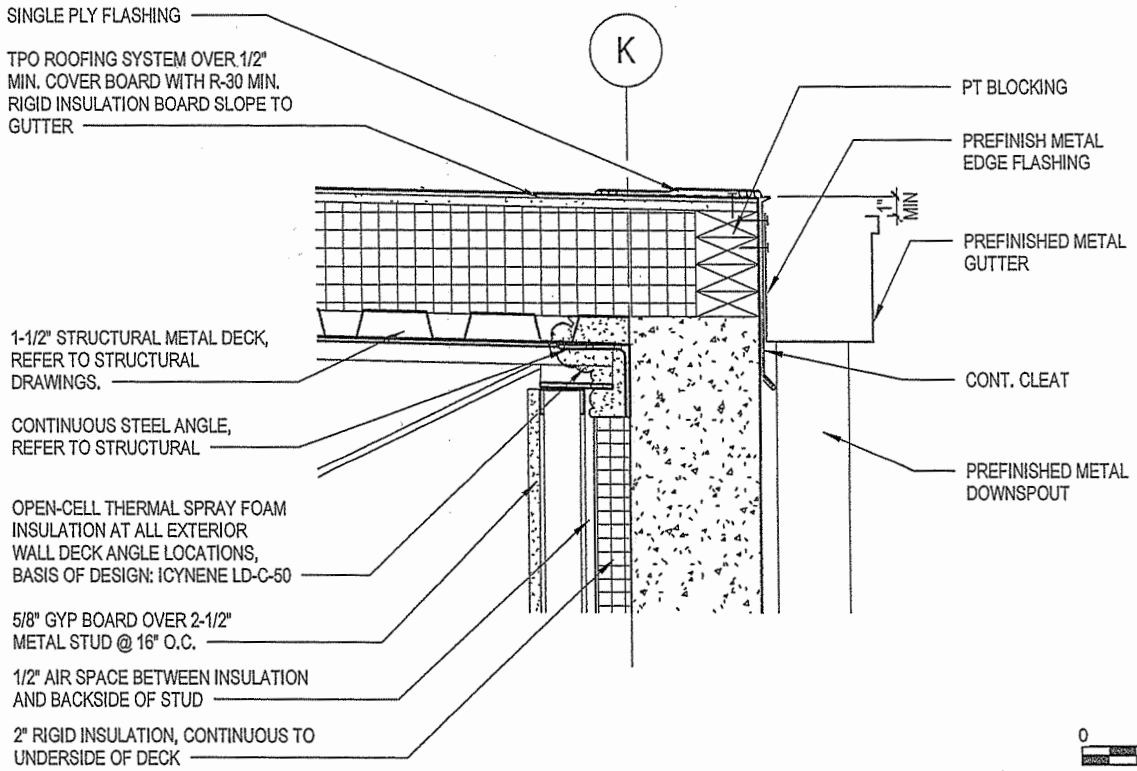

9
TRACK
8 (BELOW 7)
7
8 (BELOW 7)
7
A = CLEAR OPENING
B = POST SPACING C/C
PLAN VIEW
Scale: None
C = OVERALL GATE LENGTH
BARBED WIRE AND ARMS ARE OPTIONAL
G = FABRIC HEIGHT
D = COUNTERBALANCE LENGTH
SECTION VIEW
9
7
7
8
8
GRADE
5"
E = GATE HEIGHT
F = POST HEIGHT
ELEVATION
Scale: None
SECTION
Scale: None
SPHERICAL SUPPORT
BEARINGS
W4 TRUCK
5/8" HANGER BOLT
GUSSETS
HANGER BRACKET
7 GATE HANGER ASSEMBLY
Scale: None
CATCHER
COMPANION
4" O.D. POST
SMOOTH LEADING EDGE. (NO PROTRUSIONS PER ASTM F 2200)
9 CATCH ASSEMBLY
Scale: None
4" O.D. POST
GUIDE WHEEL
UL 325 COMPLIANT WHEEL COVERS (STANDARD)
BOTTOM GUIDE BRACKET
8 BOTTOM GUIDE
Scale: None
TRACK
W4 TRUCK (TYP.)
FABRIC
7
ASTM F2200 COMPLIANT GAP PROTECTORS (STANDARD)
4'-0" MINIMUM
8
5"
ENLARGED SECTION
Scale: None
NOTES:
1. ALL FITTINGS STANDARDLY PROVIDED FOR 4" O.D. POSTS. OTHER SIZES AVAILABLE UPON REQUEST.
2. BARB ARMS (FOR BARBED WIRE) OPTIONAL.
REV. 2 – 10/27/11
TYMETAL CORP.
www.tymetal.com
2549 STATE ROUTE 40
GREENWICH, N.Y. 12834
PH:(800) 328-4283 - FX:(518) 692-9404
HEAVY DUTY CANTILEVER SLIDE GATE

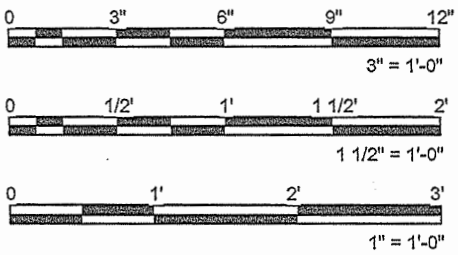


EXTERIOR PLAN DETAIL - TYP. PRECAST PANEL JOINT

11

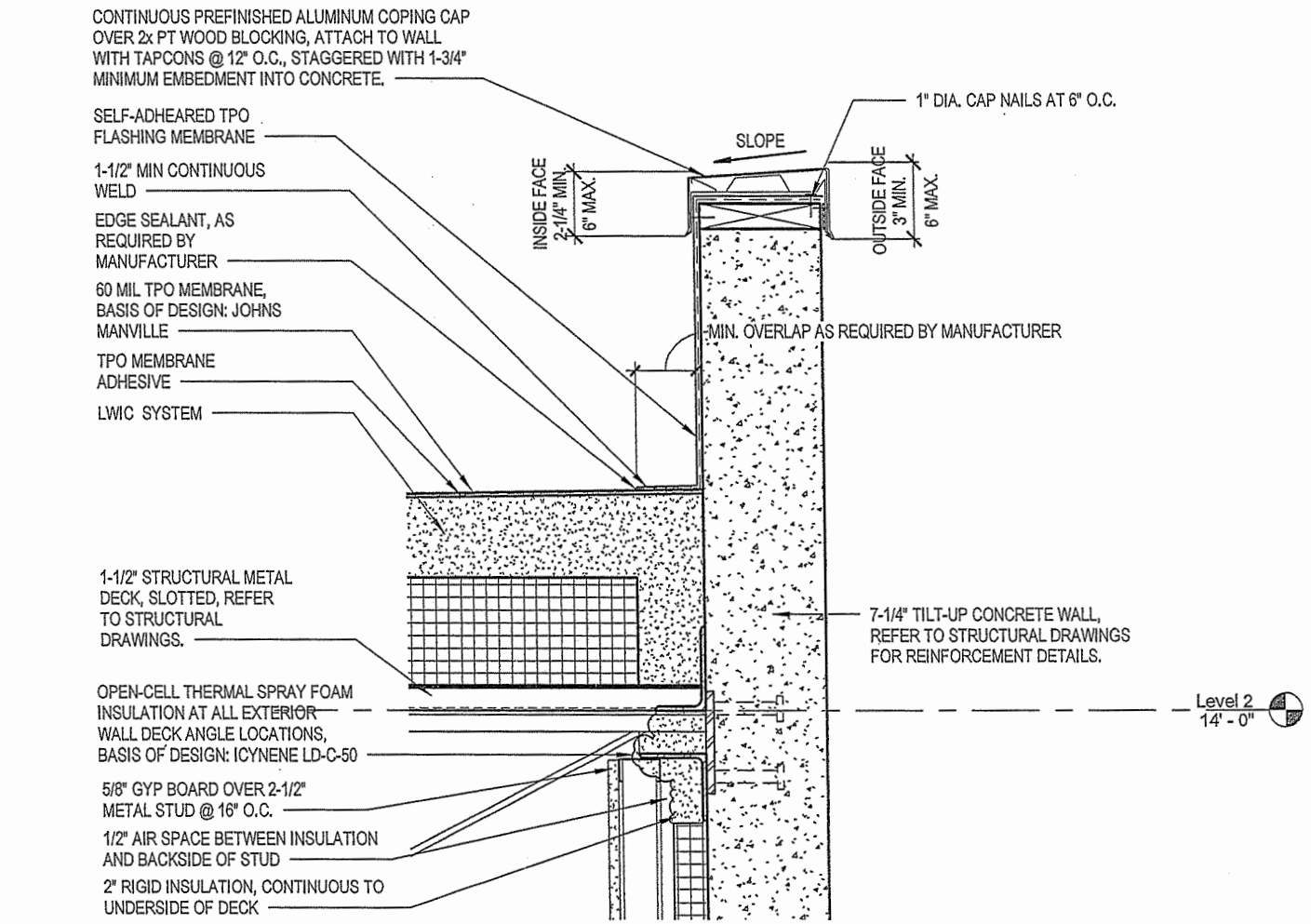
1 1/2" = 1'-0"





