PART 6: TECHNICAL STANDARDS

6.1 Technical Notes (in CSI category sequence):

02 00 00 Existing Conditions (reserved)
03 00 00 Concrete (reserved)
04 00 00 Masonry (reserved)
05 00 00 Metals (reserved)
06 00 00 Wood, Plastics, and Composites (reserved)
07 00 00 Thermal and Moisture Protection (reserved)
08 00 00 Openings (reserved)
09 00 00 Finishes (reserved)
10 00 00 Specialties (reserved)
11 00 00 Equipment (reserved)
12 00 00 Furnishings (reserved)
13 00 00 Special Construction (reserved)

14 00 00 Conveying Equipment
   14 06 00 Schedules for Conveying Equipment
   14 06 20 Schedules for Elevators
      14 06 20.13 Elevator Equipment Schedule
   14 08 00 Commissioning of Conveying Equipment
   14 08 20 Commissioning of Elevators
   14 20 00 Elevators
   14 21 00 Electric Traction Elevators
      14 21 13 Electric Traction Freight Elevator
         • No MRLs
   14 24 00 Hydraulic Elevators
   14 24 13 Hydraulic Freight Elevators
   14 24 23 Hydraulic Passenger Elevators
   14 27 00 Custom Elevator Cabs and Doors
      14 27 13 Custom Elevator Cab Finishes
      14 27 16 Custom Elevator Doors
   14 28 00 Elevator Equipment and Controls
      • Non-proprietary – College’s elevator consultant must be part of contract
      14 28 16 Elevator Controls
   14 28 19 Elevator Equipment
      14 28 19.13 Elevator Safety Equipment
      14 28 19.16 Elevator Hoistway Equipment

21 00 00 Fire Suppression (reserved)
22 00 00 Plumbing (reserved)

23 00 00 Heating, Ventilating, and Air Conditioning (HVAC) (reserved)
   23 01 00 Operation and Maintenance of HVAC Systems
23 01 10 Operation and Maintenance of Facility Fuel Systems
   • Confirm need – only one MC building has such a system
23 01 20 Operation and Maintenance of HVAC Piping and Pumps
23 01 30 Operation and Maintenance of HVAC Air Distribution
   23 01 30.51 HVAC Air-Distribution System Cleaning
   • Never
23 01 50 Operation and Maintenance of Central Heating Equipment
23 01 60 Operation and Maintenance of Central Cooling Equipment
23 01 60.71 Refrigerant Recovery/Recycling
23 01 70 Operation and Maintenance of Central HVAC Equipment
23 01 80 Operation and Maintenance of Decentralized HVAC Equipment
23 01 90 Diagnostic Systems for HVAC

23 05 00 Common Work Results for HVAC
23 05 05 Selective Demolition for Heating, Ventilating, and Air Conditioning (HVAC)
23 05 13 Common Motor Requirements for HVAC Equipment
   • Premium Efficiency, Inverter Duty
23 05 16 Expansion Fittings and Loops for HVAC Piping
23 05 17 Sleeves and Sleeve Seals for HVAC Piping
   • Link Seal
23 05 19 Meters and Gages for HVAC Piping
   • Pressure gauges, isolation valves, snubbers
   • Temperature gauges, self-powered solar digital, Weiss
23 05 23 General-Duty Valves for HVAC Piping
   • ¾”-2” – full port ball valve
   • 2.5 – larger – high performance, full lug body butterfly – Dezurik, Keystone
23 05 29 Hangers and Supports for HVAC Piping and Equipment
   • Vibration isolation
23 05 33 Heat Tracing for HVAC Piping
23 05 48 Vibration and Seismic Controls for HVAC
   • Analysis
23 05 53 Identification for HVAC Piping and Equipment
23 05 93 Testing, Adjusting, and Balancing for HVAC

23 06 00 Schedules for HVAC
23 06 10 Schedules for Facility Fuel Service Systems
23 06 20 Schedules for HVAC Piping and Pumps
   23 06 20.13 Hydronic Pump Schedule
      • Bell & Gossett
      • See College Standard Base Mounted Pump Configuration
      • Flex Connectors -
23 06 30 Schedules for HVAC Air Distribution
   23 06 30.13 HVAC Fan Schedule
      • Fan Wall
   23 06 30.16 Air Terminal Unit Schedule
      • Non-fan powered, hydronic re-heat, Titus or Nailor
   23 06 30.19 Air Outlet and Inlet Schedule
      • Coanda effect diffusers
23 06 30.23 HVAC Air Cleaning Device Schedule
- **MERV 13 Camfil with local Magnahelic & BAS monitoring.**

23 06 50 Schedules for Central Heating Equipment
23 06 50.13 Heating Boiler Schedule
- *New boilers?*

23 06 60 Schedules for Central Cooling Equipment
- **Carrier**
- **Frick**
- **Tecochill**
23 06 60.13 Refrigerant Condenser Schedule
23 06 60.16 Packaged Water Chiller Schedule
- **Carrier**
- **Frick**
- **Tecochill**

23 06 70 Schedules for Central HVAC Equipment
23 06 70.13 Indoor, Central-Station Air-Handling Unit Schedule
23 06 70.16 Packaged Outdoor HVAC Equipment Schedule

23 06 80 Schedules for Decentralized HVAC Equipment
23 06 80.13 Decentralized Unitary HVAC Equipment Schedule
- **RTUs – TMI, etc.**
- **Mitsubishi splits or VRF systems.**
23 06 80.16 Convection Heating and Cooling Unit Schedule
23 06 80.19 Radiant Heating Unit Schedule
- *Underfloor – Taco Xpump Block, Rehau*

**23 07 00 HVAC Insulation**
23 07 13 Duct Insulation
- *See duct spec.*
23 07 16 HVAC Equipment Insulation
23 07 19 HVAC Piping Insulation
- **Interior - Fiberglas, vapor barrier, formed PVC jacket**
- **Exterior - Fiberglas, vapor barrier, formed Aluminum jacket**

**23 08 00 Commissioning of HVAC**

**23 09 00 Instrumentation and Control for HVAC**
23 09 13 Instrumentation and Control Devices for HVAC
- *Reliable as represented by Pritchett Controls*
23 09 13.13 Actuators and Operators
- **Belimo**
- **Belimo Energy Valve**
23 09 13.23 Sensors and Transmitters
23 09 13.33 Control Valves
- **Belimo**
- **Belimo Energy Valve**
23 09 13.43 Control Dampers
- **Stainless steel lip and edge seals**
PART 6 – TECHNICAL NOTES AND STANDARDS

- Oil-lite Brass Bushings
- Opposing blade

23 09 23 Direct-Digital Control System for HVAC

23 09 23.11 Control Valves
- Belimo
- Belimo Energy Valves

23 09 23.12 Control Dampers
- Stainless steel lip and edge seals
- Oil-lite Brass Bushings
- Opposing blade
- Ruskin

23 09 23.13 Energy Meters
- Onicon-BACNet

23 09 23.14 Flow Instruments
  a. Onicon

23 09 93 Sequence of Operations for HVAC Controls

23 09 93.11 Sequence of Operation for HVAC DDC

23 10 00 Facility Fuel Systems

23 11 00 Facility Fuel Piping

23 12 00 Facility Fuel Pumps

23 13 00 Facility Fuel-Storage Tanks

23 20 00 HVAC Piping and Pumps

23 21 00 Hydronic Piping and Pumps

23 21 13 Hydronic Piping
- Underground Hydronic Piping
  Permapipe
- Aboveground Hydronic Piping
  Carbon Steel, Schedule 40, A53 Grade B, Welded no Victaulic for dynamic systems.

23 21 16 Hydronic Piping Specialties

23 21 23 Hydronic Pumps
- In-Line Centrifugal Hydronic Pumps
  Bell & Gossett
- Base-Mounted, Centrifugal Hydronic Pumps
  Bell & Gossett
- Vertical-Mounted, Double-Suction Centrifugal Hydronic Pumps
  Bell & Gossett
- Vertical-Turbine Hydronic Pumps
- Automatic Condensate Pump Units
  Little Giant

23 22 00 Steam and Condensate Piping and Pumps

23 23 00 Refrigerant Piping

23 24 00 Internal-Combustion Engine Piping

23 25 00 HVAC Water Treatment
23 25 13 Water Treatment for Closed-Loop Hydronic Systems
  • Campus Provider
  • WSSC/COR sub-meter
  • College sub-meter connected to DDC.
23 25 33 HVAC Makeup-Water Filtration Equipment

23 30 00 HVAC Air Distribution

23 31 00 HVAC Ducts and Casings
23 31 13 Metal Ducts
23 31 13.13 Rectangular Metal Ducts
  • Duct-in-Duct Configuration, only allowed by approval
23 31 13.16 Round and Flat-Oval Spiral Ducts
  • Duct-in-Duct Configuration – This is the preferred duct
23 31 13.19 Metal Duct Fittings
  • Factory installed, Flanged and bolted, NO slip connections.
23 31 16 Nonmetal Ducts
  • Limited to 6’ or less on discharge of terminal devices.
  • Interior liner and exterior insulation individually banded to hard duct.

23 32 00 Air Plenums and Chases

23 33 00 Air Duct Accessories
23 33 13 Dampers
  23 33 13.13 Volume-Control Dampers
  • Ruskin
  23 33 13.16 Fire Dampers
  23 33 13.19 Smoke-Control Dampers
  23 33 13.23 Backdraft Dampers
  • Actuated dampers only, no gravity.
23 33 19 Duct Silencers
23 33 23 Turning Vanes
  • Airfoil vanes only
23 33 33 Duct-Mounting Access Doors
  • Ductmate/ductmate style – non hinge -
23 33 38 Duct Security Bars
23 33 46 Flexible Ducts
  • Limited to 6’ or less on discharge of terminal devices.
  • Interior liner and exterior insulation individually banded to hard duct.
23 33 53 Duct Liners
  • No exposed duct liners

23 34 00 HVAC Fans

23 35 00 Special Exhaust Systems
23 35 16 Engine Exhaust Systems
  • Low sound silencers
23 36 00 Air Terminal Units
23 36 13 Constant-Air-Volume Units
23 36 16 Variable-Air-Volume Units
  • Titus, Nailor, non-fan powered, hydronic re-heat all boxes.

23 37 00 Air Outlets and Inlets
23 37 13 Diffusers, Registers, and Grilles
  • Titus - Coanda
23 37 13.43 Security Registers and Grilles
23 37 23.13 HVAC Gravity Dome Ventilators
  • Actuated dampers only, no gravity.
23 37 23.16 HVAC Gravity Louvered-Penthouse Ventilators
  • Actuated dampers only, no gravity.
23 37 23.19 HVAC Gravity Upblast Ventilators
  • Actuated dampers only, no gravity.

23 38 00 Ventilation Hoods
23 40 00 HVAC Air Cleaning Devices
23 43 00 Electronic Air Cleaners
23 50 00 Central Heating Equipment
23 51 00 Breechings, Chimneys, and Stacks

23 52 00 Heating Boilers
23 52 16 Condensing Boilers
  23 52 16.13 Stainless-Steel Condensing Boilers
  • Fulton

23 53 00 Heating Boiler Feedwater Equipment
23 54 00 Furnaces
23 55 00 Fuel-Fired Heaters
23 56 00 Solar Energy Heating Equipment

23 57 00 Heat Exchangers for HVAC
  23 57 19.13 Plate-Type, Liquid-to-Liquid Heat Exchangers
  23 57 19.16 Shell-Type, Liquid-to-Liquid Heat Exchangers

23 60 00 Central Cooling Equipment

23 61 00 Refrigerant Compressors
23 61 13 Centrifugal Refrigerant Compressors
  23 61 13.13 Non-Condensable Gas Purge Equipment
23 61 16 Reciprocating Refrigerant Compressors
23 61 19 Scroll Refrigerant Compressors
23 61 23 Rotary-Screw Refrigerant Compressors

23 62 00 Packaged Compressor and Condenser Units
23 62 13 Packaged Air-Cooled Refrigerant Compressor and Condenser Units
23 62 23 Packaged Water-Cooled Refrigerant Compressor and Condenser Units
23 62 46 Packaged Variable-Refrigerant-Flow Air-Conditioning Systems

23 63 00 Refrigerant Condensers
23 63 13 Air-Cooled Refrigerant Condensers
23 63 23 Water-Cooled Refrigerant Condensers
23 63 33 Evaporative Refrigerant Condensers

23 64 00 Packaged Water Chillers
23 64 16 Centrifugal Water Chillers
   • See CT building – (high efficiency at lower loads)
23 64 16.16 Water-Cooled Centrifugal Water Chillers
23 64 26 Rotary-Screw Water Chillers
23 64 26.16 Water-Cooled, Rotary-Screw Water Chillers

23 65 00 Cooling Towers
23 65 14 Induced-Draft Cooling Towers
   • BAC only
23 65 14.14 Open-Circuit, Induced-Draft Crossflow Cooling Towers

23 70 00 Central HVAC Equipment

23 71 00 Thermal Storage
23 71 19 Ice Storage
   • BAC only
23 71 19.16 External Ice-on-Coil Thermal Storage

23 72 00 Air-to-Air Energy Recovery Equipment
23 72 13 Heat-Wheel Air-to-Air Energy-Recovery Equipment
23 72 16 Heat-Pipe Air-to-Air Energy-Recovery Equipment

23 73 00 Indoor Central-Station Air-Handling Units
23 73 13 Modular Indoor Central-Station Air-Handling Units
23 73 23 Custom Indoor Central-Station Air-Handling Units
23 73 33 Indoor Indirect Fuel-Fired Heating and Ventilating Units
   23 73 33.13 Indoor Indirect Oil-Fired Heating and Ventilating Units
   23 73 33.16 Indoor Indirect Gas-Fired Heating and Ventilating Units
23 73 39 Indoor, Direct Gas-Fired Heating and Ventilating Units

23 74 00 Packaged Outdoor HVAC Equipment
23 74 13 Packaged, Outdoor, Central-Station Air-Handling Units
23 74 16 Packaged Rooftop Air-Conditioning Units
   23 74 16.11 Packaged, Small-Capacity, Rooftop Air-Conditioning Units
   23 74 16.12 Packaged, Intermediate-Capacity, Rooftop Air-Conditioning Units
   23 74 16.13 Packaged, Large-Capacity, Rooftop Air-Conditioning Units
23 74 23 Packaged, Outdoor, Heating-Only Makeup-Air Units
   23 74 23.13 Packaged, Direct-Fired, Outdoor, Heating-Only Makeup-Air Units
   23 74 23.16 Packaged, Indirect-Fired, Outdoor, Heating-Only Makeup-Air Units
23 74 33 Dedicated Outdoor-Air Units
23 75 00 Custom-Packaged Outdoor HVAC Equipment
23 75 13 Custom-Packaged, Outdoor, Central-Station Air-Handling Units
23 75 16 Custom-Packaged, Rooftop Air-Conditioning Units
23 75 23 Custom-Packaged, Outdoor, Heating and Ventilating Makeup-Air Units
23 75 33 Custom-Packaged, Outdoor, Heating and Cooling Makeup Air-Conditioners

23 76 00 Evaporative Air-Cooling Equipment

23 80 00 Decentralized HVAC Equipment

23 81 00 Decentralized Unitary HVAC Equipment
23 81 13 Packaged Terminal Air-Conditioners
   23 81 13.11 Packaged Terminal Air-Conditioners, Through-Wall Units
   23 81 13.12 Packaged Terminal Air-Conditioners, Freestanding Units
   23 81 13.13 Packaged Terminal Air-Conditioners, Outdoor, Wall-Mounted Units
23 81 16 Room Air-Conditioners
23 81 19 Self-Contained Air-Conditioners
   23 81 19.13 Small-Capacity Self-Contained Air-Conditioners
   23 81 19.16 Large-Capacity Self-Contained Air-Conditioners
23 81 23 Computer-Room Air-Conditioners
   23 81 23.11 Small-Capacity, Computer-Room Air-Conditioners, Floor Mounted Units
   23 81 23.12 Large-Capacity, Computer-Room Air-Conditioners, Floor-Mounted Units
   23 81 23.13 Computer-Room Air-Conditioners, Ceiling Mounted Units
   23 81 23.14 Computer-Room Air-Conditioners, Console Units
   23 81 23.16 Computer-Room Air-Conditioners, Rack Mounted, Space-Cooling Units
   23 81 23.18 Computer-Room, Rack-Cooling Equipment
23 81 26 Split-System Air-Conditioners
   23 81 26.13 Small-Capacity Split-System Air-Conditioners
   23 81 26.16 Large-Capacity Split-System Air-Conditioners
23 81 29 Variable Refrigerant Flow HVAC Systems
23 81 43 Air-Source Unitary Heat Pumps
23 81 46 Water-Source Unitary Heat Pumps
23 81 49 Ground-Source Unitary Heat Pumps

23 82 00 Convection Heating and Cooling Units
23 82 19 Fan Coil Units
23 82 26 Induction Units
23 82 29 Radiators
23 82 33 Convectors
23 82 36 Finned-Tube Radiation Heaters
23 82 39 Unit Heaters
   23 82 39.13 Cabinet Unit Heaters
   23 82 39.16 Propeller Unit Heaters
   23 82 39.19 Wall and Ceiling Unit Heaters
23 82 41 Water-to-Water Heat Pumps

23 83 00 Radiant Heating Units
23 84 00 Humidity Control Equipment
23 84 19 Desiccant Dehumidification Units

25 00 00 Integrated Automation (reserved)

26 00 00 Electrical Standards
26 01 00 Operation and Maintenance of Electrical Systems
26 01 20 Operation and Maintenance of Low-Voltage Electrical Distribution
26 01 26 Maintenance Testing of Electrical Systems
26 01 30 Operation & Maintenance of Facility Electrical Power Generating & Storing Equipment
26 01 40 Operation and Maintenance of Electrical Protection Systems
   26 01 40.13 Operation and Maintenance of Lightning Protection Systems
26 01 50 Operation and Maintenance of Lighting
   26 01 50.51 Luminaire Relamping
   26 01 50.81 Luminaire Replacement

26 05 00 Common Work Results for Electrical
26 05 05 Selective Demolition for Electrical
26 05 19 Low-Voltage Electrical Power Conductors and Cables
   • Copper – no Aluminum
   • No taps/splices – all homeruns
26 05 19.13 Undercarpet Electrical Power Cables
26 05 19.23 Manufactured Wiring Assemblies
26 05 23 Control-Voltage Electrical Power Cables
26 05 26 Grounding and Bonding for Electrical Systems
   • Building steel is not a path to ground
   • All buses, copper or other, (e.g., used for IT) etc. shall have grounds running from the bus bar or other grounding connection point to the building ground in the building’s electrical room.
26 05 29 Hangers and Supports for Electrical Systems
   • In general: trapeze for conduit
26 05 33 Raceway and Boxes for Electrical Systems
   • All steel
   • No wireways
   • Busways and ?????OK with approval.
26 05 33.13 Conduit for Electrical Systems
   • Service entrance to panels – threaded IMC
   • Panels to classroom/office/room interiors (generally to center of space) EMT with compression fittings only
   • No quick connect
   • ¾ inch minimum
26 05 33.16 Boxes for Electrical Systems
   • Steel
26 05 33.23 Surface raceways for Electrical Systems
   • Wiremold
26 05 36 Cable Trays for Electrical Systems
26 05 39 Underfloor Raceways for Electrical Systems
26 05 43 Underground Ducts and Raceways for Electrical Systems
26 05 44 Sleeves and Sleeve Seals for Electrical Raceways and Cabling
26 05 46 Poles for Electrical Systems
26 05 48 Vibration and Seismic Controls for Electrical Systems
   26 05 48.16 Seismic Controls for Electrical Systems
26 05 53 Identification for Electrical Systems
   • Phenolic style with engraved name with rivet of SS screw attachment. Adhesive
     only when rigid not physically capable of application or desired to use
26 05 73 Power System Studies
   26 05 73.13 Short-Circuit Studies
      • Required
   26 05 73.16 Coordination Studies
      • Required
   26 05 73.19 Arc-Flash Hazard Analysis
      • Required
   26 05 73.23 Load Flow Studies
   26 05 73.26 Stability Studies
   26 05 73.29 Harmonic-Analysis Studies
26 05 76 Photometric Studies
26 05 83 Wiring Connections

26 06 00 Schedules for Electrical
26 06 20 Schedules for Low-Voltage Electrical Distribution
   26 06 20.13 Electrical Switchboard Schedule
   26 06 20.16 Electrical Panelboard Schedule
   26 06 20.19 Electrical Motor-Control Center Schedule
   26 06 20.23 Electrical Circuit Schedule
   26 06 20.26 Wiring Device Schedule
26 06 30 Schedules for Facility Electrical Power Generating and Storing Equipment
26 06 40 Schedules for Electrical Protection Systems
26 06 50 Schedules for Lighting
   26 06 50.13 Lighting Panelboard Schedule
   26 06 50.16 Lighting Fixture Schedule

26 08 00 Commissioning of Electrical Systems

26 09 00 Instrumentation and Control for Electrical Systems
26 09 13 Electrical Power Monitoring
   • At service entrance and additional as required
26 09 15 Peak Load Controllers
26 09 16 Electrical Controls and Relays
26 09 19 Enclosed Contactors
26 09 23 Lighting Control Devices
26 09 26 Lighting Control Panel boards
   • Main breaker
   • 20A min circuit brkr
   • Bolt on Circuit brkr
   • Circuit brkr AIC match main (fully rated)
26 09 33.13 Multichannel Remote-Controlled Dimmers
- In general we avoid complex lighting control (digital)
26 09 33.16 Remote-Controlled Dimming Stations
26 09 36 Modular Dimming Controls
- 26 09 36.13 Manual Modular Dimming Controls
- 26 09 43.13 Digital-Network Lighting Controls
  - Existing BAS system
- 26 09 43.16 Addressable Luminaire Lighting Controls
  - Try to avoid
- 26 09 43.19 Wireless Network Lighting Controls
  - Try to avoid
- 26 09 43.23 Relay-Based Lighting Controls
26 09 61 Theatrical Lighting Controls

26 20 00 Low-Voltage Electrical Distribution

26 21 00 Low-Voltage Electrical Service Entrance
- 26 21 16 Low-Voltage Underground Electrical Service Entrance
  - Spares are preferred

26 22 00 Low-Voltage Transformers
- 26 22 13 Low-Voltage Distribution Transformers
  - K=All copper
  - Meet DOE 2016 standard
  - 85° C temp rise

26 23 00 Low-Voltage Switchgear
- 26 23 13 Paralleling Low-Voltage Switchgear

26 24 00 Switchboards and Panelboards
- 26 24 13 Switchboards
  - Eaton
  - Square D
  - Include metering
  - Probably 2-3 MDP blanks
- 26 24 16 Panelboards
  - Same as Service Entrance
- 26 24 19 Motor-Control Centers

26 25 00 Low-Voltage Enclosed Bus Assemblies
- 26 25 13 Low-Voltage Busways

26 27 00 Low-Voltage Distribution Equipment
- 26 27 13 Electricity Metering
  - BacNet
- 26 27 16 Electrical Cabinets and Enclosures
- 26 27 19 Multi-Outlet Assemblies
- 26 27 23 Indoor Service Poles
26 27 26 Wiring Devices
26 27 33 Power Distribution Units
26 27 73 Door Chimes

26 28 00 Low-Voltage Circuit Protective Devices
26 28 13 Fuses
26 28 16 Enclosed Switches and Circuit Breakers
   26 28 16.13 Enclosed Circuit Breakers
   • Match manufacturer
   26 28 16.16 Enclosed Switches

26 29 00 Low-Voltage Controllers
26 29 13 Enclosed Controllers
26 29 13.13 Across-the-Line Motor Controllers
   • See College’s electronic motor starter list
26 29 13.16 Reduced-Voltage Motor Controllers
26 29 23 Variable-Frequency Motor Controllers
   • ABB ACH 550
26 29 33 Controllers for Fire Pump Drivers
   26 29 33.13 Full-Service Controllers for Fire Pump Electric-Motor Drivers
   26 29 33.16 Limited-Service Controllers for Fire Pump Electric-Motor Drivers
   26 29 33.19 Controllers for Fire Pump Diesel Engine Drivers

26 30 00 Facility Electrical Power Generating and Storing Equipment

26 31 00 Photovoltaic Collectors

26 32 00 Packaged Generator Assemblies
26 32 13 Engine Generators
   • PEPCO provides 460V service – not 480V
26 32 13.13 Diesel-Engine-Driven Generator Sets
   • MTU - Baltimore
26 32 23.13 Horizontal-Axis Wind Turbines
26 32 23.16 Vertical-Axis Wind Turbines

26 33 00 Battery Equipment
   26 33 23.13 Central Battery Equipment for Emergency Lighting
   • Myers Power Products - Pennsylvania

26 36 00 Transfer Switches
26 36 23 Automatic Transfer Switches
   • Four wire

26 40 00 Electrical Protection

26 41 00 Facility Lightning Protection
   • Master Label Certification
   • Aluminum air terminal is OK if flashing is Aluminum. However, the roof loop should be copper with copper downleads concealed within the building
PART 6 – TECHNICAL NOTES AND STANDARDS

26 41 13 Lightning Protection for Structures
   26 41 13.13 Lightning Protection for Buildings

26 43 00 Surge Protective Devices
   26 43 13 Surge Protective Devices for Low-Voltage Electrical Power Circuits

26 50 00 Lighting

26 51 00 Interior Lighting
26 51 19 LED Interior Lighting
   • Blackbody temp = 3500° K
   • See Colleges list of approved/suggested fixtures
   • Point by Point required for typical classrooms, offices and untypical spaces.
   • Built-in dimming
   • In general – no cans – if cans, then no smaller than eight inches in diameter
   • Cans not used for general lighting in an area
   • No direct view LEDs anywhere – interior/exterior
   • Occupancy sensors – no vacancy sensor mode
   • No building wide central lighting control/monitoring
   • Dual technology OS – infra-red/ultrasonic
   • Local office/classroom control – Wattstopper

26 52 00 Safety Lighting
26 52 13 Emergency and Exit Lighting
   26 52 13.13 Emergency Lighting
   • No battery – all on generator
   26 52 13.16 Exit Signs
   • See College’s list of approved fixtures

26 55 00 Special Purpose Lighting
26 55 53 Security Lighting
   • White security lighting in the hallway – stairway, etc., lighting always on – no OS control on these.
   • Exit egress lighting on building’s emergency photo cell

26 56 00 Exterior Lighting
26 56 13 Lighting Poles and Standards
   • Powder coated
26 56 19 LED Exterior Lighting
   • Manufacturers: KIM for parking lots –AAL for interior/campus lighting – see College standards-both are Hubbell companies. We have standard fixtures for these applications
   • No direct view LEDs
   • Blackbody temp = 4000° K

27 00 00 Communications (reserved)
28 00 00 Electronic Safety and Security (reserved)
31 00 00 Earthwork (reserved)
32 00 00 Exterior Improvements (reserved)
33 00 00 Utilities (reserved)
PART 6 – TECHNICAL NOTES AND STANDARDS

6.2 Technical Standards
075200 – Low Slope Roofing
275100 – Distributed Audio-Visual Communication – Emergency Call Box
281300 – Access Control
282300 – Video Surveillance
283111 – Addressable Fire Detection & Alarm System
SECTION 075200 - LOW-SLOPE ROOFING

1. GENERAL
   A. Owner Project Requirements: see the Roof Systems and Roof-related Systems section of Part 5: Owner’s Building Construction Requirements of this College Design Standards document for additional information related to low-slope roofing.
   B. The roofing installation includes the following materials:
      1. Two-ply, modified bituminous roofing.
      2. Roofing insulation.
      3. SBS Base Sheet.
      4. SBS Cap Sheet.
      5. Walkways.
   C. Performance Requirements
      1. General: Install a watertight, modified bituminous membrane roofing and base flashing system with compatible components that will not permit the passage of liquid water and will withstand wind loads, thermally induced movement, and exposure to weather without failure. On low slope roofs of slopes greater than 2 inches per foot, all felt plies shall be back nailed. The system shall consist of four plies of roofing felts alternately placed, overlapped and saturated with hot asphalt bitumen. Gravel surfacing to be set in hot asphalt. Steep roofing asphalt shall conform to ASTM D-312.
      2. FM Listing: Provide modified bituminous membrane, base flashings, and component materials that meet requirements of FM-4450 and FM-4470 as part of a roofing system and that are listed in FM's "Approval Guide" for Class-1 or noncombustible construction, as applicable. Identify materials with FM markings.
      3. Roofing system shall comply with the following:
         a. Fire/Windstorm Classification: Class-1A-690
         b. Hail Resistance Rating: MH
      4. Roofing System Design: Provide a roofing system that complies with roofing system manufacturer's written design instructions.
   D. Warranty
      1. The roofing system shall be covered by a 20 year Total System, No Dollar Limit (NDL) Warranty and must include all flashings and sheet-metal work. All materials and workmanship are to be fully guaranteed by the roofing manufacturer issuing the warranty. All materials must be manufactured by the manufacturer who is to supply the warranty. Any materials that are not made by the Roofing Materials Manufacturer but submitted for approval must be accompanied by a letter from the Roofing Materials Manufacturer issuing the 20 year NDL warranty, stating that this material is suitable for use with their system and fully covered under their 20 year NDL warranty.
      2. Insulation materials shall be considered an integral component of the roofing system, shall be furnished or approved by the roofing system manufacturer and shall be covered fully by the roofing system warranty.