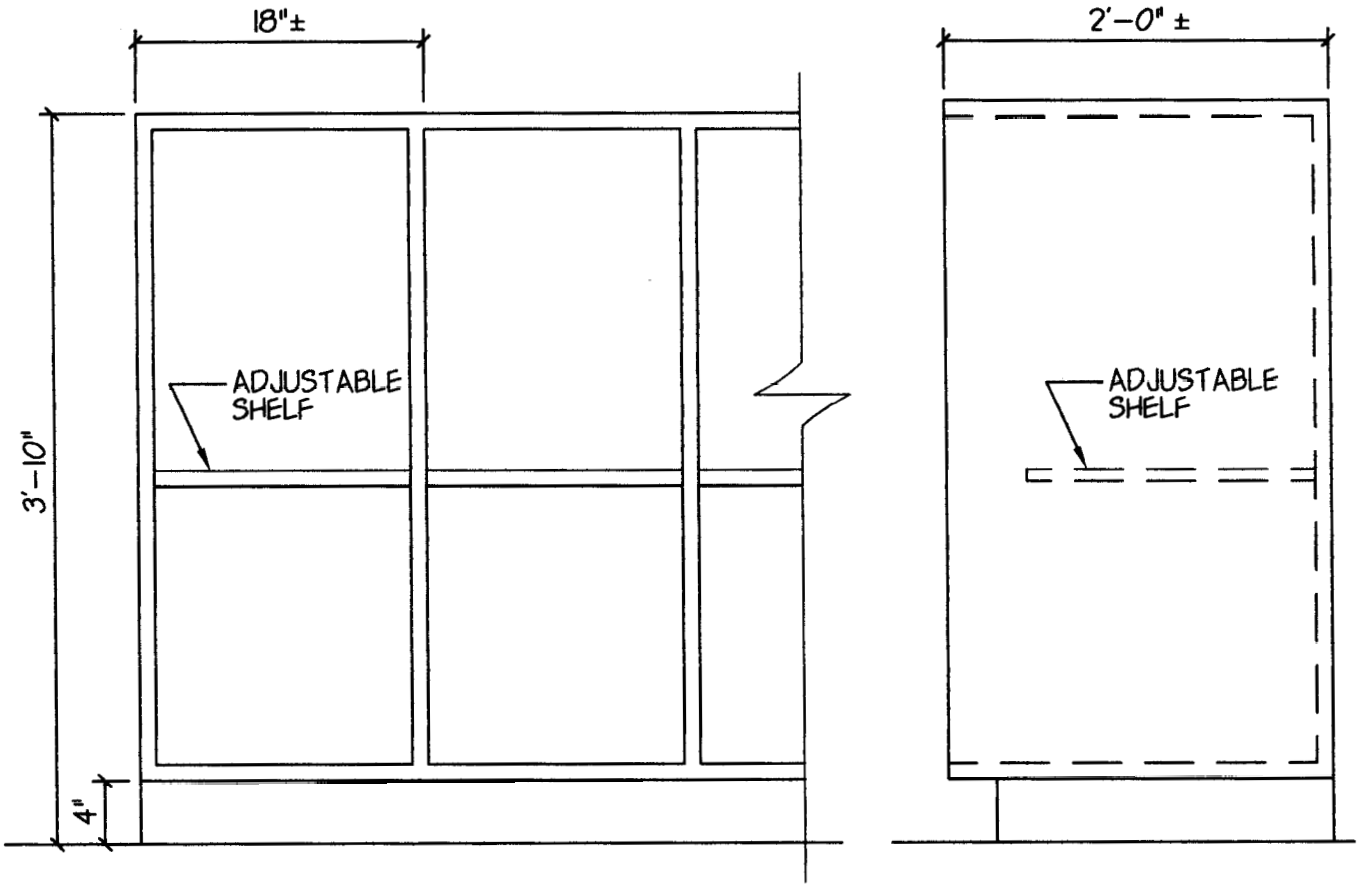
1 ROOF DETAIL - GUTTER @TPO

1 1/2" = 1'-0"



5 TYP. PARAPET - LWIC

1 1/2" = 1'-0"



ELEMENTARY SCHOOL STORAGE "CUBBIES" DETAIL

SCALE: 1"=1'-0"

10/31/07

ALLEGION

SCHLAGE

AD-400

Networked wireless electronic lock



Overview

AD Series electronic locks from Schlage® are designed to be modular and provide more options to choose from, more functionality in the lock and more compatibility with existing access control systems. Its patented modular design allows the lock to **be customized to fit the needs of an application now and changed to meet future** needs without removing it from the door.

To simplify installation, the AD Series combines all the hardware components required at the door for a complete access control system into one integrated design that **includes the electrified lock, credential reader, request-to-exit and request-to-enter** sensors, door position switch, tamper switch and more.

The AD-400 wireless networked lock gives you many of the key benefits of a hardwired access control system — without the wires. This allows you to secure doors **that were traditionally difficult to run wires to in the past and increase the security** throughout your facility.

[1] Check with PACS provider for specific support of mobile credentials in Apple Wallet® and Google Wallet.™
[2] Applies to cylindrical and mortise chassis only.

Encryption key and credential interoperability

- **Hardware configured with our default encryption key or custom key developed by Schlage Custom Encryption Key Service (SCEKS) including NXP, HID®** and NFC
- **Schlage MIFARE® DESFire® and MIFARE Classic®** credentials
- Apple Wallet® and Google Wallet™ NFC student ID and employee badge
- HID iCLASS®, iCLASS SE® and SEOS® plastic and NFC mobile credentials (see page 3)
- Other competitive credentials (see page 3)

Schlage Credential Services

- **CardTrax™ credential format sequencing service offering industry standard formats**
- Custom format development

Features and benefits

- Open architecture platform - integrated into most popular physical access control systems through our **PACS Alliance** program
- Multi-technology credential compatibility includes Schlage MIFARE®, NFC mobile[1], and proximity
  - Optional support for HID® smart and NFC mobile credentials
- Panel interface options ensure seamless communication with the access control system
- Secure encrypted data transmission
- Unique communication protocols won't interfere with other wireless networks
- Wake up on Radio feature enables centralized lockdown in less than 10 seconds while still optimizing battery life up to 2 years
- Non-invasive wireless installation for historic buildings and sensitive areas
- Wireless accessories available for remote, gate, elevator and portable or temporary (mustering) applications

CYBERSECURITY
Learn about Allegion's commitment

Reliable communications

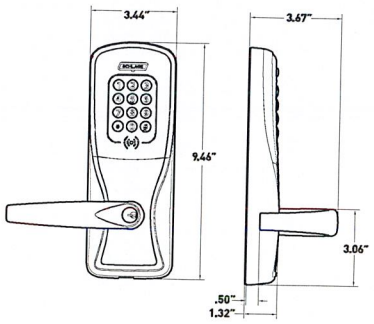
Secure and reliable wireless communication with the Panel Interface Module (PIM) is accomplished using 900 MHz frequency. 900 MHz band enables longer transmission ranges because signal propagation with longer wavelengths travel a greater distance and better penetrate typical building construction **– allowing for simplified system design.**

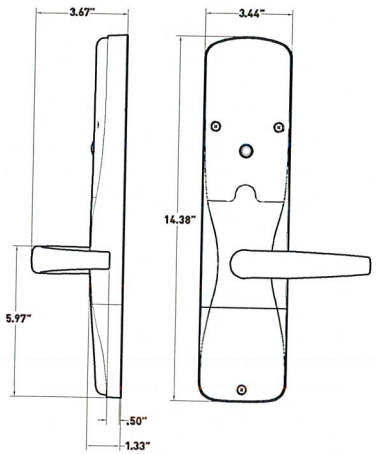
Wake-Up on Radio

This feature enables implementation of wireless locks in applications where centralized lockdown or unlock is required. 'Wake Up on Radio' utilizes patent-pending technology to enable real-time activation at a remote battery-powered wireless lock. The technology is **configurable from 10 to 1 second** increments. When Wake-Up on Radio is used in critical applications, Dynamic Channel Switching should also be enabled.

Panel Interface Module (PIM400)

The PIM400 (sold separately) is required for communication between the AD-400 wireless lock and the access control panel, and can support up to 16 locks depending on your access control system.