2. PRODUCTS
   A. Basis-of-Design Product: Subject to compliance with requirements, provide Firestone Building Products or comparable product by one of the following:
      1. SBS-Modified Bituminous Roofing System:
         a. Siplast Roofing Systems
         b. Tremco Incorporated
      2. Polyisocyanurate Board Insulation:
a. CertainTeed Corp.
b. Atlas Insulation Co.

3. **Rubber Walkpad Manufacturers**: Subject to compliance with requirements, provide products by one of the following:
   a. Roof Gard Pads by Humane Equipment Company.

**B. SBS-Modified Bitumen Sheets**

1. **SBS-Modified Bituminous Sheet, Base Surfaced**: SBS-modified asphalt sheet, smooth surfaced, dusted with fine parting agent on both sides; suitable for application method specified; manufacturer's standard thickness and weight; for use and of reinforcing type as follows:
   a. **Use**: Base ply of 2-ply, modified bituminous membrane roofing.
   b. **Reinforcing**: Glass-fiber mesh or non-woven glass-fiber mat.

2. **SBS FR-Modified Bituminous Sheet, Mineral Surfaced**: SBS-modified asphalt sheet, with continuous layer of mineral granules factory applied to top exposed surface; suitable for application method specified; with physical properties and for use with reinforcing type and granule color as follows:
   a. **Use**: Finish ply of 2-ply, modified bituminous membrane roofing and base flashing.
   b. **Reinforcing**: Non-woven polyester with glass fiber reinforcing in machine direction.
   c. **Granule Color**: White, high albedo.

**C. Auxiliary Membrane Materials**

1. **General**: Furnish auxiliary materials recommended by roofing system manufacturer for intended use and compatible with SBS-modified bituminous roofing.
   a. Furnish liquid-type auxiliary materials that meet VOC limits of authorities having jurisdiction.

2. **Asphalt Primer**: ASTM-D-41.

3. **Roofing Asphalt**: ASTM-D-312, Type-IV.

4. **Roofing Asphalt**: ASTM-D-312, Type-IV, as recommended by modified bituminous membrane manufacturer.

5. **Asphalt Roofing Cement**: ASTM-D-4586, SBS modified asbestos free, of consistency required by roofing system manufacturer for application.

6. **Mastic Sealant**: Polyisobutylene, plain or modified bituminous, non-hardening, non-migrating, non-skinning, and non-drying.

7. **Fasteners**: Factory-coated steel fasteners complying with corrosion-resistance provisions of FM-4470; designed for fastening base flashings and acceptable to roofing system manufacturer.

8. **Roofing Granules**: Ceramic-coated roofing granules, No.-11 screen size with 100 percent passing No.-8 (2.36-mm) sieve and 98 percent of mass retained on No.-40 (0.425-mm) sieve.
   a. **Color**: White.

9. **Glass-Fiber Fabric**: Woven glass cloth, treated with asphalt; complying with ASTM-D-1668, Type-1.

10. **Miscellaneous Accessories**: Provide miscellaneous accessories recommended by roofing system manufacturer for intended use.
D. Walkways
1. Walkway Pads: Reinforced asphaltic composition pads with slip-resisting mineral-granule surface, manufactured as a traffic pad for foot traffic and acceptable to roofing system manufacturer, 3/4 inch thick, minimum.
   a. Pad Size: 36x48 inches
2. Adjustable Pedestal Pavers:
   a. Description: Concrete pavers mounted on adjustable supports.
      • Size: Nominal 12 x 12 x 1-1/2.
   c. Basis-of-design: Hanover Elevator System of adjustable supports

E. Insulation Materials
1. General: Provide preformed, roofing insulation boards that comply with requirements, selected from manufacturer's standard sizes.
   a. Provide preformed, tapered insulation boards as needed for sloping to drain.
      Fabricate with the following taper:
      • 1/4 inch per 12 inches (1:48),
      • As indicated on Drawings.
   b. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.
2. Polyisocyanurate Board Insulation: Rigid, cellular polyisocyanurate thermal insulation with core formed by using HCFCs as blowing agents complying with ASTM-C-1289-02 with an LTTR R-Value of: 30 and a thickness of 5": classified by facer type as follows:
   a. Facer Type: Type-II, felt or glass-fiber mat on both major surfaces.

F. Insulation Accessories
1. General: Furnish roofing insulation accessories recommended by roof system manufacturer for intended use and compatible with roofing material.
2. Cover Board: Factory primed, glass-fiber faced gypsum sheathing (Dens-Deck by Georgia-Pacific or approved equal) complying with ASTM-E-136, & E 84, ½ inch thick.

G. Exclusions (reserved)

3. EXECUTION
A. Install modified bituminous membrane roofing system according to roofing system manufacturer's written instructions and applicable recommendations of NRCA/ARMA's "Quality Control Recommendations for Polymer Modified Bitumen Roofing."
B. Install roofing system according to applicable specification plates of NRCA's "The NRCA Roofing and Waterproofing Manual."
C. All low slope roofing systems shall include insulation. The majority of the insulating value shall be accomplished with the necessary thickness of flat poly-isocyanurate boards. Where necessary, roof slope shall be developed with tapered perlite board. Insulation material installed between the roof deck and the roof ply shall be compatible with the roof ply material and asphalt bitumen binder or other adhesive used in the roofing system. Organic insulation material shall not be used under built-up roofs. In all cases a minimum 1/2” cover board must be installed over the Isocyanurate insulation. Perlite and wood fiber are acceptable cover board materials. For new buildings the insulation value of the roof area envelope is to be a minimum of R-30 for low-slope roofs. Coordinate with College to determine the actual target R-value. For roof replacements/renovations on older buildings, a lower "R" value will be considered. The first ply of insulation systems over metal decks and wood decks shall be mechanically fastened using steel fasteners acceptable to the manufacturer furnishing
guarantee of roofing system. Insulation shall be applied in several layers, with the joints staggered, in accordance with the manufacturer’s recommendations. Insulation shall also be installed in accordance with Factory Mutual System Class 120 wind uplift guidelines.

D. Flashing is part of the roofing system and shall meet requirements of manufacturer furnishing roofing system. Where roof meets a parapet or adjacent building wall, the base flashing shall extend up the wall at least 8 inches, but generally not more than 14 inches unless necessary to be consistent with existing conditions or design requirements. If flashing height is greater than 14 inches, a 2 piece flashing system may be required. Other than base flashing - metal flashing, including expansion joint flashing, shall be in accordance with SMACNA Standards and the NRCA Roofing and Waterproofing Manual and fully covered under the 20 year ‘NDL’ warranty.

E. Pitch pockets shall be avoided. Where that is not possible, pitch pockets shall be filled with a pourable urethane sealer. Roof penetrations will be flashed with preformed flexible flashing, using clamps and tents, unless the penetration is such a complex shape that a pitch pocket is required.

F. A pitch pocket is required.

G. All parapet walls must be covered with a metal coping cap over a “peel and stick” type modified bitumen membrane and any necessary wood blocking/nailers, etc.

H. Roof drains shall be provided with shallow sumps, gravel stops, and minimum 4.0 pound lead flashing in accordance with the NRCA Roofing and Waterproofing Manual and the International Plumbing Code. Roof drains shall be located at the low points, and crickets must be provided between drains in structurally formed valleys and around any structure impeding the flow of water in the drain field to assure positive water flow to the drains.

I. Roof drainage patterns should be designed to locate roof drains at the mid-points between columns and beams. Overflow scuppers should be provided through perimeter parapet walls, or overflow relief drains should be provided at roof drain locations, to relieve storm water build-up caused by clogged roof drains.

J. Splash blocks shall be provided at all ground discharge points from exterior downspouts, or downspouts may discharge directly into a storm drainage systems.
SECTION 275100 - DISTRIBUTED AUDIO-VISUAL COMMUNICATION
- EMERGENCY CALL BOX

PART 1 - GENERAL
1.1 SUMMARY
A. Section includes requirements for emergency call box units.

PART 2 - PRODUCTS
2.1 MANUFACTURERS
A. Ramtel – No Exceptions

2.2 EXISTING SYSTEMS
A. The emergency call box units provided under the scope of this project shall be completely integrated with the existing systems.

2.3 EMERGENCY CALL BOX
A. General
1. The Emergency Call Box shall consist of an outdoor-rated, vandal resistant and ADA-compliant hands-free speakerphone communications device with a stainless steel faceplate and metal buttons.
2. The Emergency Call Box shall have one red anodized aluminum tactile button labeled "EMERGENCY" and one 0.375" diameter red light emitting diode (LED) labeled "LIGHT ON INDICATES CALL RECEIVED". The unit shall be programmable from a remote location and have a two number dialing capability, reverting to the second number if the first is busy or does not respond. The unit shall be totally hands-free on both sides after connection is initiated at site or by attendant. The unit shall be phone line powered, requiring no outside power source or battery back-up. DIP switch programming, push to talk devices, and devices requiring external power are not acceptable. The unit shall have a dedicated communication line.

B. Construction
1. Chassis, back box and face plate shall be constructed of stainless steel.
2. Faceplate shall be 12 gauge #4 brushed stainless steel measuring 9.5" W x 11.75" H.
3. Unit shall weigh approximately 8 lbs.
4. Signage shall be constructed of cast metal with lettering and Braille raised approximately 3/32" for ADA compliance.
5. Word "EMERGENCY" and button shall be red.
6. Push button and switch shall be a single assembly rated for 1,000,000 cycles.
7. Speaker and microphone shall be protected by non-ferrous metal screen to provide a barrier against vandalism, rain and snow.

C. Features
1. Unit shall be capable of operating on standard phone lines or analog PBX extensions.
2. Unit shall dial at approximately 10 tones per second.
3. Output sound level shall be greater than 80 dB at one meter for normal conversation.
4. All programming shall be stored in non-volatile EEPROM memory.
5. Button shall provide tactile feedback.
6. Unit shall be programmable from a remote telephone via keypad entry.
7. Call timer shall be programmable from 1 to 4320 minutes.
8. LED for the hearing impaired shall illuminate to indicate when calling party may speak (when receiving party is silent).
9. Unit shall be programmable with two different telephone numbers of up to 18 digits each including pauses. If first number does not answer or is busy, unit shall automatically call the second number. If that number is busy or does not answer, unit shall call the first number again. Unit shall continue alternating until call is answered or call timer limit is reached.
10. Unit shall include two auxiliary outputs and one auxiliary input that are opto-isolated from the telephone line to 1,000 volts. Outputs shall be activated, providing a dry contact closure, either automatically when Emergency Phone is activated or manually by guard keypad operation. Input shall allow unit to be activated by any device or switch that provides a contact closure.

11. Incoming and outgoing volume shall be adjustable separately.

12. Unit shall be capable of automatically notifying attendant of location via programmable 6 digit ID.

13. Unit shall be capable of silent monitoring.

14. Unit shall utilize tone dialing.

15. When call is finished, unit shall automatically shut off.

16. Unit shall answer any call placed to it from any other telephone.

17. Two levels of programmable passwords shall be available.

18. Unit shall be varistor lightening suppressed and full wave polarity guarded.

19. Unit shall have parallel tip and ring connected to an RJ-11 connector for quick installation.

20. Unit shall be compatible with RAMTEL’s All Campus Alert System.


D. Environmental

1. Speaker: Unit shall have a 3.5 inch waterproof speaker with a vinyl-impregnated cloth cone. Magnet and solid aluminum voice coil area shall be protected from ferrous and non-ferrous particles by a special sealed design. The speaker shall be capable of operating without deterioration of sound quality after total immersion in water for 96 hours. Speaker shall operate at temperatures of -55ºC to +85ºC. Steel basket shall have a zinc dichromate finish for protection against corrosion.

2. Microphone: Unit shall include a gold, water-resistant microphone.

3. Push Button/Switch: Button and switch shall be a single assembly. Epoxy seals shall protect contacts and terminals from hostile environments and solder flux. Unit shall be waterproof and submergible to 3 feet in water. Unit shall have a mechanical life of 1,000,000 cycles. Case shall be moisture-proof, dust-tight and designed to accommodate the high shock military specifications of MIL-STD-202, method 207. Case shall be aluminum alloy, anodized clear. Button shall be red anodized aluminum. Switch shall be rated to operate from -55ºC to +80ºC.