AD-400 electronic lock specifications

Modulation	900 MHz spread spectrum, direct sequence, 10 channels
Frequency range	902-928 MHz
Transmission/encryption	AES-128 bit key
Credential verification time	< 1 second[1]
Wake-Up on Radio	Responds to lock/unlock command from host in less than 10 seconds **in battery powered applications (per field configuration)**
Communication range	**Up to 200 ft with obstructions (normal building construction), up to 1000 ft clear line of sight**
RF interference avoidance	**Configurable dynamic channel switching**
Data rate	RF: 40 kbps
Visual/audible communications	**Tri-colored LED's and audible indicators (field configurable)**
System interface	RS-485, Wiegand, or Clock & Data via PIM400 to host
Power supply	4AA, 8AA, 12 VDC or 24 VDC
Voltage range	4 VDC to 26 VDC
Max current requirement	Up to 250 mA
Battery life	Up to 2 yrs with 4AA
Operating temperature	Exterior: -31° to 151°F (-35° to 66°C) Interior: 32° to 120°F (0° to 49°C) (battery)
Operating humidity	0 - 100% non-condensing
Certifications	ANSI/BHMA A156.25; ANSI/BHMA Grade 1; UL 294; ULC S319; UL 10C 3 hour; FCC Part 15; Industry Canada (IC); ADA compliant; Cylindrical and mortise chassis only: TDI DR-464; DR-465; FL12400, FL4613, FL1592, FL13013, FL14482; Mortise chassis only: FL3905
Accessories	Panel Interface Module (PIM400), SUS-A Cable used with SUS Android mobile app, remote antennas for PIM400 to extend range, Dry Contact Relay Board (RLBD) may be required for supervised inputs (Wiegand systems)

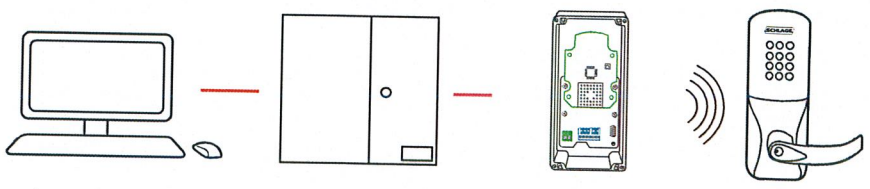
Functions

- Storeroom[2]
- **Office/classroom**[2, 3]
- Privacy[3]
- Apartment[3]

Available status signals

- Lock/unlock status[4]
- Request-to-exit
- Door position
- Mechanical key override[3]
- Deadbolt position[3]
- Interior push button[3]
- Interior cover tamper guard[3]
- Battery status
- Communication status[3]
- Request-to-enter[3]

The AD-400 has a number of field-configurable features and provides opening intelligence through status signals that can be monitored by access control software. Please consult one of our Physical Access Control Software (PACS) providers for details on specific features.



Access control management system — Access Control Panel (ACP) — Panel Interface Module (PIM400) — AD-400 (up to 16 locks)

1 Lock requires less than 100 msec, response time does not include latency time of ACP.
2 **Storeroom and office/classroom functions not available with mortise deadbolt option.**
3 **Consult your Physical Access Control Software (PACS) provider for specific scope of support. Interior pushbutton,** mechanical key override and deadbolt position are only available when linked via PIM400-485.
4 **Software indicates lock/unlock status based on sequence of events, but cannot validate mechanical clutch position unless** monitored on RS-485 connection.

Mechanical specifications

Chassis	Cylindrical	Mortise	Exit trim
Handing	Handed to order, field reversible		
ANSI standard (Meets or exceeds)	A156.25 locked outdoor A156.2 Series 4000 Grade 1	A156.25 locked outdoor A156.13 Series 1000 Grade 1	A156.25 locked outdoor A156.3 Grade 1
Door thickness	1 3/4" standard, 1 3/8" to 2 3/4" optional (available in 1/8" increments)		
Backset	Standard: 2 3/4" Optional: 2 3/8", 3 3/4", 5"	2 3/4" only	**Defined by** exit device
Latch bolt	Standard: 1/2" throw Optional: 3/4" throw	Standard: 3/4" throw Optional: 1" throw on mortise deadbolt	Provided by exit device
Levers	Pressure cast zinc, plated		
Strike	Standard: 1 3/16" lip, ANSI, 1 1/4" x 4 7/8" Optional: Additional **configurations available,** please see price book		Provided by exit device
Cylinder and keys	Schlage® 6-pin Everest 29 S123 keyway Conventional cylinder with two patented keys standard. Additional options available including SFIC, FSIC and competitor brands. See lever and cylinder compatibility data sheet (010432)		

Standard multi-technology reader specification

Credential technologies	Proximity (125 kHz), Smart (13.56 MHz) and Near Field Communication (NFC)
Standards	ISO 15693 ISO 14443
Read range	Proximity: up to 1.25" Smart: up to .75" NFC mobile: mobile device dependent
Proximity credential compatibility	**Compatibility:** Schlage, ISONAS™, HID[4], GE/CASI ProxLite®, AWID® and LenelProx® **Schlage credential style formats:** Clamshell, ISO card, ISO card with magnetic stripe, keyfob, thin keyfob, PVC adhesive disc
Smart credential compatibility	**Secure sector compatibility:** Schlage MIFARE Classic®, Schlage MIFARE Plus®, Schlage MIFARE® DESFire®, PIV and PIV-I[1,2] **CSN only compatibility:** HID iCLASS®, HID iCLASS SE®, Inside Contactless Pico Tag®, MIFARE Classic/Plus/DESFire, ST Microelectronics®, Texas Instruments Tag-It®, Phillips I-Code® **Schlage credential style formats:** Clamshell, ISO card, ISO card with magnetic stripe, keyfob, thin keyfob, wearable wristband, PVC patch
Mobile credential compatibility	Apple Wallet® NFC student ID and employee badge mobile credentials, Google Wallet™ NFC student ID and employee badge mobile credentials[3]
Certifications	FCC, Industry Canada (IC), UL 294
Options	12 button, 3 x 4 matrix backlit keypad

[1] FIPS 201-2 integration ready option available: The AD Series can be used in applications which require approval by the U.S. Federal Government under HSPD-12 for FIPS 201-2 compliance when installed as part of a tested and approved integrated solution. Please see the AD-402 data sheet or AD-302 data sheet for complete details.
[2] **75 bit output format default. Configurable to other output formats.**
[3] **Check with PACS provider for specific support of mobile credentials in Apple Wallet®** and Google Wallet.™
[4] Proximity bit lengths greater than 37 not supported.

Available AD Series reader modules



Multi-technology
- Proximity
- Smart
- NFC mobile

KEYPAD

Multi-technology
- Proximity
- Smart
- NFC mobile

Si with HID support
- Smart
- NFC mobile

KEYPAD

Si with HID support
- Smart
- NFC mobile

Magnetic stripe (insertion)

KEYPAD

Magnetic stripe (insertion)

Magnetic stripe (swipe)

KEYPAD

Magnetic stripe (swipe)

Keypad

AD Series exit trim:

AD-400 exit trim is exclusively compatible with Von Duprin 98/99 and 98/99XP (Rim, Mortise, and SVR. CVC and CVR on metal doors only), Von Duprin 22/22F (Rim and SVR) and Falcon 25 (Rim) exit devices made by Allegion. The proper low current request-to-exit switch (RX-LC or AE) is required.

Part numbers for request-to-exit switch:
- Von Duprin: 050281
- Falcon: 650359

Benefits of AD Series multi-technology readers:

- Reads multiple brands of both proximity (125 kHz) and smart (13.56 MHz) technologies with single reader
- Compatible with NFC mobile credentials on iOS and Android platforms[3]
- Allows facility to migrate to more secure credential technologies over time and as budgets permit

Additional readers

Si option with HID® support

Supports:
- Secure application area of HID iCLASS®, iCLASS SE®, Seos® smart credentials
- iCLASS Standard Key and Elite Keys
- HID NFC mobile credentials
- All Schlage MIFARE® and NFC mobile credentials

Does not support:
- Proximity
- Bluetooth® (BLE) mobile credentials

Magnetic stripe

- Available with choice of insertion or swipe style readers
- **Triple track reader (1, 2 or 3), field configurable**
- ABA, ISO76XX standard

Keypad

- Backlit keypad
- 12 button, 3 x 4 matrix

Ordering information

Available through one of our GSA schedule 84 approved distributions; BAA options available

AD-400-CY-70-MG-SPA-626-P6-S123-RH-4B-13-049-10-025-1 3/4

1 Series	2 Class	3 Chassis	4 Function	5 Reader	6 Lever style	7 Finish	8 Lever cylinder	9 Keying type	10 Handing	11 Battery	12 Backset & latch	13 Strike	14 Door thickness

Selections correspond with the numbers above

Standard options are indicated in bold. See price book for specific configuration options.