4. PC boards and Other Electronic Components: Boards and components shall withstand a corrosive atmosphere of 90% H2S for 16 hours. PC boards shall be rated R4. Unit shall be designed to operate at temperatures from -20ºC to +65ºC and humidity levels up to 95% relative humidity at 49ºC.

5. Protective Sealing of Completed PC Boards: Once the unit has been wave soldered and inspected and the completed boards tested, the entire circuit board apparatus shall be uniformly coated by dipping rather than spraying (Mil-I416058C amend 6). The microprocessor chip shall then be installed in its socket and sealed in place with a special electrical grade RTV type sealant. At this point the boards can be sprayed with water without affecting the operation of the unit.

E. Electrical

1. Unit shall be fully phone line powered, requiring no external power or battery back-up.

2. One dedicated, twisted-shielded communication pair shall provide a minimum of 24VDC and 20mA while off hook.

F. Model

1. The emergency call box shall be a Ramtel model RR-733

G. Options

1. Contractor shall provide custom silk screening of the Owner's logo and the words "Montgomery College" on each emergency call box faceplate. The specified
manufacturer has the College design template.

2. For indoor installations Contractor shall provide flush mount bezel produced by the call box manufacturer.

2.4 WALKWAY LED

A. Walkway LED devices are required only in special conditions and may not be required on the project. Coordinate with the College to determine whether or not there is a need, and on all aspects of the items below.

B. Provide walkway LED illumination for indoor wall mounted call boxes with technical features as follows:

1. Electrical:
   a. 1W LED powered by 120V primary, 3W 350mA non-dimmable integral driver.
   b. Input Current: 350mA
   c. Input Voltage: 4V DC
   d. Power Consumption: 1W

2. Dimming: Dimmable with remote driver (not included). Consult factory.

3. Weight: 0.99lbs (0.45kg).


5. Mounting: Mounts to standard 4” (102mm) octagonal box (1-1/2” (38mm) deep minimum) with flush mounted tamper proof screws.

6. Approval: Dry locations. Approved to UL standards by CSA/US.

C. Manufactured unit shall be MP Lighting L21 Walkway LED or approved equal.

2.5 EMERGENCY CALL BOX TOWER MOUNT

A. Illumination

1. The tower mount has three (3) different lights.
   a. Sodium Vapor Blue Light - A high intensity 50 watt light illuminates immediate area around the tower. The blue light is continuously lit.
   b. Strobe Light - A one million candle power strobe housed in a blue Fresnel Lexan polycarbonate lens is provided. The strobe flashes continuously when the emergency call button is pushed and shuts off when the calling party hangs up.
   c. Phone Panel Light - A five (5) watt fluorescent light illuminates the emergency call box face plate.

B. Construction

1. 0.25” thick non-rusting, non-magnetic stainless steel
2. Dimensions - 9’ x 11” sq.
3. Weight - 175 lbs.
4. Mounting - Four (4) 5/8” x 16” J-Bolts cast into a concrete footer.
5. Color - Coordinate with Owner
6. Finish - Powder Coat
7. Graphics - “EMERGENCY” on all four sides
8. Graphics Color - Coordinate with Owner
9. Power - 120 VAC

C. Model

1. The emergency call box tower mount shall be a Ramtel model PLC-8

D. Options

1. Contractor shall provide the optional internal heating unit
2. Contractor shall provide top-mount camera arm. Installed by Owner.

PART 3 - EXECUTION

3.1 INTERCOMMUNICATION SYSTEMS

A. Installation:

1. The Contractor shall install all system components including Owner furnished equipment, and appurtenances in accordance with the manufacturer’s instructions, ANSI C2 and as shown, and shall furnish all necessary connectors, terminators, interconnections, services, and adjustments required for a complete and operable emergency communications
B. Tamper Resistant Substations:
   1. The Contractor shall locate emergency call boxes where shown on the drawings. Provide tamper resistant center post torx screws for mounting the emergency call box units to the tower mounts.

PART 4 - SYSTEM PROGRAMMING

4.1 The College programs PBX, the vendor is responsible for programming RamTel unit per college direction.

END OF SECTION 275100
SECTION 281300 – ACCESS CONTROL

PART 1 - GENERAL

1.1 SUMMARY
   A. This Section includes access control devices to be connected to the Security Management System (SMS).
   B. Access Control:
      1. Regulating access through doors, gates, traffic-control bollards and others access controls as specified in drawing documents.
      2. Anti-passback where required.
      3. Surge and tamper protection.
      5. Card readers.
      7. Push-button switches.
      8. RS-232 ASCII Interface.
      9. Reporting.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. Security Management System Software
      1. GE Security Facility Commander
   B. Security Management System Field Hardware
      1. GE Security ACULX16 Network Intelligent Controller – No Exception
      2. GE Security Remote Reader Electronics – No Exception
   C. Card Reader
      1. HID multiClass SE RP40 Proximity Card Reader – No Exception
      2. HID multiClass SE RP10 Mini Prox Reader

2.2 FACILITY COMMANDER ENTERPRISE EDITION SECURITY MANAGEMENT PLATFORM
   A. Security devices and hardware shall be integrated with the owner’s existing Security Management system (SMS). The SMS server is located in the main MDF room of the Computer Science Center located on the Montgomery College, Rockville, MD campus. Security devices and hardware provided under this project shall communicate with the SMS server via the Owner’s proprietary MC F-Net network. Network Intelligent Controllers shall be terminated at the Owner furnished, Contractor (by others) installed MC F-Net switches.
   B. The Contractor is responsible for providing all software licenses required to complete this work.

2.3 NETWORK INTELLIGENT CONTROLLER
   A. General:
      1. The Networked Intelligent Controller (NIC) shall be a microprocessor-based device, which utilizes a 32-bit processor and a 32-bit bus structure. The controller shall have a minimum clock speed of 90 MHz, and shall be provided with at least 16 Mbytes of battery backed dynamic RAM. The controller shall feature a direct LAN/WAN connection to the controller bus structure in addition to two RS-232 or RS-485 connections, all of which should be designed for use in communication with the ACAM server. The communication architecture of the NIC shall be such that in the event that the primary communication channel to the ACAM server is lost, the unit shall be capable of automatically switching to a secondary communication channel using one of the host RS-232 or RS-485 connections,
and if required shall be able to establish communications via dial-up modem.

2. The NIC shall be provided with a parallel printer port, which will enable it to print
transaction data during loss of communication with the ACAM server. The NIC
shall be capable of dynamically allocating its memory between database
information and transaction history, which shall be stored if the controller has lost
communication with the ACAM server. Such transaction history shall be
automatically uploaded to the ACAM server once communication has been
restored. In its maximum configuration, the NIC shall be capable of storing
250,000 cardholders, and its memory utilization shall be such that if storing
database information for 10,000 cardholders, it shall also be capable of storing
500,000 transactions.

3. The NIC shall support the monitoring and control of 16 card readers, with or
without keypads. It shall also be provided with at least 12 five-state, fully
supervised and fully configurable input points, and at least 12 fully configurable
auxiliary output control relays mounted on the main circuit board.

4. Each controller must also be capable of expansion, by external Remote
Input Modules (RIMs) and/or Remote Relay Modules (RRMs), to support a
combination of up to 172 fully configurable five-state supervised input points
or 156 output relays per NIC depending on configuration.

5. Each NIC shall be provided with a UL Listed uninterruptible power supply (UPS)
mounted within the NIC enclosure. It shall provide sufficient battery backup to sustain
complete operational effectiveness including Remote Reader Electronic (RRE)
modules, card readers, electric locks (fail secure), RIMs and RRMs for a minimum of
four [eight] hours of normal operation.

6. Each NIC shall utilize on-board self-diagnostic LEDs, removable terminal strips and a
pop-in/pop-out circuit board.

7. Each NIC in addition to its on-board LAN/WAN connection shall support RS-232 and
multi-drop RS-485 communication topologies. Provision of external LAN terminal server
devices that are connected though serial communications to the NIC are not acceptable.

8. Each NIC shall support RS-485 bi-directional communication paths (dual multi-drop paths
back to ACAM file server) with no additional hardware or firmware required.

9. Each NIC shall be supplied with all specified options available, including a
locking enclosure with a tamper switch.

10. Each NIC shall be capable of reporting the following alarm conditions to the ACAM file
server:
   a. enclosure door tamper
   b. primary power failure
   c. low battery conditions
   d. loss of communications
   e. all access control violations

11. The Network Intelligent Controller shall be a GE Security ACULX 16

2.4 REMOTE READER ELECTRONIC MODULES

A. General:

1. The Remote Reader Electronic (RRE) modules shall be provided to support all
card readers, door contact switches, request-to-exit devices and electric locks.
The RRE modules shall support all industry standard card reader technologies
(magnetic stripe, Wiegand, bar code, barium ferrite, and proximity) as well as
keypads and compatible biometric devices. These modules shall be available in
configurations suitable to support the connection of one, two or four card
devices as required.

2. Each RRE module shall support five-state supervised input points, output
relays, and shall provide power outputs of 5-VDC, 12-VDC and 24-VDC output
at 500-Ma to power card readers, biometric devices, request to exit (REX)
devices and door strikes. Each RRE module shall be capable of being
powered by the on-board UPS of a NIC to avoid the need for power supplies and 115-volt outlets to be located near controlled doors. Each RRE shall also be capable of being powered by a local 24-VDC UPS where required.

3. RRE modules shall utilize on-board self-diagnostic LEDs, removable terminal strips and pop-in/pop-out circuit boards.

4. RRE modules shall be supplied with all specified options available, including an enclosure with an enclosure tamper switch.

5. Quantity and location of RRE modules shall be as specified in Contract Documents and drawings.

2.5 ACULX 16 NETWORK INTELLIGENT CONTROLLER POWER SUPPLY

A. The ACULX 16 requires a power supply/charger that transforms 120 VAC to 27.5 VDC. The Contractor shall provide the ACU-8APWR power supply/charger assembly to power the ACULX 16 and the supporting RREs. The ACU-8APWR becomes an uninterruptible power supply when stand-by batteries are connected. It has a special power limiting circuit that allows the batteries to be charged. The batteries are protected with an automatic resetting circuit breaker and diode for over current and accidental reversed battery hookup. Float charging means faster recovery time for the batteries. There is no switch over or voltage drop when power fails. Contractor shall size batteries of 8 hours of backup power with a connected load.

2.6 ACCESS CONTROL POWER SUPPLY

A. Electrified locksets shall be powered from a power supply that is exclusively for electrified locks. The power supply shall provide eight (8) fused protected Fail Secure and/or Fail Safe 24VDC 10 Amps outputs. Power supply shall be a filtered, electronically regulated power source with a built in charger. The power supply shall be provided with sealed gel type batteries for backup power. In the event primary power fails, the power supply shall automatic switch-over to standby battery power, and back when primary power is restored. The transfer to and from backup power shall not cause other electrical anomalies such as false alarms loss of communication etcetera. The power supply shall be provided with thermal and short circuit protection with auto reset, fused battery protection, AC input and DC output LED indicators, and AC power and low battery supervision relays (Form "C", SPDT).

B. Each 24 VDC power supply shall be supplied with a minimum of two 12 VDC 7 AH rechargeable batteries for standby power operation. If necessary, additional batteries shall be supplied by the Contractor to meet a four (4) hour standby time.

C. All power supplies shall be labeled with permanent labels for their intended purpose and input and output voltage. AC ground shall have continuity to both the mounting panel and the housing. If necessary, the Contractor shall provide grounding straps from the mounting board to the housing.

D. Power Supply shall feature a fire alarm disconnect. The fire alarm disconnect can be latch or non-latching and is individually selectable for any or all of the 8 outputs. The fire alarm disconnect can be either Normally Open (NO) or Normally Closed (NC).

E. Acceptable equipment shall be Altronix Power Supply AL1024ULACM or equivalent.

2.7 CARD READERS

A. Proximity Card Readers

1. Provide surface mounting style 125 KHz proximity card readers suitable for wall or US 2-S single-gang box mounting, and for mounting configurations as shown on the project plans.

2. The reader shall be capable of reading access control data in standard Wiegand formats up to 84 bits in length from any HID Proximity card or equivalent, outputting the data in one of the following configurations:

   a. The card reader shall output credential data in compliance with the SIA AC-01Wiegand standard, compatible with all standard access control systems.
b. The card reader shall output credential data using a Clock and Data interface, and be compatible with systems requiring a magnetic stripe reader.

3. The reader shall be capable of outputting a periodic reader supervision message at a configurable time interval, enabling the host system to signal an alarm condition based on the absence of this message.

4. The Proximity card reader shall provide the ability to change operational features in the field through the use of a factory-programmed command card. Command card operational programming options shall include:
   a. Reader beeps and flashes green on a card read, LED normally red, single line control of LED.
   b. Reader flashes green on a card read, LED normally red, single line control of LED.
   c. Reader beeps on a card read, LED normally red, single line control of LED.
   d. Reader beeps and flashes green on a card read, LED normally off, red and green LED's controlled individually.
   e. Reader flashes green on a card read, LED normally off, red and green LED's controlled individually.
   f. Reader beeps on a card read, LED normally off, red and green LED's controlled individually.
   g. Beeper and LED are controlled by host only, LED normally red, single line control of LED.
   h. Reader beeps and flashes green on a card read, LED normally off, red and green LED's controlled individually.
   i. Change from Wiegand to Mag Stripe output format
   j. Change from Mag Stripe to Wiegand output format
   k. Reset to Factory Defaults

5. Proximity card readers shall provide the following programmable audio/visual indication:
   a. A piezoelectric sounder shall provide an audible tone upon successful power up/self test, good card read, or whenever the beeper control line is asserted by the host.
   b. A bi-color, red/green LED shall light upon successful power up/self test, good card read, or whenever the LED control line(s) are asserted by the host.
   c. The reader shall have individual control lines for the sounder, and for red and green LED indication. When the LED control lines are asserted simultaneously, an amber LED indication will occur.