3 Chassis

CY	Cylindrical
MS	Mortise
MD	Mortise deadbolt
993R	Exit trim – Rim/CVC/CVR
993S	Exit trim – SVR
993M	Exit trim – mortise
993DT	Non-functioning dummy trim for exit

4 Function

70	Storeroom
50	**Office/classroom**
40	Privacy
60	Apartment

Lock function capabilities are determined by users access control system.

5 Reader

KP	**Keypad**
MG	Magnetic stripe (insertion)
MGK	Magnetic stripe + keypad (insertion)
MS	Magnetic stripe (swipe)
MSK	Magnetic stripe + keypad (swipe)
MT	Multi-technology (125 kHz, 13.56 MHz, NFC)
MTK	Multi-technology + keypad (125 kHz, 13.56 MHz, NFC)
FMK	FIPS 201-1 compliant multi-technology + keypad (125 kHz and 13.56 MHz)
Si	HID support
SiK	HID support + keypad
DT	Dummy trim

6 Lever

ATH	Athens
BRK	Boardwalk
BRW	Broadway
LAT	Latitude
LON	Longitude
RHO	Rhodes
SPA	Sparta
TLR	Tubular

Available with tactile warning options.

7 Finish

626	**Satin chrome**
605	Bright brass
606	Satin brass
612	Satin bronze
619	Satin nickel
625	Bright chrome
643e	Aged bronze
626AM	Satin chrome antimicrobial

8 Lever cylinder type

P6 **Schlage 6-pin Conventional key-in-lever cylinder**

See price book for other SFIC, FSIC and less cylinder options available. Compatible with Schlage®, Sargent®, Corbin Russwin, Medeco® and Yale®.

9 Keyway type

S123 **Everest 29**

See price book for other available keyway options including restricted keyways in Primus XP high security cylinders and master keying.

10 Handing

XP at Exterior Gates Only

RH	**Right handed**
LH	**Left handed**

Field reversible.

11 Battery

4B	**4AA**
8B	8AA

12 Backset & latch or armor front

Cylindrical

13-247 **2 3/4" backset, deadlatch, square corner, 1 1/8" x 2 1/4"**

Mortise

09-663 **Armor front, 1 1/4" wide, square corner**

See price book for mortise deadbolt and other backset and latch options or armor front options.

13 Strike

Cylindrical

10-025 **1 3/16" lip, ANSI, no box, 1 1/4" x 4 7/8"**

Mortise

10-072 **1 3/16" lip, 1 1/4" x 4 7/8" square corner, box**

See price book for other available strikes.

14 Door thickness

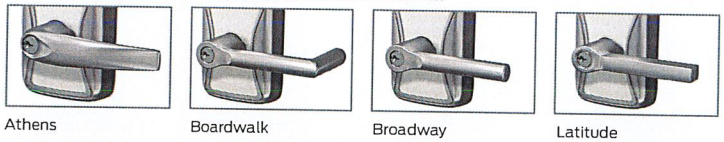
1 3/4"

Other thicknesses available between 1 3/8" and 2 3/4"

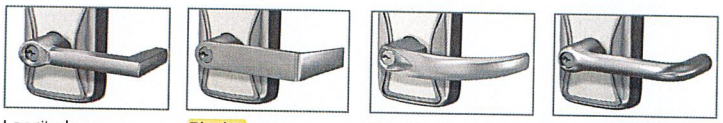
See price book for details.

Lever styles

Conventional cylinders shown, SFIC and FSIC also available.



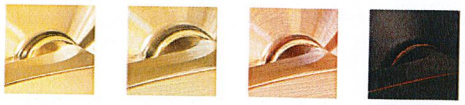
Athens | Boardwalk | Broadway | Latitude



Longitude | Rhodes | Sparta | Tubular

Finishes

Warm tone finishes



605 Bright brass | 606 Satin brass | 612 Satin bronze | 643e Aged bronze

Cool tone finishes



619 Satin nickel | 625 Bright chrome | 626 Satin chrome | 626AM Satin chrome with antimicrobial

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About Allegion

Allegion (NYSE: ALLE) is a global pioneer in seamless access, with leading brands like CISA®, Interflex®, LCN®, Schlage®, SimonsVoss® and Von Duprin®. Focusing on security around the door and adjacent areas, Allegion secures people and assets with a range of solutions for homes, businesses, schools and institutions.

For more, visit **www.allegion.com**

ALLEGION

KRYPTONITE ■ LCN ■ SCHLAGE ■ STEELCRAFT ■ VON DUPRIN

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004446, Rev. 02/23

www.allegion.com/us

ALLEGION

SCHLAGE

NDE

Mobile enabled wireless cylindrical lock



Overview

The Schlage® NDE mobile enabled wireless cylindrical lock is designed to affordably extend electronic access control deeper into the building beyond traditional perimeter and high security openings and offers users the security and convenience of using a smart device to gain access.[1]

NDE wireless locks simplify installation by combining the lock, credential reader, door position sensor and request-to-exit switch all in one unit, eliminating the need to install additional components or run wires to each opening.

The open architecture design of NDE allows it to be managed by Allegion software or to be integrated into popular physical access control systems through our PACS **Alliance program. This enables customers to choose the system that best fits their** requirements now and move to a networked solution at any time.

NDE suites with all Schlage ND levers and keyways to provide attractive options to meet the requirements of nearly any environment.

[1] Use of mobile credential is dependent on availability of compatible mobile credential.
[2] Integration with NDE mobile enabled wireless locks required for operation. For information on PACS providers and their capabilities, visit us.allegion.com/alliances.

Encryption key and credential interoperability

- **Hardware configured with our default encryption key or custom key developed by Schlage Custom Encryption Key Service (SCEKS) including NXP, HID®** and NFC
- **Schlage MIFARE® DESFire® and MIFARE Classic®** credentials
- Apple Wallet® and Google Wallet™ student ID and employee badge
- HID iCLASS®, iCLASS SE® and SEOS® plastic and NFC mobile credentials (see page 3)
- Schlage Mobile Bluetooth® Credential
- Other competitive credentials (see page 3)

Schlage Credential Services

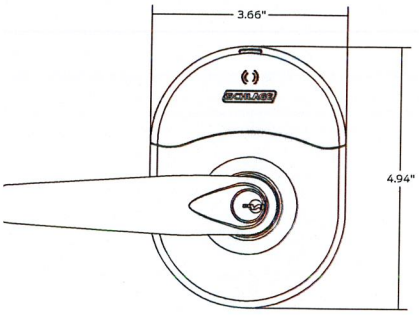
- **CardTrax™ credential format sequencing service offering industry standard formats**
- Custom format development

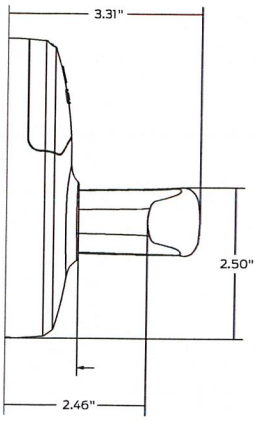
Features and benefits

- NDE includes interior push button with **indication for storeroom, office, privacy, and** apartment applications
- Standard multi-technology credential compatibility includes Schlage MIFARE®, Bluetooth® and NFC mobile[1], and proximity
  - Optional support for HID® smart and NFC mobile credentials
- **Wireless configuration from connected** smartphones and tablets
- Built-in Wi-Fi® enables automated daily updates **sent directly from host software**
- Networked real-time communication available with the ENGAGE Gateway and PACS provider solutions[2]
- **Ideal for office and suite entries, conference** rooms, common area doors, resident units, and sensitive storage areas
- Fits mechanical ND door prep with minor **modifications**
- Weather resistant design
- **Lever handing is field reversible in seconds; no** tools required
- Up to 2 years of battery life

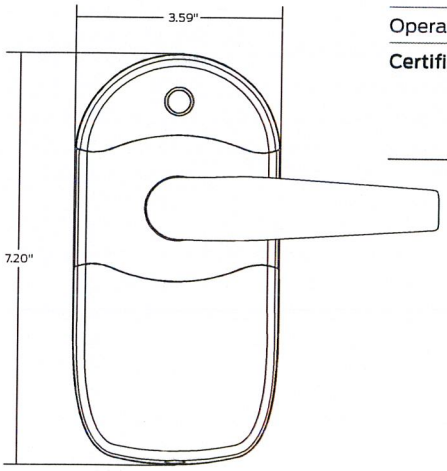
CYBERSECURITY
Learn about Allegion's commitment