6. The reader shall have a configurable hold input, which when asserted shall either buffer a single card read or disable the reader, until the line is released. This input may be used for special applications or with loop detectors.

7. The reader shall require that a card, once read, must be removed from the RF field for one second before it will be read again, to prevent multiple reads from a single card presentation and anti-passback errors.

8. Proximity card readers shall meet the following physical specifications:
   a. **Dimensions:** 4.80 x 3.3 x 1.0" (12.2 x 8.4 x 2.4 cm)
   b. **Weight:** 7.7oz (220g)
   c. **Material:** UL94 Polycarbonate
   d. **Two-part design with separate reader body and mounting plate.**
   e. **Color:** Black

9. Proximity card readers shall meet the following electrical specifications:
   a. **Operating voltage:** 5–16 VDC, reverse voltage protected. Linear power supply recommended.
   b. **Current requirements:** (average/peak) 20/115mA @ 12 VDC

10. Proximity card readers shall meet the following environmental specifications:
    a. **Operating temperature:** -31 to 150 degrees F (-35 to 65 degrees C)
    b. **Operating humidity:** 5% to 95% relative humidity non-condensing
c. Weatherized design suitable to withstand harsh environments. The reader shall be of potted, polycarbonate material, sealed to a NEMA rating of 4X (IP55).

11. Proximity card reader cabling requirements shall be:
   a. **Cable distance:** Wiegand: 500 feet (150m); Clock & Data: 50 feet (15m)
   b. **Cable type:** 5-conductor #22 AWG w/overall shield. Additional conductors will be required for 2-line LED control, beeper, hold, or card present functions.
   c. **Standard reader termination:** 18” (.5m) cable pigtail

12. Warranty of Proximity card readers shall be lifetime against defects in materials and workmanship.

13. **Proximity card reader shall be HID Corporation Model iCLASS SE R40**

**B. Proximity Card Reader (Mullion Mount)**

1. Provide surface mounting style 125 KHz proximity card readers suitable for door or window mullion mounting, and for minimal space mounting configurations as shown on the project plans.

2. The reader shall be capable of reading access control data in standard Wiegand formats up to 84 bits in length from any HID Proximity card or equivalent, outputting the data in one of the following configurations:
   a. The card reader shall output credential data in compliance with the SIA AC-01 Wiegand standard, compatible with all standard access control systems.
   b. The card reader shall output credential data using a Clock and Data interface, and be compatible with systems requiring a magnetic stripe reader.

3. The reader shall be capable of outputting a periodic reader supervision message at a configurable time interval, enabling the host system to signal an alarm condition based on the absence of this message.

4. The Proximity card reader shall provide the ability to change operational features in the field through the use of a factory-programmed command card. Command card operational programming options shall include:
   a. Reader beeps and flashes green on a card read, LED normally red, single line control of LED.
   b. Reader flashes green on a card read, LED normally red, single line control of LED.
   c. Reader beeps on a card read, LED normally red, single line control of LED.
   d. Beeeper and LED are controlled by host only, LED normally red, single line control of LED.
   e. Reader beeps and flashes green on a card read, LED normally off, red and green LED's controlled individually.
   f. Reader flashes green on a card read, LED normally off, red and green LED's controlled individually.
   g. Reader beeps on a card read, LED normally off, red and green LED's controlled individually.
   h. Beeeper and LED are controlled by host only, LED normally off, red and green LED controlled individually
   i. Change from Wiegand to Mag Stripe output format
   j. Change from Mag Stripe to Wiegand output format
   k. Reset to Factory Defaults

5. Proximity card readers shall provide the following programmable audio/visual indication:
   a. A piezoelectric sounder shall provide an audible tone upon successful power up/self test, good card read, or whenever the beeper control line is asserted by the host.
   b. A bi-color, red/green LED shall light upon successful power up/self test, good card read, or whenever the LED control line(s) are asserted by the host.
   c. The reader shall have individual control lines for the sounder, and for red and green LED indication. When the LED control lines are asserted simultaneously, an amber LED indication will occur.
6. The reader shall have a configurable hold input, which when asserted shall either buffer a single card read or disable the reader, until the line is released. This input may be used for special applications or with loop detectors.

7. The reader shall require that a card, once read, must be removed from the RF field for one second before it will be read again, to prevent multiple reads from a single card presentation and anti-passback errors.

8. Typical proximity card read range shall be up to:
   a. 5.2” (13 cm) using HID Proxcard II card.
   b. 5” (12.5 cm) using HID ISOProx or DuoProx cards
   c. 2” (5 cm) using HID ProxKey II key fob
   d. 2.5” (6.25 cm) using HID MicroProx Tag
   e. 5” (12.5 cm) using HID iCLASS Prox
   f. 2” (5.0 cm) using HID Prox/Wiegand Card

9. Proximity card readers shall meet the following physical specifications:
   a. **Dimensions:** 1.9 x 4.1 x 0.9” (4.8 x 10.3 x 2.3cm)
   b. **Weight:**
      (i) Terminal Strip: 3.5 oz (99 gm)
      (ii) Pigtails: 3.9 oz (113 gm)
   c. **Material:** UL94 Polycarbonate
   d. Two-part design with separate reader body and mounting plate.
   e. **Color:** Black

10. Proximity card readers shall meet the following electrical specifications:
    a. **Operating voltage:** 5 – 16 VDC, reverse voltage protected.
       Linear power supply recommended.
    b. **Current requirements:** (average/peak)
       20/110mA @ 12 VDC

11. Proximity card readers shall meet the following environmental specifications:
    a. **Operating temperature:** -31 to 150 degrees F (-35 to 65 degrees C)
    b. **Operating humidity:** 5% to 95% relative humidity non-condensing
    c. Weatherized design suitable to withstand harsh environments The reader shall be of potted, polycarbonate material, sealed to a NEMA rating of 4X (IP55).

12. Proximity card reader cabling requirements shall be:
    a. **Cable distance:** Wiegand: 500 feet (150m); Clock & Data: 50 feet (15m)
    b. **Cable type:** 5-conductor #22 AWG w/overall shield. Additional conductors will be required for 2-line LED control, beeper, hold, or card present functions
    c. **Standard reader termination:** 18” (.5m) cable pigtail
    d. **Optional reader termination:** 10 screw terminals located under reader cover.

13. Warranty of Proximity card readers shall be lifetime against defects in materials and workmanship.

14. **Proximity card reader shall be HID Corporation iCLASS SE R10**

### 2.8 LINE SUPERVISION

**A.** Communications between the host computer and the data gathering panels shall be protected against compromise. The system shall detect substitution of resistance or electrical potential, substitution of like equipment, and introduction of synthesized signals. Protective circuits (alarm inputs) shall be protected between the data gathering panel and the sensing devices (door contacts, motion detectors, etc.). Each circuit shall be supervised by end or line resistors located at the sensing device. The system shall detect resistance changes and report alarm and trouble signals at designated values defined by the system manufacturer. The system shall register a minimum of four (4) states: normal, alarm, trouble open (cut), and trouble closed (shorted). Trouble signals shall be displayed to the operator in a format readily identifiable by the operator as a supervisory condition.
2.9 SYSTEM SENSORS AND RELATED EQUIPMENT
   A. The EECS (Electronic Entry Control System) and related Equipment provided by the Contractor shall meet or exceed the following performer specifications:
   B. Request To Exit Detectors:
      1. The electrified door hardware provided by the Division 8 Door Hardware Contractor shall feature an integrated request to exit device. Electrified door hardware shall be installed by the Division 8 Door Hardware Contractor. The Security Contractor is responsible for performing final terminations to the EECS.
   C. Magnetic Contacts
      1. Recessed Single Pole Double Throw Door Contact
         a. The door contact shall contain a hermetically sealed magnetic reed switch. The reed shall be potted in the contact housing with a polyurethane based compound. Contact and magnet housing shall snap-lock into a 25.4 mm (1 in) diameter hole. Housing shall be molded of flame retardant abs plastic. Color of housings shall be off-white, grey or mahogany brown. Choice of color to depend on door decor. The contact shall contain a single pole double throw (SPDT) switch with an open or closed loop. Contacts and magnets shall be treated with a thin coat of RTV silicone to hold the contact and magnet in place. Card reader controlled doors, biased and recessed perimeter door contacts, shall be GE model # 1078 or equivalent.

PART 3 - EXECUTION
3.1 GENERAL
   A. The Contractor shall install all system components and appurtenances in accordance with the manufacturers’ instructions, ANSI C2, and shall furnish all necessary interconnections, services, and adjustments required for a complete and operable system as specified. Control signals, communications, and data transmission lines grounding shall be installed as necessary to preclude ground loops, noise, and surges from affecting system operation. Equipment, materials, installation, workmanship, inspection, and testing shall be in accordance with manufacturers’ recommendations and as modified herein.
   B. Consult the manufacturers’ installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation. Refer to the Riser/Connection diagram for all schematic system installation/termination/wiring data.
   C. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., sensors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

3.2 CURRENT SITE CONDITIONS
   A. The Contractor shall visit the site and verify that site conditions are in agreement with the design package. The Contractor shall report all changes to the site or conditions which will affect performance of the system to the Owner in a report as defined in paragraph Group II Technical Data Package. The Contractor shall not take any corrective action without written permission from the Owner.

3.3 EXAMINATION
   A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.
   B. Examine roughing-in for LAN and control cable conduit systems to PCs, Controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.
   C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.4 PREPARATION
   A. Comply with recommendations in SIA CP-01.

C. Obtain detailed Project planning forms from manufacturer of access-control system; develop custom forms to suit Project. Fill in all data available from Project plans and specifications and publish as Project planning documents for review and approval. All forms shall be completed in accordance with specified timelines outlines in Group Technical Data Packages in Section 280500.
1. Record setup data for control station and workstations.
2. For each Location, record setup of Controller features and access requirements.
3. Access Lists
4. Propose start and stop times for time zones and holidays, and match up access levels for doors.
5. Set up groups, facility codes, linking, and list inputs and outputs for each Controller.
6. Assign action message names and compose messages.
7. Set up alarms. Establish interlocks between alarms, intruder detection, and video surveillance features.
8. Prepare and install alarm graphic maps.
9. Develop user-defined fields.
10. Develop screen layout formats.
11. Propose setups for guard tours and key control.
12. Discuss badge layout options; design badges.
13. Complete system diagnostics and operation verification.
14. Prepare a specific plan for system testing, startup, and demonstration (see the Testing section for requirements).
15. Develop acceptance test concept and, on approval, develop specifics of the test.
16. Develop cable and asset management system details; input data from construction documents. Include system schematics and Visio Technical Drawings.
17. Develop data gathering panel matrices that conform to Section 280500.

D. In meetings with Architect and Owner, present Project planning documents and review, adjust, and prepare final setup documents. Use final documents to set up system software.

E. All Programming and access lists are submitted, reviewed, and accomplished before any devices are terminated and/or tested.

END OF SECTION 281300
SECTION 282300 – VIDEO SURVEILLANCE

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes video management system which consists of cameras, data transmission wiring, and a control station with its associated equipment.

B. The video surveillance system shall be integrated with monitoring and control system specified in Division 28 Sections "Common Work Results for Electronic Security", "Intrusion Detection", and "Access Control" which specifies systems integration.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. The following are acceptable manufacturers of electronic security system products as specified in this specification section. Any proposed product from a different manufacturer is subject to the review procedures in Section 1.05 in this specification.

1. Closed Circuit Television:
   a. Mobotix

2. Video Recording and Storage:
   a. Network Attached Storage (NAS) appliance - Owner Provided, Owner Installed

2.2 VIDEO SURVEILLANCE SYSTEM

A. The Contractor shall configure the Color CCTV system as specified and shown on the Contract Documents and Drawings. All distances shown are approximate and shall be verified by the Contractor.

B. The system shall include all interior and exterior housings, mounts, connectors, adapters, and terminations necessary for the interconnection of the video surveillance system. The Contractor shall also supply and install all cabling necessary to interconnect the video equipment installed in the Security Operations Center.

1. The new video system shall consist of all (CMOS) Cameras, Network Attached Storage (Owner Provided, Contractor Installed), and network transmission devices, necessary to integrate with the Owner’s existing Video Head-End Equipment.

2. The Video System shall provide operator interface, interaction, control of cameras. The cameras shall continuously view selected locations and/or display operator selections.