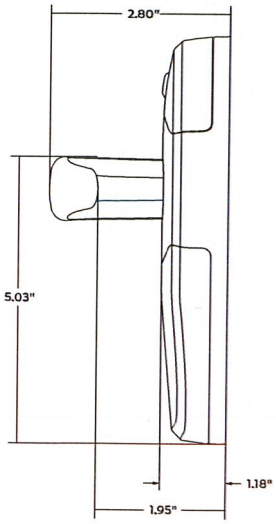
Exterior of the lock





Interior of the lock





NDE wireless lock specifications

Users	Up to 5,000[1]
Audits	Up to 2,000[2]
Credential verification time[3]	**Smart and proximity: ≤ 1 second** Mobile: mobile device dependent
Visual communications	LED (red, amber, green)
Audible communications	**Audible indicator (field configurable)**
Communication standards	▪ 2.4 GHz Wi-Fi® (IEEE 802.11b/g/n) ▪ WPA2, WPA, WEP, 802.1x ▪ Bluetooth® low energy (version 4.2) ▪ Transport Layer Security (TLS) version 1.2 ▪ Advanced Encryption Standard (AES), 256-bit
Gateway communication range	Up to 30' in typical building environments. A detailed site survey is recommended using the ENGAGE Test Kit (TKE). Reference ENGAGE™ Gateway Data Sheet for additional detail.
Wake-Up on Radio	Responds to command from host in less than 5 seconds when linked to ENGAGE Gateway (requires PACS provider system)
Data rate	54 Mbps
Connectivity options	▪ Bluetooth via mobile device (send updates at the lock) ▪ Wi-Fi access point (automatic daily updates[7]) ▪ No-Tour[8] ▪ ENGAGE Gateway (real-time communication) – RS-485 to ACP or IP to host
Battery life[4]	Uses 4 AA batteries Up to 2 years
Operating temperature	Exterior: -31° to 151°F (-35° to 66°C) Exterior: -13° to 151°F (-25° to 66°C) (NDEBSi) Interior: 32° to 120°F (0° to 49°C) (battery)
Operating humidity	0 - 100% non-condensing
Certifications	ANSI/BHMA A156.25 locked outdoor; ANSI/BHMA A156.2, Series 4000, Grade 1; UL 294; ULC 60839; UL 10C 3 hour; CSA C22.2 No. 205-M1983; FCC Part 15; Industry Canada (IC); ADA compliant; ICC ANSI A117.1; FL1592, FL10356, FL12400, FL14482

Functionality

- Storeroom
- Office
- Privacy
- Apartment

NDE comes with Vandlgard® standard

Available status signals

- Request-to-exit
- Door position
- Interior cover tamper[5]
- Magnetic tamper
- Battery status
- Lock/unlock status[6]
- Communication status[5]

Flexible solutions

NDE wireless locks offer **connectivity options to fit** any size budget or business.

1. Mobile
2. No-Tour[8]
3. Wi-Fi
4. Real-time with ENGAGE Gateway

ENGAGE™ cloud-based web and mobile applications

ENGAGE™ TECHNOLOGY

The ENGAGE cloud-based web and mobile applications deliver simple and convenient site set-up with basic access management for users and locks. Please refer to the ENGAGE data sheet for additional detail.

Download on the App Store

ANDROID APP ON Google play

1 Maximum database storage capacity of lock. Can vary by **access control software database capacity.**

2 Maximum audit storage capacity of lock. Can vary by **access control software audit storage capacity.**

3 Response time does not include latency time of host when linked with an ENGAGE Gateway or when using No-Tour.

4 Assuming indoor application, default settings, 80 actuations, interior LED disabled and one Wi-Fi update per day.

5 **Consult your access control software provider for specific** scope of support.

6 **Software indicates lock/unlock status based on** sequence of events.

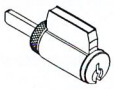
7 When using the ENGAGE cloud-based access **management software.**

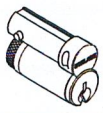
8 With MT20W and smart credential or mobile credential **(consult your access control software provider for specific support).**

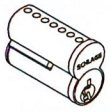
Mechanical specifications

Chassis	Cylindrical
Handing	Right-handed from factory. Field reversible in seconds (no tools required).
ANSI standard (Meets or exceeds)	ANSI/BHMA A156.25-2013 (Indoor/Outdoor) ANSI/BHMA A156.2-2011, Series 4000, Grade 1
Door thickness	Standard: 1 5/8" - 2" (41mm - 51mm) only
Backset	Standard: 2 3/4" (70mm) Optional: 2 3/8" (60mm)
Latch bolt	Standard: 1/2" (12mm) throw deadlatch (steel) Optional: 3/4" **(19mm) throw anti-friction deadlatch available for pairs of fire doors**
Levers	Pressure cast zinc, plated
Strike	Standard: 1 3/16" lip, ANSI, DPS, 1 1/4" x 4" Optional: Additional strikes, lip lengths and ANSI strike box available
Cylinder and keys	Standard: Schlage 6-pin Everest 29 S123 keyway Conventional cylinder with two patented keys. Additional keying options available, including interchangeable cores, competitor brands, master keying and grand master keying.

Compatible cylinders







Schlage key systems	Conventional key-in-lever cylinder	Full size interchangeable core	Small format interchangeable core
With cylinder	P, P6, Z	M, R	G7
Construction core	----	T	H
Disposable core	----	----	BDC
Less cylinder	L	J	B
Compatible cylinders listed above are supported on all levers.			
SARGENT® - Less cylinder	L-SAR	J-SAR	----
Corbin Russwin® - Less cylinder	L-CO6	J-CO6, J-CO7	----
Yale® - Less cylinder	----	J-YA6, J-YA7	----
Medeco - Less cylinder	----	J-MED	----
Six-pin competitive cylinders listed above are supported on ATH, SPA, RHO, and TLR levers. Seven-pin competitive cylinders listed above are supported on RHO levers.			

Standard multi-technology reader specifications

Credential technologies	Proximity (125 kHz), Smart (13.56 MHz), Bluetooth Low Energy (BLE) (2.4 GHz), and Near Field Communication (NFC)
Standards	ISO standard 15693 and ISO 14443
Maximum read range	Proximity: up to 1.25" Smart: up to .75" Bluetooth Low Energy: up to 15' NFC: mobile device dependent
Proximity credential compatibility	**Compatibility:** Schlage®, ISONAS™, HID[5], GE/CASI ProxLite®, AWID® and LenelProx® **Schlage credential style formats:** Clamshell, ISO card, ISO card with magnetic stripe, keyfob, thin keyfob, PVC adhesive disc
Smart credential compatibility[1]	**Secure sector compatibility:** Schlage MIFARE Classic®, Schlage MIFARE Plus®, Schlage MIFARE® DESFire® **CSN only compatibility:** HID iCLASS®, HID iCLASS SE®, Inside Contactless Pico Tag®, MIFARE Classic/Plus/DESFire[2], ST Microelectronics®, Texas Instruments Tag-It®, Phillips I-Code® **Schlage credential style formats:** Clamshell, ISO card, ISO card with magnetic stripe, keyfob, thin keyfob, wearable wristband, PVC adhesive patch
Mobile credential compatibility[3]	Schlage Mobile Bluetooth® credential[4], integrated PACS/Proptech mobile credential with Bluetooth, Apple Wallet® NFC student ID and employee badge mobile credentials, Google Wallet™ NFC student ID and employee badge mobile credentials

Mobile enabled retrofit kits

Retrofit kits are available allowing the upgrade of legacy NDE locks to the mobile enabled model, adding the ability to read Bluetooth® mobile credentials and new functions supported by an interior push button with indication.

- Kit includes: Interior escutcheon with PCBA and DPS with lead (requires **modified door prep)***

* Kit requires reuse of exterior of lock, lock chassis, existing levers/spring cages, battery cover, mounting screws and interior mounting plate.

Si option with HID® support

Supports:

- Secure application area of HID iCLASS®, iCLASS SE®, Seos® and MIFARE® DESFire® EV1 smart credentials
- iCLASS Standard Key and Elite Keys
- HID NFC mobile credentials
- All Schlage MIFARE and mobile credentials

Does not support:

- Proximity
- HID Seos Bluetooth mobile

[1] No-Tour applications require a 1K Byte Schlage MIFARE smart credential.
[2] Specify CE-5901-0402 for ISONAS credential parity.
[3] Dependent on PACS /Proptech provider capabilities. Visit us.allegion.com/alliances for more information.
[4] Supported through ENGAGE web and mobile apps, ISONAS Pure Access Cloud.
[5] Proximity bit lengths greater than 37 not supported

Ordering information

NDEB - P6 -SPA-626

Series	Lever cylinder	Outside		Inside		Backset and latch	Strike	Dim	Additional details
		Lever style	Finish	Lever style	Finish				
1	2	3	4	5	6	7	8	9	10

Selections correspond with the numbers above

Standards options are indicated in bold. See price book for specific configuration options.