C. Computer Software

1. Video management software is provided by Manufacturer at no additional charge.

2. Contractor is responsible for installing and configuring video management software.

2.3 360º CAMERAS

A. The 360º Camera shall meet or exceed the following specifications:

1. Lenses L11 (hemispheric)
2. Sensitivity Color: 1 lux (t=1/60s), 0.05 lux (t=1/1s) B/W: 0.1 lux (t=1/60s), 0.005 lux (t=1/1s)
3. Sensor ½” CMOS, progressive scan
4. Max. Image Resolution Color: 2048 x 1536 (3 MEGA) Black/White: 1280 x 960 (MEGA)
5. Image Format Free image format selection (from 160 x 120 to 2040 x 1536); with L11: PTZ view, Quad view, panorama broad view image, double panorama view, panorama focus with 3 views
6. Max Frame Rate VGA: 25 fps, TV-PAL: 18 fps, MEGA 8 fps, 3 (M-JPEG) (Live/Recording) MEGA: 4 fps
7. Video Stream (MxPEG) VGA: 30 fps, TV-PAL: 30 fps, MEGA: 30 fps, 3 (Live/Recording) MEGA: 20 fps
8. Image Compression MxPEG, M-JPEG, JPEG, H.263 (only Video-VoIP)
9. Internal DVR MicroSD slot (camera-internal video recording up to 32GB)
10. External Storage Directly on NAS and PC/Server without additional recording software
11. Software (Inclusive) Video management software MxEasy, Control room software MxControlCenter
12. Image Processing Backlight compensation, automatic white balance, image distortion correction (panorama image correction included), video sensor (Motion Detection)
13. Virtual PTZ Digital Pan/Tilt/Zoom, continuous 8x zoom
14. Alarm/Events Triggering of events by integrated multiple-window motion detection, temperature sensor, notification over email, FTP, IP telephony (VoIP, SIP), visual/acoustic alarm, pre-and post alarm images
15. Audio Integrated microphone and speaker, lip-synchronous audio, two-way speaker, audio recording
16. Interfaces Ethernet 10/100, USB, MxBus
17. Video Phone VoIP, SIP, two-way speaker, remote control via DTMF signaling, event notification
18. Security User-/Group management, HTTPS/SSL, IP Address filter, IEEE 802.1x, intrusion detection, digital image signature
19. Certificates EMC (EN50121-4, EN55022, EN55024, EN61000-6-2, FCC part 15B, AS.NZS3548)
20. Power Supply Power over Ethernet (802.3af): PoE class variable depending on operating mode; power consumption; typ. 3W; with PoE switch/MOBOTIX PoE – Adapter COLLEGE PROVIDES POE ETHERNET SWITCH
21. Operating Conditions IP65 (DIN EN 60529), -30 to +60 ºC (-22 to +140 ºF)
22. Dimensions n x H: 16 x 5 cm, weight: ca. 450 g
23. Standard Delivery Housing (high resistance composites – PBT-PC), white, incl. 360° lens, mounting parts, allen wrench patch cable – 50cm, manual, software, 4 GB Micro SD (except Basic)

B. 360° Camera shall be the Q24 Hemispheric camera by Mobotix, or Owner approved equal.
C. The Contractor shall provide camera mounts and mounting hardware as described in the Contract Documents.
D. Contractor shall coordinate all camera views with the Owner prior to procuring cameras and camera lenses. Contractor responsible for performing all calculations necessary to provide optimal camera images in accordance with Owner’s guidance. All camera images must be verified by the Owner or Owner’s representative prior to final adjustment.

2.4 SINGLE VIEW FIXED DOME CAMERA
A. The Single View Fixed Dome Camera shall meet or exceed the following specifications:
1. Lenses 22 to 135 mm format, Horizontal angle 90º to 15º
2. Sensitivity Color: 1 lux (t-1/60s), 0.05 lux (t=1/1s) B/W: 0.1 lux (t-1/60s), 0.005 lux (t-1/1s)
3. Sensor ½” CMOS, progressive scan
4. Max. Image Resolution Color: 2048 x 1536 (3 MEGA) Black/White: 1280 x 960 (MEGA)
5. Image Format 2048 x 1536, 1280 x 960, 1024 x 768, 800 x 600, 768 x 576 (D1), 704 x 576 (TV-PAL), 640 x 480, 384 x 288, 352 x 288, 320 x 240, 160 x 120; free image format selection (e.g. 1000 x 200 for skyline)
6. Max Frame Rate VGA: 25 fps, TV-PAL: 18 fps, MEGA 8 fps, (M-JPEG) (Live/Recording) 3MEGA: 4 fps
7. Video Stream (MxPEG) VGA: 30 fps, TV-PAL: 30 fps, MEGA: 30 fps, (Live/Recording) 3MEGA: 20 fps
8. Image Compression MxPEG, M-JPEG, JPEG, H.263 (only Video-VoIP)
9. Internal DVR MicroSD slot (camera-internal video recording up to 32GB)
10. External Storage Directly on NAS and PC/Server without additional recording software
11. Software (Inclusive) Video management software MxEasy, Control room software MxControlCenter
12. Image Processing Backlight compensation, automatic white balance, image distortion
13. Virtual PTZ Digital Pan/Tilt/Zoom, continuous 8x zoom
14. Alarm/Events Triggering of events by integrated multiple-window motion detection, temperature sensor, notification over email, FTP, IP telephony (VoIP, SIP), visual/acoustic alarm, pre-and post alarm images
15. Audio Optional via ExtlIO, lip-synchronous audio, two-way speaker, audio recording
16. Interfaces Ethernet 10/100, USB, MxBus
17. Security User-/Group management, HTTPS/SSL, IP address filter, IEEE 802.1x, intrusion detection, digital image signature
18. Certificates EMC (EN50121-4, EN55022, EN55024, EN61000-6-2, FCC part 15B, AS.NZS3548)
19. Power Supply Power over Ethernet (802.3af): PoE class variable depending on operating mode; power consumption; typ. 3W; with PoE switch/MOBOTIX PoE – Adapter.
20. Operating Conditions IP65 (DIN EN 60529), -30 to +60 ºC (-22 to +140 ºF)
21. Dimensions n x H: 16 x 8.6 cm, weight: ca. 350 g
22. Standard Delivery Housing (high-resistance composites – PBT), white, shockproof polycarbonate dome (transparent), free choice of lenses, mounting parts, allen wrench, patch cable – 50cm, manual, software, 4 GB Micro SD (except Basic)

B. Fixed Dome Camera shall be the D24 MonoDome by Mobotix, or Owner approved equal.
C. The Contractor shall provide camera mounts and mounting hardware as described in the Contract Documents.
D. Contractor shall coordinate all camera views with the Owner prior to procuring cameras and camera lenses. Contractor responsible for performing all calculations necessary to provide optimal camera images in accordance with Owner’s guidance. All camera images must be verified by the Owner or Owner’s representative prior to final adjustment.

2.5 DUAL VIEW FIXED DOME CAMERA
A. The Dual View Fixed Dome Camera shall meet or exceed the following specifications:
1. Lenses 22 to 135mm format Horizontal angel 90º to 15 º
2. Sensitivity Color: 1 lux (t=1/60s), 0.05 lux (t=1/1s) B/W: 0.1 lux (t=1/60s), 0.005 lux (t=1/1s)
3. Sensors 2 x ½” CMOS, progressive scan
4. Max. Image Resolution Color: 2048 x 1536 (3 MEGA) Black/White: 1280 x 960 (MEGA)
5. Image Format 2048 x 1536, 1280 x 960, 1024 x 768, 800 x 600, 768 x 576 (D1), 704 x 576 (TV-PAL), 640 x 480, 384 x 288, 352 x 288, 320 x 240, 160 x 120; free image format selection (e.g. 1000 x 200 for skyline)
6. Max Frame Rate VGA: 16 fps, TV-PAL: 12 fps, MEGA 6 fps, (M-JPEG) (Live/Recording) 3MEGA: 4 fps
7. Video Stream (MxPEG) VGA: 30 fps, TV-PAL: 24 fps, MEGA: 14 fps, (Live/Recording) 3MEGA: 10 fps
8. Image Compression MxPEG, M-JPEG, JPEG, H.263 (only Video-VoIP)
9. Internal DVR SD slot (up to 32GB), 16GB internal (Sec-R16)
10. External Storage Directly on NAS and PC/Server without additional recording software
11. Software (Inclusive) Video management software MxEasy, Control room software MxControlCenter
12. Image Processing Backlight compensation, automatic white balance, image distortion correction, video sensor (motion detection)
13. Virtual PTZ Digital Pan/Tilt/Zoom, continuous 8x zoom
14. Alarm/Events Triggering of events by integrated multiple-window motion detection, temperature sensor, notification over email, FTP, IP telephony (VoIP, SIP), visual/acoustic alarm, pre-and post alarm images
15. Audio Integrated microphone and speaker, Line-In/Line-Out, lip-synchronous audio, two-way speaker, audio recording
16. Interfaces Ethernet 10/100, ISDN, RS232, 3 x In, 1 x Out
17. Video Phone VoIP, SIP, two-way speaker, remote control via DTMF signaling, event notification
18. Security User-/Group management, HTTPS/SSL, IP address filter, IEEE 802.1x, intrusion detection, digital image signature
19. Certificates EMC (EN55022, EN55024, EN61000-6-2, FCC part 15B, AS.NZS3548)
20. Power Supply Power over Ethernet (802.3af; Class 0), Netpower- Adapter, typ. 4W. COLLEGE PROVIDES POE ETHERNET SWITCH
21. Operating Conditions IP54/IP65 (without/with wall mount), -30 to +60 °C (-22 to +140 °F)
22. Dimensions n x H: 20.1 x 11 cm, weight: ca. 650 g
23. Standard Delivery Housing (high-resistance composites – PBT), white, shockproof polycarbonate dome (transparent), free choice of lenses, mounting parts, allen wrench, patch cable – 50cm, manual, software, 4 GB Micro SD (except Basic)

B. Dual View Fixed Dome Camera shall be the D12 DualDome by Mobotix, or Owner approved equal.
C. The Contractor shall provide camera mounts and mounting hardware as described in the Contract Documents.
D. Contractor shall coordinate all camera views with the Owner prior to procuring cameras and camera lenses. Contractor responsible for performing all calculations necessary to provide optimal camera images in accordance with Owner’s guidance. All camera images must be verified by the Owner or Owner’s representative prior to final adjustment.

PART 3 - EXECUTION

3.1 GENERAL
A. The Contractor shall install all system components and appurtenances in accordance with the manufacturer’s instructions, ANSI C2, and shall furnish all necessary interconnections, services, and adjustments required for a complete and operable system as specified. Control signals, communications, and data transmission lines grounding shall be installed as necessary to preclude ground loops, noise, and surges from affecting system operation. Equipment, materials, installation, workmanship, inspection, and testing shall be in accordance with manufacturers’ recommendations and as modified herein.
1. Consult the manufacturer’s installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation. Refer to the Riser/Connection diagram for all schematic system installation/termination/wiring data.
2. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., sensors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.
B. Current Site Conditions: The Contractor shall visit the site and verify that site conditions are in agreement with the design package. The Contractor shall report all changes to the site or conditions that will affect performance of the system to the Owner in a report as defined in paragraph Group II Technical Data Package. The Contractor shall not take any corrective action without written permission from the Owner.
C. Conduit and Wire: Refer to 280513 – Conductors and Cables for Electronic Security

3.2 CLOSED CIRCUIT TELEVISION
A. Installation: The Contractor shall install all system components including Owner furnished equipment, and appurtenances in accordance with the manufacturer’s instructions, ANSI C2, and shall furnish all necessary connectors, terminators, interconnections, services, adjustments and licenses required for a complete and operable video system.
B. Interconnection Video Equipment: The Contractor shall connect signal paths between video equipment of 250’ or less with Cat 6 cable. Cat 6 cables shall be terminated to a Cat 6 RJ-45 Patch Panel (See OIT Cable Standards) Cables shall be as short as
practicable for each signal path without causing strain at the connectors. Rack mounted equipment on slide mounts shall have cables of sufficient length to allow full extension of the slide rails from the rack.

C. Cameras: The Contractor shall install the cameras with the proper focal length lens as indicated for each zone; connect power and signal lines to the camera; set cameras with fixed iris lenses to the proper f-stop to give full video level; aim camera to give field of view as needed to cover the alarm zone; aim fixed mount cameras installed outdoors facing the rising or setting sun sufficiently below the horizon to preclude the camera looking directly at the sun; focus the lens to give a sharp picture over the entire field of view; and synchronize all cameras so the picture does not roll on the monitor when cameras are selected.

D. Video Recording Equipment: The Contractor shall install the video recording equipment as shown and as specified by the manufacturer; connect video signal inputs and outputs as shown and specified; connect alarm signal inputs and outputs as shown and specified; and connect video recording equipment to AC power. **THIS IS COLLEGE PROVIDED EQUIPMENT. ALL CONNECTIONS ARE MADE VIA COLLEGE PROVIDED MCFNET NETWORK**

E. Video Signal Equipment: The Contractor shall install the video signal equipment as specified by the manufacturer and as shown; connect video or signal inputs and outputs as shown and specified; terminate video inputs as required; connect alarm signal inputs and outputs as required; connect control signal inputs and outputs as required; and connect electrically powered equipment to AC power.

F. System Start Up: The Contractor shall not apply power to the CCTV system until the following items have been completed:
   1. CCTV system equipment items and DTM have been set up in accordance with manufacturer's instructions.
   2. A visual inspection of the CCTV system has been conducted to ensure that defective equipment items have not been installed and that there are no loose connections.
   3. System wiring has been tested and verified **PER OIT COLLEGE CABLE STANDARDS as correctly connected as indicated.**
   4. All system grounding and transient protection systems have been verified as properly installed and connected as indicated.
   5. Power supplies to be connected to the system have been verified as the correct voltage, phasing, and frequency as indicated. There may be no power supply needed, as the cameras are POE devices.
   6. Satisfaction of the above requirements shall not relieve the Contractor of responsibility for incorrect installation, defective equipment items, or collateral damage as a result of Contractor work/equipment.

### 3.3 Wireline Data Transmission (See Montgomery College OIT Cable Standards)

A. **Installation:** The Contractor shall install all system components including Owner furnished equipment, and appurtenances in accordance with the manufacturer's instructions, ANSI C2 and as shown, and shall furnish all necessary connectors, terminators, interconnections, services, and adjustments required for a complete and operable data transmission system.

B. **Identification and Labeling:** The Contractor shall supply permanent identification labels for each cable at each end that will appear on the as-built drawings. The labeling format shall be identified and a complete record shall be provided to the Owner with the final documentation. Each cable shall be identified by type or signal being carried and termination points. The labels shall be printed on letter size label sheets that are self laminated vinyl that can be printed from a computer data base or spread sheet. The labels shall be E-Z code WES12112 or equivalent.
   1. The Contractor shall provide all personnel, equipment, instrumentation, and supplies necessary to perform all testing.
C. Transient Voltage Surge Suppressors (TVSS): The Contractor shall mount TVSS within 3 m (118 in) of equipment to be protected inside terminal cabinets or suitable NEMA 1 enclosures. Terminate off Montgomery premise conductors on input side of device. Connect the output side of the device to the equipment to be protected. Connect ground lug to a low impedance earth ground (less than 10 ohms) via Number 12 AWG insulated, stranded copper conductor.