1	Series
NDEB	Mobile enabled cylindrical with **configurable functions**
NDEBSi	Mobile enabled cylindrical with **configurable functions that** supports HID® credential types

Prior to ordering, confirm support with preferred PACS provider, visit us.allegion.com/alliances.

2	Lever cylinder type
P6	Schlage 6-pin Conventional key-in-lever

See price book for other SFIC, FSIC and Less Cylinder options available. Supports Schlage, SARGENT®, Corbin, Russwin®, and Yale®.

3/5	Lever style
ATH	Athens*
BRK	Boardwalk*
BRW	Broadway*
LAT	Latitude
LON	Longitude
OME	Omega
RHO	Rhodes*
SPA	Sparta*
TLR	Tubular*

* Available with tactile surface.

4/6	Finish
626	Satin chrome
605	Bright brass
606	Satin brass
612	Satin bronze
619	Satin nickel
622	Matte black
625	Bright chrome
643e	Aged bronze
626AM	Satin chrome antimicrobial

7	Backset and latch
13-247	**2 3/4" backset, deadlatch, square corner, 1 1/8" x 2 1/4"**

See price book for additional backset and latch options.

8	Strike
47267101	**1 1/4" x 4 7/8" with 1 3/16" lip (NDEB)**

See price book for other available strikes.

9	Dim (strike lip length)
138	**1 3/8" non-standard lip length**

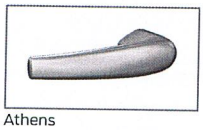
Enter only for non-standard strike lip lengths. See price book for other available non-standard lengths.

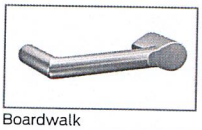
10	Additional details
S123	**Everest 29**

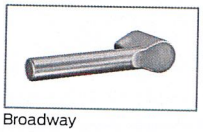
See price book for other available keyway options including restricted keyways in Primus XP high security cylinders and master keying.

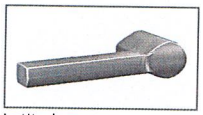
Lever styles

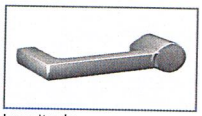
The NDE shares the same levers as the Schlage ND mechanical lock. All NDE locks feature mechanical key override; standard, SFIC or FSIC options available.

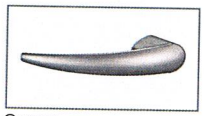

Athens

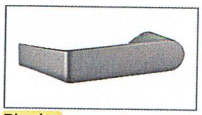

Boardwalk

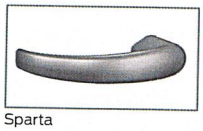

Broadway

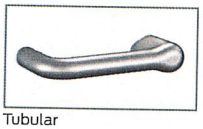

Latitude


Longitude


Omega


Rhodes


Sparta


Tubular

Finishes

Warm tone finishes

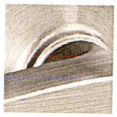

605
Bright brass


606
Satin brass


612
Satin bronze

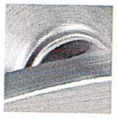

643e
Aged bronze

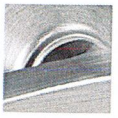
Cool tone finishes


619
Satin nickel


622
Matte black


625
Bright chrome


626
Satin chrome


626AM
Satin chrome antimicrobial

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About Allegion

Allegion (NYSE: ALLE) is a global pioneer in seamless access, with leading brands like CISA®, Interflex®, LCN®, Schlage®, SimonsVoss® and Von Duprin®. Focusing on security around the door and adjacent areas, Allegion secures people and assets with a range of solutions for homes, businesses, schools and institutions.

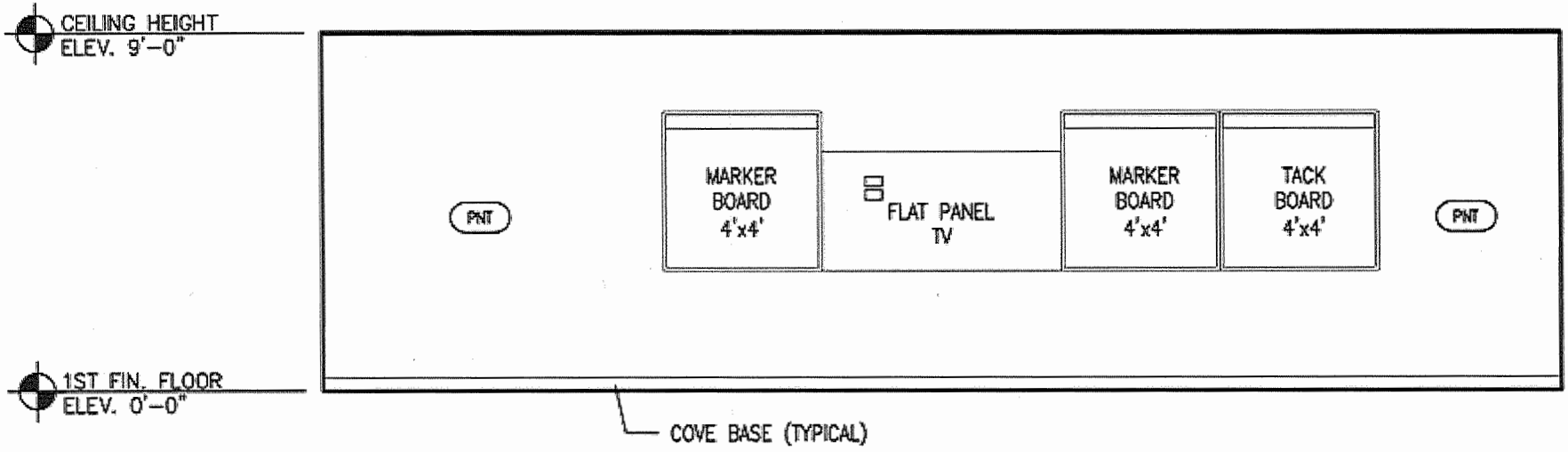
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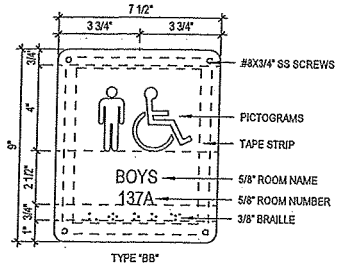
TYPICAL CLASSROOM TEACHING WALL



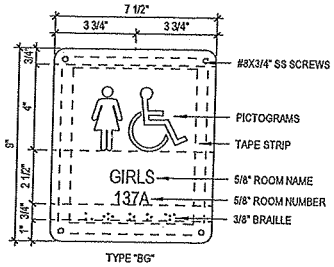
NOTES:

1. **ELEM - 30" Above Finish Floor**
2. **MIDDLE & HIGH - 36" Above Finish Floor**
3. **MUSIC ROOMS - Markerboard with Staff Lines (only one)**

INTERIOR SIGNAGE REQUIREMENTS



TYPE "BB"



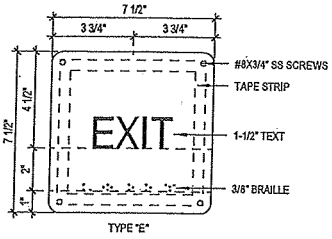
TYPE "BG"

INTERIOR SIGN NOTES:

1. ALL TEXT TO BE UPPER CASE SANS SERIF WITH GRADE 2 BRAILLE.
2. CHARACTER WIDTH-HEIGHT RATIO BETWEEN 3:5 TO 1:1 AND STROKE-WIDTH RATIO BETWEEN 1:5 TO 1:10.
3. CHARACTERS ARE RAISED 1/32" WITH HEIGHT 5/8" MINIMUM AND 2" MAXIMUM.
4. BORDER DIMENSIONS OF PICTOGRAMS SHALL BE 6" MINIMUM IN HEIGHT.
5. SIGN BACKGROUNDS SHALL BE NON-GLARE AND CONTRAST WITH CHARACTERS IN LIGHT/DARK OR DARK/LIGHT COMBINATION.
6. PROVIDE SIGN BACKER FOR ALL GLASS MOUNTED SIGNAGE.
7. REFERENCE FURNITURE PLANS FOR SIGN TYPE LOCATIONS. PROVIDE SIGNAGE APPROPRIATE FOR OUTDOOR CONDITIONS FOR SIGNS TAGGED ON BUILDING EXTERIOR.
8. SIGNS WITHOUT BRAILLE SHOULD BE MOUNTED AS BEST FITS THE AMOUNT OF AVAILABLE WALL SPACE WHEN ADJACENT TO ACCESSIBLE SIGNS; COORDINATE LOCATION WITH OTHER ITEMS OR DEVICES ON WALL.
9. SIGNS CONTAINING TACTILE CHARACTERS SHALL BE LOCATED SO THAT A CLEAR FLOOR SPACE OF 18" MIN. BY 18" MIN. CENTERED ON THE TACTILE CHARACTERS IS PROVIDED BEYOND THE ARC OF ANY DOOR SWING BETWEEN THE CLOSED POSITION AND 45 DEGREE OPEN POSITION.
10. REFERENCE SHEET A-573 FOR MONUMENTAL SIGN DETAILS.