D. Contractor’s Field Test: The Contractor shall verify the complete operation of the data transmission system during the Contractor’s Field Testing. Field test shall include a bit error rate test. The Contractor shall perform the test by sending a minimum of 1,000,000 bits of data on each DTM circuit and measuring the bit error rate. The bit error rate shall not be greater than one (1) bit out of each 100,000 bits sent for each dial-up DTM circuit, and one (1) bit out of 1,000,000 bits sent for each leased or private DTM circuit. The Contractor shall submit a report containing results of the field test.

E. Acceptance Test and Endurance Test: The wire line data transmission system shall be tested as a part of the completed IDS and EECS during the Acceptance test and Endurance Test as specified.

F. Identification and Labeling: The Contractor shall supply identification tags or labels for each cable. Cable shall be labeled at both end points and at intermediate hand holes, manholes, and junction boxes. The labeling format shall be identified and a complete record shall be provided to the Owner with the final documentation. Each cable shall be identified with type of signal being carried and termination points.

3.4 VIDEO SURVEILLANCE SYSTEM INSTALLATION
   A. Install cameras level and plumb.
   B. Install tamper switches on components indicated to receive tamper switches, arranged to detect unauthorized entry into system component enclosures, and mounted in self-protected, inconspicuous positions.
   C. Identify system components, wiring, cabling, and terminals according to Division 26 Section "Identification of Electrical Systems."

3.5 PROGRAMMING
   A. Coordinate with College OIT

3.6 FIELD QUALITY CONTROL
   A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field assembled components and equipment installation and supervise pretesting, testing, and adjusting of video surveillance equipment.
   B. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.
   C. Pretesting: Refer to 280500, Part V

3.7 ADJUSTING
   A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions and to optimize performance of the installed equipment. Tasks shall include, but are not limited to, the following:
      1. Check cable connections.
      2. Check proper operation of cameras and lenses. Verify operation of auto-iris lenses and adjust back-focus as needed.
      3. Adjust all preset positions; consult Owner's personnel.
4. Recommend changes to cameras, lenses, and associated equipment to improve Owner's utilization of video surveillance system.
5. Provide a written report of adjustments and recommendations.

3.8 CLEANING
A. Clean installed items using methods and materials recommended in writing by manufacturer.
B. Clean video surveillance system components, including camera-housing windows, lenses, and monitor screens.

END OF SECTION 282300
SECTION 283111 – ADDRESSABLE FIRE DETECTION AND ALARM SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY
A. This Section includes fire alarm systems. Provide all materials, labor, coordination, additional design, phasing, and all incidentals required to provide a complete and operable fire alarm and mass notification system as shown in the drawings and specifications and to the satisfaction of the owner and engineer.
B. Provide system internal provision for future interface to the security system related to the release of egress door upon building evacuation alarms.
C. Provide system provisions for interface to the Mass Notification System. Coordinate all interconnections and functions with the Mass Notification System.

1.03 DEFINITIONS
A. FACP: Fire alarm control panel.
B. LED: Light-emitting diode.
C. NICET: National Institute for Certification in Engineering Technologies.
D. Definitions in NFPA 72 apply to fire alarm terms used in this Section.

1.04 SYSTEM DESCRIPTION
A. Non-coded, addressable system; multiplexed signal transmission dedicated to fire alarm service only. All buildings shall be provided with new Simplex 4100 ES fire alarm control panels as shown on the drawings.

1.05 PERFORMANCE REQUIREMENTS
A. Comply with NFPA 72.
B. Fire alarm signal initiation shall be by one or more of the following devices:
   2. Smoke detectors.
   3. Verified automatic alarm operation of smoke detectors.
   5. Automatic sprinkler system water flow.
   6. Smoke evacuation system initiated by smoke detector (where applicable).
   7. Hood fire suppression system (where applicable).
C. Fire alarm signal shall initiate the following actions:
   1. Alarm notification appliances shall operate continuously.
   2. Identify alarm at the FACP and remote annunciator(s).
   3. Transmit an alarm signal to the remote alarm receiving station.
   4. Transmit an alarm signal to the building management system via BACNet.
   5. Activate voice/alarm communication system.
   6. Initiate the digital alarm communicating transmitter (DACT).
   7. Switch heating, ventilating, and air-conditioning equipment controls to fire alarm mode (where applicable).
   8. Record events in the system memory.
   9. Record events by the system printer.

D. Supervisory signal initiation shall be by one or more of the following devices or actions:
   1. Operation of a fire-protection system valve tamper switch.
   2. Operation of a duct mounted smoke detector.

E. System trouble signal initiation shall be by one or more of the following devices or actions:
   1. Open circuits, shorts and grounds of wiring for initiating device, signaling line, and notification-appliance circuits.
   2. Opening, tampering, or removal of alarm-initiating and supervisory signal-initiating devices.
   3. Loss of primary power at the FACP.
   4. Ground or a single break in FACP internal circuits.
   5. Abnormal ac voltage at the FACP.
   6. A break in standby battery circuitry.
   7. Failure of battery charging.
   8. Abnormal position of any switch at the FACP or annunciator.

F. System Trouble and Supervisory Signal Actions: Ring trouble bell and annunciate at the FACP and remote annunciator(s). Record the event on system printer.

1.06 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:
   1. Shop Drawings shall be prepared by persons with the following qualifications:
      a. Trained and certified by manufacturer in fire alarm system design.
      b. Fire alarm certified by NICET, minimum Level III.
   2. System Operation Description: Detailed description for this Project, including method of operation and supervision of each type of circuit and sequence of operations for manually and automatically initiated system inputs and outputs. Manufacturer's standard descriptions for generic systems are not acceptable.
   3. Device Address List: Coordinate with final system programming.
4. System riser diagram with device addresses, conduit sizes, and cable and wire types and sizes.

5. Wiring Diagrams: Power, signal, and control wiring. Include diagrams for equipment and for system with all terminals and interconnections identified. Show wiring color code.


7. Duct Smoke Detectors: Performance parameters and installation details for each detector, verifying that each detector is listed for the complete range of air velocity, temperature, and humidity possible when air-handling system is operating.

8. Ductwork Coordination Drawings: Plans, sections, and elevations of ducts, drawn to scale and coordinating the installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, the detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.

9. Voice/Alarm Signaling Service: Equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram. Include cut sheets and layout of microphone cabinet with selector switches being provided adjacent to the fire alarm annunciator panel.

10. Floor Plans: Indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.

11. Knox-Vault (Box): Provide cut sheets, installation instructions and monitoring module connection to fire alarm system.

C. Qualification Data: For Installer.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For fire alarm system to include in emergency, operation, and maintenance manuals. Comply with NFPA 72, Appendix A, recommendations for Owner's manual. Include abbreviated operating instructions for mounting at the FACP.

F. Submittals to Authorities Having Jurisdiction: In addition to distribution requirements for submittals specified in Division 1 Section "Submittals," make an identical submittal to authorities having jurisdiction. To facilitate review, include copies of annotated Contract Drawings as needed to depict component locations. Resubmit if required to make clarifications or revisions to obtain approval. On receipt of comments from authorities having jurisdiction, submit them to Owner for review. Include proposed graphic annunciator panel within the submittal.

G. Documentation:

1. Approval and Acceptance: Provide the "Record of Completion" form according to NFPA 72 to Owner, and authorities having jurisdiction.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 72, Article 100, by a testing agency acceptable to authorities having jurisdiction.
jurisdiction, and marked for intended use.

1.08 WARRANTY

A. Warranty Period and Coverage: Two years from date of Substantial Completion. Warranty shall cover manufacturer’s standard form in which manufacturer and installer agree to repair or replace system devices and equipment that fail in materials or workmanship within specified warranty period. Warranty work shall include all labor on a 24 hour per day, 7 days per week basis.

B. Provide complete system inspection and testing every 6 months, after the initial installation, testing, and inspection, for the duration of the warranty. Submit to the College a written report of the inspection. Correct all deficiencies found during the inspection and testing of the system.

C. All warranty work shall be provided to the College at no additional cost.

1.09 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but not less than 1 unit.
2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but not less than 1 unit.
3. Smoke and Fire Detectors: Quantity equal to 10 percent of amount of each type installed, but not less than 1 unit of each type.
4. Detector Bases: Quantity equal to 2 percent of amount of each type installed, but not less than 1 unit of each type.
5. Keys and Tools: One extra set for access to locked and tamperproofed components.
6. Audible and Visual Notification Appliances: One of each type installed.
7. Fuses: Two of each type installed in the system.

B. In addition to the items listed above, provide the following audible, visual, and combination audible/visual devices inclusive of labor and materials to install after final walk-through by the Fire Marshall:

1. AR: 4 audible; 4 visual; 4 combination audible/visual.
2. CS: 4 audible; 4 visual; 4 combination audible/visual.
3. HU: 8 audible; 4 visual; 8 combination audible/visual.
4. MU: 4 audible; 4 visual; 4 combination audible/visual.
5. PE: 10 audible; 5 visual; 10 combination audible/visual.
6. TC: 8 audible; 4 visual; 8 combination audible/visual.

Devices shall be installed in locations as directed by Fire Marshal and shall include all cutting, patching, and finishing of all walls and/or ceilings. All unused devices shall be turned over to the Owner for use as spares.
2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following, no substitution permitted:

1. Fire Alarm System Equipment:

   a. SimplexGrinnell LP; a Tyco International Company. Contact Dave Lewis at 240-786-2894 (davlewis@simplexgrinnell.com) for all fire alarm system work at Montgomery College.

2. Wire and Cable:

   a. Comtran Corporation.
   b. Helix/HiTemp Cables, Inc.; a Draka USA Company.
   c. Rockbestos-Suprenant Cable Corporation; a Marmon Group Company.
   d. West Penn Wire/CDT; a division of Cable Design Technologies.

2.02 FIRE ALARM CONTROL PANEL

A. General Description:

1. Simplex Model: 4100 ES Series.
2. Modular, power-limited design with electronic modules, UL 864 listed.
3. Addressable microprocessor based fire alarm control panel.
4. Addressable initiation devices that communicate device identity and status.

   a. Smoke sensors shall additionally communicate sensitivity setting and allow for adjustment of sensitivity at the FACP.
   b. Temperature sensors shall additionally test for and communicate the sensitivity range of the device.

5. Addressable control circuits for operation of mechanical equipment.
6. Addressable notification appliances.

B. Alphanumeric Display and System Controls: Arranged for interface between human operator at the FACP and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, three lines of 80 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands; and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.

C. Circuits:


   a. System Layout: Install no more than 50 addressable devices on each signaling line circuit.

2. Notification-Appliance Circuits: NFPA 72, Class B, Style Y.
3. Actuation of alarm notification appliances, emergency voice communications, annunciation, elevator recall, and activation of suppression system (where applicable) shall occur within 10 seconds after the activation of an initiating device.

D. Smoke-Alarm Verification:

1. Initiate audible and visible indication of an "alarm verification" signal at the FACP.
2. Activate a listed and approved "alarm verification" sequence at the FACP and the detector.
3. Record events by the system printer.
4. Sound general alarm if the alarm is verified.
5. Cancel FACP indication and system reset if the alarm is not verified.

E. Notification-Appliance Circuit: Operation shall sound in a temporal pattern, complying with ANSI S3.41.

F. Power Supply for Supervision Equipment: Supply for audible and visual equipment for supervision of the ac power shall be from a dedicated dc power supply, and power for the dc component shall be from the ac supply.

G. Alarm Silencing, Trouble, and Supervisory Alarm Reset: Manual reset at the FACP and remote annunciators, after initiating devices are restored to normal.

1. Silencing-switch operation halts alarm operation of notification appliances and activates an "alarm silence" light. Display of identity of the alarm zone or device is retained.
2. Subsequent alarm signals from other devices or zones reactivate notification appliances until silencing switch is operated again.
3. When alarm-initiating devices return to normal and system reset switch is operated, notification appliances operate again until alarm silence switch is reset.

H. Walk Test: A test mode to allow one person to test alarm and supervisory features of initiating devices. Enabling of this mode shall require the entry of a password. The FACP and annunciators shall display a test indication while the test is underway. If testing ceases while in walk-test mode, after a preset delay, the system shall automatically return to normal.

I. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and control of changes in those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and make a print-out of the final adjusted values on the system printer.

J. Transmission to Remote Alarm Receiving Station

1. Provide digital alarm communication transmitter (DACT) for supervisory and alarm signals via two telephonic lines. Transmitted information shall include alarm initiating device and location, similar to information listed on the control panel LCD display.
2. Provide all network ports and RS 232 jacks.
3. Provide BACNet remote annunciation provisions.
K. Voice/Alarm Signaling Service: A central emergency communication system with redundant microphones, preamplifiers, amplifiers, and tone generators provided as a special module that is part of the FACP.

1. Indicated number of alarm channels for automatic, simultaneous transmission of different announcements to different zones, or for manual transmission of announcements by use of the central-control microphone. Amplifiers shall be UL 1711 listed.
   a. Allow the application of and evacuation signal to indicated number of zones and, at the same time, allow voice paging to the other zones selectively or in any combination.
   b. Programmable tone and message sequence selection.
   c. Standard digitally recorded messages for "Evacuation" and "All Clear."
   d. Generate tones to be sequenced with audio messages of the type recommended by NFPA 72 and that are compatible with tone patterns of the notification-appliance circuits of the FACP.

2. Notification-Appliance Circuits: NFPA 72, Class B.


4. Preamplifiers, amplifiers, and tone generators shall automatically transfer to backup units, on primary equipment failure.

5. Amplifiers shall be adequately sized to power all speakers at 0.5 watt tap setting.

6. Speaker zones shall include as a minimum the following: elevator cabs, egress stairways, building exterior, each floor and an “all call” zone.

L. Ports: Ports shall be RS-232 for connection to external peripheral equipment. The port shall allow remote access to the FACP for programming changes and system diagnostic routines. Access by a remote terminal shall be by encrypted password algorithm.

M. Printout of Events: On receipt of signal, print alarm, supervisory, and trouble events. Identify zone, device, and function. Include type of signal (alarm, supervisory, or trouble), and date and time of occurrence. Differentiate alarm signals from all other printed indications. Also print system reset event, including the same information for device, location, date, and time. Commands initiate the printing of a list of existing alarm, supervisory, and trouble conditions in the system and a historical log of events.

N. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signal and supervisory signal shall be powered by the 24-V dc source.

1. The alarm current draw of the entire fire alarm system shall not exceed 80 percent of the power-supply module rating.

O. Secondary Power: 24-V dc supply system with batteries and automatic battery charger and an automatic transfer switch.

2. Battery and Charger Capacity: Comply with NFPA 72.
P. Surge Protection:
   1. Install surge protection on normal ac power for the FACP and its accessories. Surge protection shall be integral to the FACP.

Q. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

R. Security System Interface: Addressable relays for interface to the existing or future security system.

2.03 MANUAL FIRE ALARM BOXES

A. Description: UL 38 listed; finished in red with molded, raised-letter operating instructions in contrasting color. Station shall show visible indication of operation. Mounted on recessed outlet box; if indicated as surface mounted, provide manufacturer's surface back box.

   1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type. With integral addressable module, arranged to communicate manual-station status (normal, alarm, or trouble) to the FACP.
   2. Station Reset: Key- or wrench-operated switch.

2.04 SYSTEM SMOKE DETECTORS

A. General Description:

   1. UL 268 listed, operating at 24-V dc, nominal.
   2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
   3. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. Provide terminals in the fixed base for connection of building wiring.
   4. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
   5. Integral Visual-Indicating Light: LED type. Indicating detector has operated status.
   6. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.
   7. Photoelectric Smoke Sensors shall have 7 selectable sensitivity levels programmed and monitored from the FACP.
   8. Detectors shall combine photoelectric smoke sensing and heat sensing technologies. An alarm shall be determined by either smoke detection, with selectable sensitivity from 0.65 to 11.6 %/meter obscuration; or heat detection, selectable as fixed temperature or fixed with selectable rate-of-rise; or based on an analysis of the combination of smoke and heat activity.

B. Duct Smoke Detectors:
1. Photoelectric Smoke Detectors:
   a. Sensor: LED or infrared light source with matching silicon-cell receiver.
   b. Detector Sensitivity: Between 2.5 and 3.5 percent/foot smoke obscuration when tested according to UL 268A.

2. UL 268A listed, operating at 24-V dc, nominal.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
4. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. The fixed base shall be designed for mounting directly to the air duct. Provide terminals in the fixed base for connection to building wiring.
5. Self-Restoring: Detectors shall not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type. Indicating detector has operated status.
7. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP. Provide with remote test switch and indicator light when indicated on the drawings.
8. Each sensor shall have multiple levels of detection sensitivity.
9. Sampling Tubes: Design and dimensions as recommended by manufacturer for the specific duct size, air velocity, and installation conditions where applied.

2.05 HEAT DETECTORS

A. General: UL 521 listed.

B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 degree F or rate-of-rise of temperature that exceeds 15 degree F per minute, unless otherwise indicated.
   2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

2.06 NOTIFICATION APPLIANCES

A. Description: Equipped for mounting as indicated and with screw terminals for system connections.
   2. All notification appliances shall be addressable.

B. Visible Alarm Devices: Xenon strobe lights listed under UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "ALERT" is engraved in minimum 1-inch-high letters on the lens.
1. Rated Light Output: 15 candela minimum unless otherwise indicated.
2. Adjustable Candela Output: Field adjustable at the device or programmable from the FACP when the device dip switch is set to “Auto”.

C. Voice/Tone Speakers:

1. UL 1480 listed.
2. Low-Range Units: Rated 1 to 2 W.
3. Mounting: Flush, semi-recessed, or surface mounted; bidirectional as indicated.
4. Matching Transformers: Tap range matched to the acoustical environment of the speaker location.

2.07 REMOTE FIREFIGHTERS' COMMUNICATION SERVICE

A. Dedicated, supervised, push-to-talk microphone voice communication links located at the FACP and remote annunciator panel(s) as shown on drawings. Supervised telephone lines shall be connected to talk circuits. Activation of either microphone activates each individual zone or all speakers for announcements, depending on which zone activation buttons have been selected. Microphone shall have higher priority than evacuation message. Provide the microphone in a factory red finish glass door cabinet mounted adjacent to the remote annunciator.

2.08 REMOTE ANNUNCIATOR

A. Description: Duplicate annunciator functions of the FACP for alarm, supervisory, and trouble indications. Also duplicate manual switching functions of the FACP, including acknowledging, silencing, resetting, and testing.

1. Mounting: Surface cabinet, NEMA 250, Class 1 at the Main Lobby (locations identified on the floor plans).

B. Display Type and Functional Performance: Alphanumeric display same as the FACP. Controls with associated LEDs permit acknowledging, silencing, resetting, and testing functions for alarm, supervisory, and trouble signals identical to those in the FACP.

C. Annunciator panel shall be smoked Plexiglas, back lighted with appropriate LEDs. Provide floor plan graphics using photo emulsion material to duplicate floor plans.

D. Submit annunciator panel shop drawing to Fire Marshal for their review and approval, and obtain their final approval, prior to manufacturing annunciator panel.

2.09 ADDRESSABLE INTERFACE DEVICE

A. Description: Microelectronic monitor module listed for use in providing a system address for listed alarm-initiating devices for wired applications with normally open contacts.

B. Integral Relay: Capable of providing a direct signal to the elevator controller to initiate elevator recall and to a circuit-breaker shunt trip for power shutdown.

2.10 SYSTEM PRINTER
A. UL Listed to Standard 864 system printer. Remote printer, high resolution, 24-pin, 
dot matrix bi-directional printing, Model 4190-9013 with stand. Provide printer stand 
for printer and paper supply.

2.11 WIRE AND CABLE

A. Wire and cable for fire alarm systems shall be UL listed and labeled as 
complying with NFPA 70, Article 760.

B. Signaling Line Circuits: Twisted, shielded pair, not less than No. 18 AWG and size 
as recommended by system manufacturer.

1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70 Article 760, 
Classification CI, for power-limited fire alarm signal service. UL listed as 
Type FPL, and complying with requirements in UL 1424 and in UL 2196 for 
a 2-hour rating.

C. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, 
color-coded insulation.

1. Low-Voltage Circuits: No. 16 AWG, minimum.
2. Line-Voltage Circuits: No. 12 AWG, minimum.
3. Multi-conductor Armored Cable: NFPA 70 Type MC, copper conductors, 
TFN/THHN conductor insulation, copper drain wire, galvanized steel armor, 
red striped, UL listed for fire alarm and cable tray installation, plenum 
rated, and complying with requirements in UL 2196 for a 2-hour rating.

PART 3 - EXECUTION

3.01 PHASING OF THE WORK

A. For each building, the new fire alarm and mass notification system shall be 
completely installed, tested, commissioned, and accepted by the college and the 
Authority having Jurisdiction (AHJ) prior to removal of the existing fire alarm 
system. Provide required reprogramming of all other campus building fire alarm 
control panels each time a new building fire alarm control panel is added to or 
removed from the main campus system.

B. Remove all existing fire alarm system components only after each new building 
fire alarm system is fully operational in accordance with the above section.

C. Provide project specific phasing plan for review to the college for approval prior to 
start of work.

D. Work can be performed simultaneously on multiple buildings. However, all 
commissioning and main campus system programming shall be performed on 
only 1 building at a time.

E. Initiate a fire watch whenever existing system is not operational. Contractor shall 
include staff as required for fire watch and shall coordinate exact requirements 
with AHJ and College. Remove existing fire alarm system components complete 
after replacement components are installed, tested, approved and fully 
operational. Reuse existing outlets for the installation of new fire alarm system 
devices such as manual striking stations where possible (coordinate with 
College which device locations can be reused – if any). Reuse existing concealed 
raceways in wall to these outlets for the provision of new system wiring. This 
process will avoid use of exposed wiring on existing finished surfaces.

F. At the completion of the work, inspect and test system.

3.02 PERMIT DRAWINGS

A. Prepare and submit all required drawings and associated documentation and
calculations to the City of Rockville as required for their permitting procedure.

3.03 EQUIPMENT INSTALLATION
A. Smoke or Heat Detector Spacing:
   1. Smooth ceiling spacing shall not exceed the rating of the detector.
   2. Spacing of heat detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas, shall be determined according to Appendix A in NFPA 72.
   3. Spacing of heat detectors shall be determined based on guidelines and recommendations in NFPA 72.
B. HVAC: Locate detectors not closer than 3 feet from air-supply diffuser or return-air opening.
C. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of the duct. Provide remote test station with indicator light where indicated on the drawings.
D. Remote Status and Alarm Indicators: Install near each smoke detector, duct smoke detector controlling smoke dampers, and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.
E. Audible Alarm-Indicating Devices: Install as indicated on the drawings.
F. Visible Alarm-Indicating Devices: Install as indicated on the drawings.
G. Device Location-Indicating Lights: Locate in public space near the device they monitor.
H. FACP: Surface mount with tops of cabinets not more than 72 inches above the finished floor.
I. Annunciator: Install with top of panel not more than 72 inches above the finished floor. Surface mount the cabinet at the Second Floor and fabricate a chase above the cabinet to conceal all wiring to the annunciator panel and simulate the installation of a flush cabinet. Coordinate final arrangement with the College.
J. Install the system printer on stand adjacent to the fire alarm control panel.

3.04 WIRING INSTALLATION
A. Install wiring according to the following:
   1. NECA 1.
   2. TIA/EIA 568-A.
B. Wiring Method: Install wiring in metal raceway according to Division 26 Section "Raceways". Provide raceways and cables in accordance with the following:
   1. Major system distribution and Risers: Provide conductor in red painted metal raceway (IMC) for all system wiring between the FACP, voice evacuation control panel (VACP), all Fire Alarm Terminal Cabinets (FATC) and Fire Alarm Extender Panels (FAEP) as indicated on the drawings. Terminate all system conductors on terminal strips in each FATC. Provide a minimum of 50 percent spare conductors for alarm initiating circuits, alarm notification circuits and other control wiring associated with the fire alarm system. Terminate spare conductors on terminal strips in each FATC. Label each system conductors terminating in the FACT and provide a typed legend in the cover of the FATC identifying all active and spare conductors. These conductors will be considered and labeled on the drawing as the back bone of the system and are intended to meet future system wiring needs.
   2. Lateral distribution system: Provide red painted MC Cable from the FACT to the system alarm initiating devices, alarm notification appliances and control wiring associated with the fire alarm system.
Conceal cables in finished spaces. Provide conductors in metal raceway for exposed wiring.

3. Annunciator Panel: Provide system conductors in red painted metal raceway (IMC) from the FACP to the remote annunciator panel. Provide a minimum of 50 percent spare conductors in the raceway and terminate spare conductors on terminal strips.

4. Firefighter's communication station: Provide system conductors in metal raceway from the FACP to the remote station located adjacent to the graphic annunciator panel(s).

5. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system. This system shall not be used for any other wire or cable.

C. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

D. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

E. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and a different color-code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

F. Wiring to Remote Alarm Transmitting Device: 1-inch conduit between the FACP and the remote equipment. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.05 IDENTIFICATION
A. Identify system components, wiring, cabling, and terminals according to Division 26 Section "Basic Electrical Materials and Methods."
B. Install instructions frame in a location visible from the FACP.
C. Paint existing power-supply disconnect switch or circuit breaker red and label "FIRE ALARM."

3.06 GROUNDING
A. Ground the FACP and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to FACP.

3.07 QUALIFICATIONS
A. The existing fire alarm system is maintained by Simplex Grinnell (a Tyco International Company). The performance of all additional fire alarm system design, shop drawing submittals, calculations, programming, commissioning, and demonstration shall be performed by Simplex Grinnell (a Tyco International Company), contact is Dave Lewis at 240-786-2894 (davlewis@simplexgrinnell.com). No substitutions are allowed. It is the contractor’s responsibility to contact this organization and to include all associated cost in the bid price.
3.08 FIELD QUALITY CONTROL
A. Manufacturer’s Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
B. Perform the following field tests and inspections and prepare test reports:
   1. Before requesting final approval of the installation, submit a written statement using the form for Record of Completion shown in NFPA 72.
   2. Perform each electrical test and visual and mechanical inspection listed in NFPA 72. Certify compliance with test parameters. All tests shall be conducted under the direct supervision of a NICET technician certified under the Fire Alarm Systems program at Level III.
   3. Visual Inspection: Conduct a visual inspection before any testing. Use as-built drawings and system documentation for the inspection. Identify improperly located, damaged, or nonfunctional equipment, and correct before beginning tests.
   4. Testing: Follow procedure and record results complying with requirements in NFPA 72.
   5. Test and Inspection Records: Prepare according to NFPA 72, including demonstration of sequences of operation by using the matrix-style form in Appendix A in NFPA 70.
C. Provide entire system demonstration after successful testing to include, but not be limited to, the following:
   1. For the Owner after completion of each building.
   2. For the Authority having Jurisdiction after completion of each building.
   3. For the Owner after completion of all buildings.
   4. For the Authority having Jurisdiction after completion of all buildings.
   5. Demonstrations shall include fire alarm and mass notification systems.

3.09 ADJUSTING
A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project outside normal occupancy hours for this purpose.
B. Follow-Up Tests and Inspections: After date of Substantial Completion, test the fire alarm system complying with testing and visual inspection requirements in NFPA 72. Perform tests and inspections listed for three monthly, and one quarterly, periods.
C. Annual Test and Inspection: One year after date of Substantial Completion, test the fire alarm system complying with the testing and visual inspection requirements in NFPA 72. Perform tests and inspections listed for monthly, quarterly, semiannual, and annual periods. Use forms developed for initial tests and inspections.

3.10 DEMONSTRATION AND TRAINING
A. Engage a factory-authorized service representative to train Owner’s maintenance personnel to adjust, operate, and maintain the fire alarm system, appliances, and devices. Refer to Section "Closeout Procedures."

END OF SECTION 283111