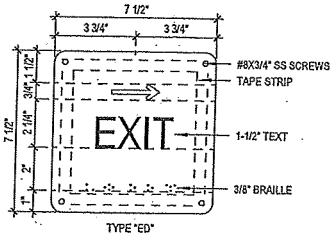
SANS SERIF

ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890

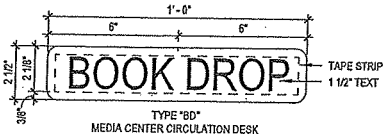


TYPE "E"

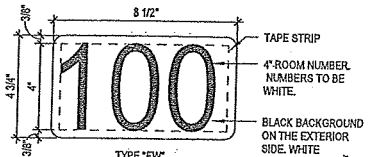
1006.3.4 Exit stair door or tactile signage.
Tactile signage stating "EXIT" and complying with ICC/ANSI A117.1, American National Standard for Accessible and Usable Buildings and Facilities, shall be installed adjacent to the latch side of the door 60 inches (1524 mm) above the finished floor to the center line of the sign.



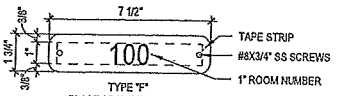
TYPE "ED"



TYPE "BD"
MEDIA CENTER CIRCULATION DESK



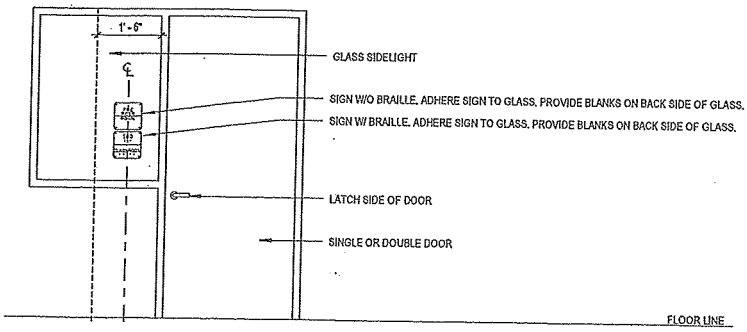
TYPE "FW"
PLACE ON THE INTERIOR SIDE, AT CENTERLINE, OF ALL EXTERIOR CLASSROOM WINDOWS. NUMBERS TO BE FACING THE EXTERIOR.

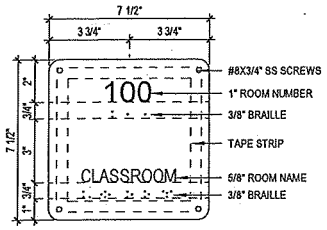


TYPE "F"
PLACE ABOVE DOOR, ON CENTERLINE OF FRAME, OF EVERY INTERIOR DOOR

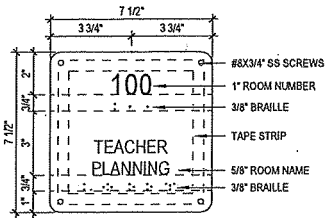
DOOR WITH GLASS

POSITION ON LATCH SIDE OF DOOR OR NEAREST ADJACENT WALL, AT A 9" MIN. DISTANCE FROM THE CENTER OF THE RAISED CHARACTERS ON THE SIGN.

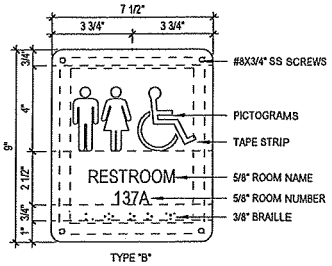




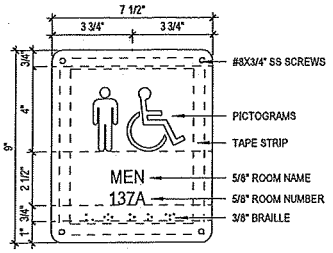
TYPE "A"
SHORT ROOM NAME



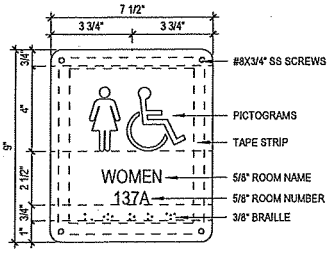
TYPE "AB"
LONG ROOM NAME



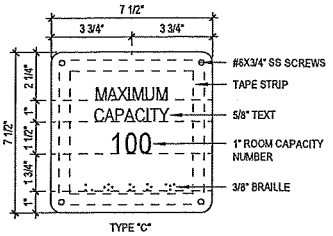
TYPE "B"



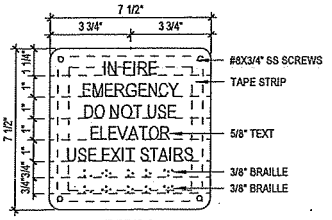
TYPE "BM"



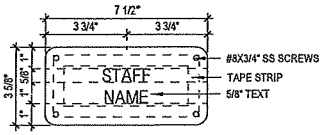
TYPE "BW"



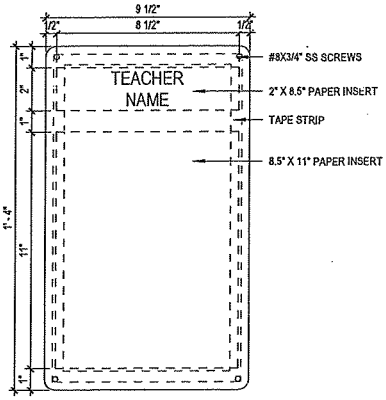
TYPE "C"



TYPE "EL"



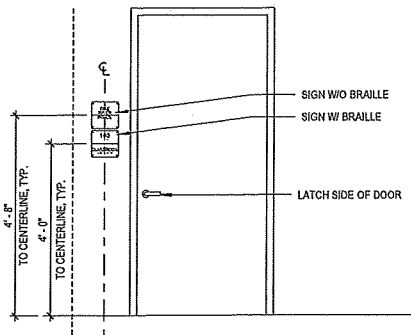
TYPE "G"
*REMOVABLE STAFF NAME PLATE TO BE LOCATED DIRECTLY ABOVE THE ROOM SIGNAGE IN THE ADMINISTRATION SUITE.



TYPE "H"
PROVIDE AT ALL CLASSROOMS AND RESOURCE ROOMS

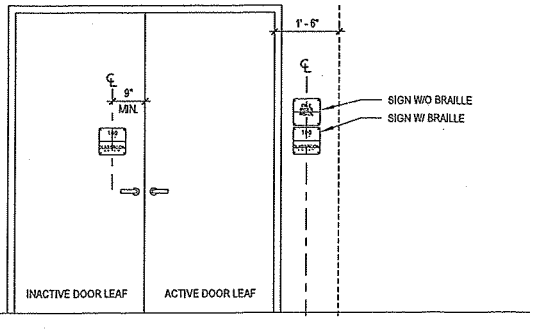
SINGLE DOOR

POSITION ON LATCH SIDE OF DOOR OR NEAREST ADJACENT WALL, AT A 9" MIN. DISTANCE FROM THE CENTER OF THE RAISED CHARACTERS ON THE SIGN.



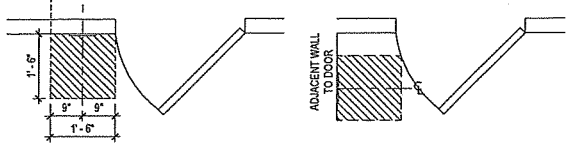
DOUBLE DOOR

POSITION ON THE INACTIVE DOOR LEAF. IF TWO ACTIVE LEAFS, SIGN GOES TO THE RIGHT OF THE RIGHT HAND DOOR. IF NO SPACE THERE, THEN ON NEAREST ADJACENT WALL.



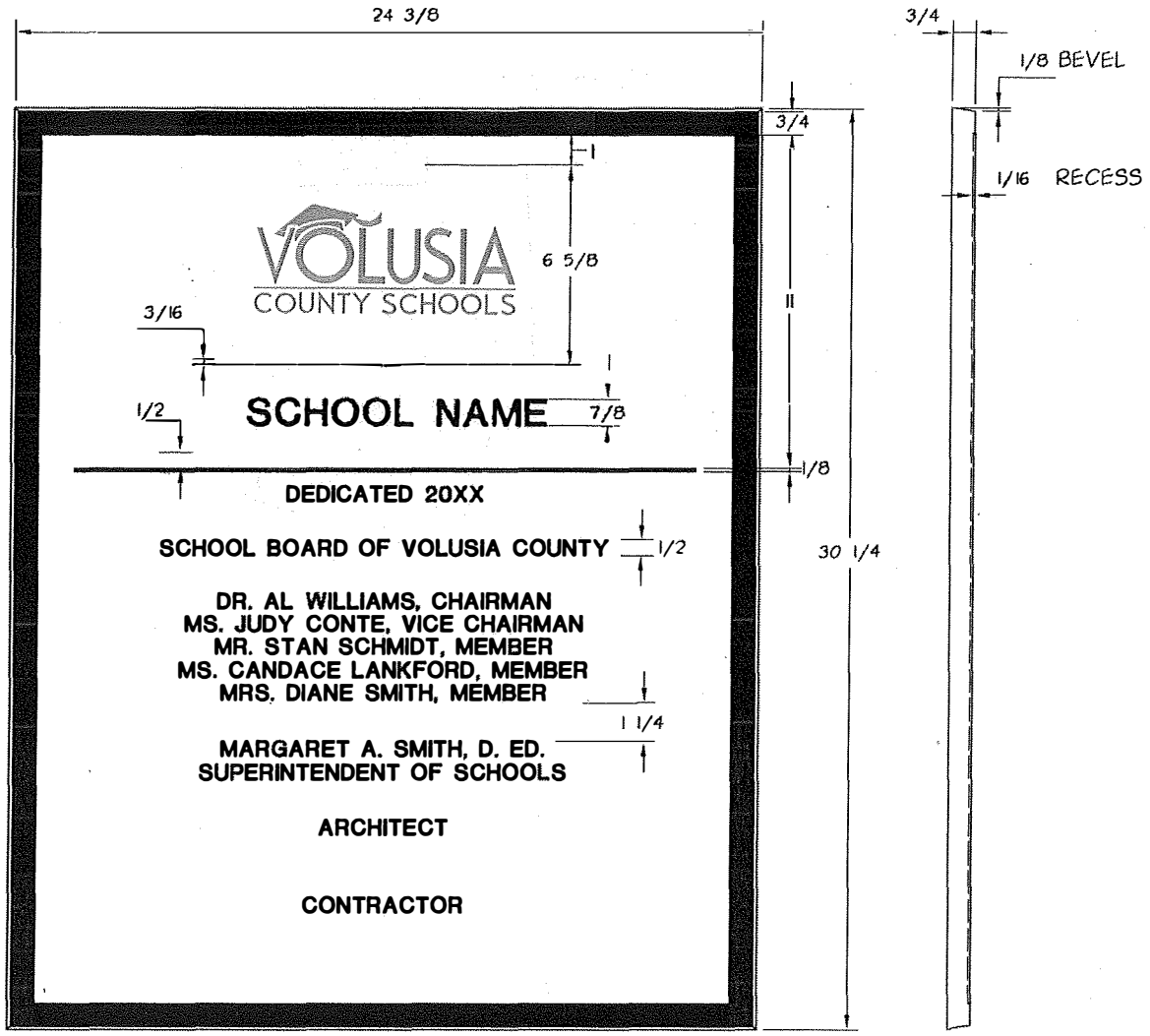
MINIMUM CLEARANCE ZONE

SIGNS CONTAINING TACTILE CHARACTERS SHALL BE LOCATED SO THAT A CLEAR FLOOR SPACE OF 18" MIN BY 18" MIN, CENTERED ON THE TACTILE CHARACTERS, IS PROVIDED BEYOND THE ARC OF ANY DOOR SWING BETWEEN THE CLOSED POSITION AND 45 DEGREE OPEN POSITION.



BRONZE DEDICATION PLAQUE

EXAMPLE



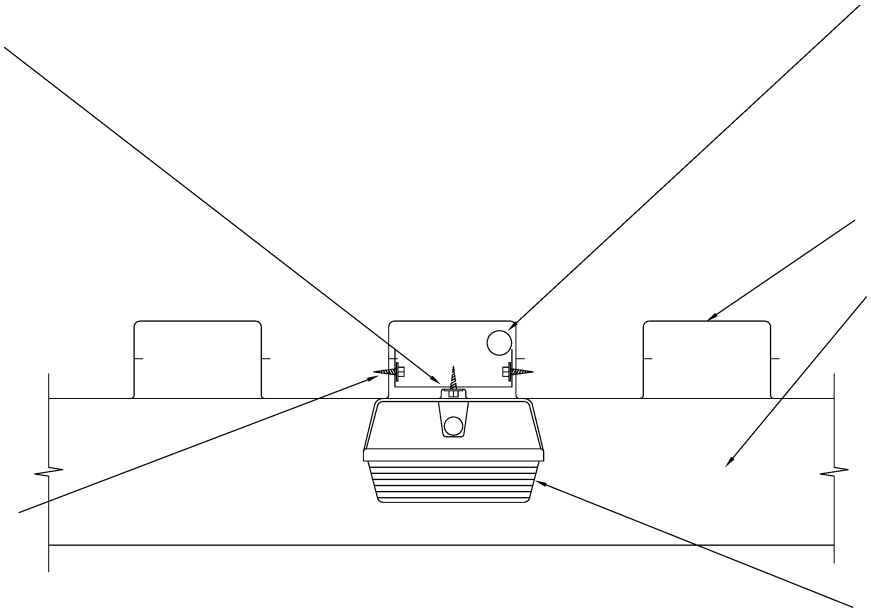
Material:	Bronze / Aluminum Bronze Plated	Finish:	Satin
Size:	24" W x 30" H	Color:	Black
Mount:	Flush	Background:	Standard Pebble
		Boarder:	Raised

Note: School Board Members shall be listed as they were at the time the project was approved.

ALUMINUM CANOPY LIGHT FIXTURE INSTALLATION

6" Long Extruded Aluminum Channel Brackets to Match Canopy Decking by Canopy Mnfr. for mounting Light Fixtures. (2) per Fixture. Attach to Sides of Decking Flutes as High as possible w/ Self-Tapping Stn. Stl. Neoprene Gasketed Fasteners. Do Not Penetrate Top or Bottom of Deck.

Silicone Sealant @ Outer Deck Side of all Fasteners.



Sched 40 PVC Electrical Conduit, Clips and Fittings @ Canopies. Fasten Clips w/ Self-Tapping Stn. Stl. Neoprene Gasketed Fasteners to Sides of Deck Flutes as High as Possible.

Extruded Alum Decking.

Extruded Aluminum Beam Beyond.

Exterior Industrial Light Fixture w/ Non-Metallic Fiberglass Housing for High-Humidity Exterior Applications. Provide Factory Threaded Hubs @ Each End of Fixture Housing. Attach Only to Alum Canopy Brackets as Shown w/ Stainless Steel Brackets and Hardware by Light Fixture Manufacturer.

1 **DETAIL** TYPICAL ALUMINUM CANOPY LIGHT FIXTURE

SCALE: 1 1/2"" = 1'-0"

TYPICAL SURGE PROTECTION DEVICE PANEL INSTALLATION

1. Use a voltmeter to check all voltages to ensure correct SPD
2. If unit has Flush Mount option refer to Flush Mount Installation Instructions following
3. If SPD has Dry Contact pre-plan its installation
4. Remove power for panel. Confirm panel is deenergized.
5. Identify breaker location and SPD location
6. Remove an appropriately sized knockout from panel
7. Mount SPD, use appropriate weatherproofing equipment as needed
8. Connect conductors as appropriate – short and straight as possible (Note that Hi-Legs are Phase B)
9. Label or mark conductors as appropriate (neutral: white, ground: green, energized: black, hi-leg: orange)
10. Make sure system is bonded per NEC® and is clear of hazards or faults before energizing (N-G bonding not per NEC® will fail SPDs: #1 cause of SPD failures)
11. Energize and confirm proper operation of indicators and/or options

A sealing O-ring is provided. SPD can be chase-nipple mounted (nut is provided).

Note that any conduits must be installed correctly.

Figure 5: Typical Panel Installation

