

APPENDIX A – DEPARTMENT OF HOUSING and RESIDENCE LIFE DESIGN STANDARDS

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010000 – Architectural - General

1. General Requirements

- A. Appendix A lists exceptions and additions to the Architecture and Engineering Design Standards for Building Technology (GT-Yellow Book) that have been adopted by the Georgia Tech Department of Housing and Residence Life (HRL) . Appendix A was developed in coordination with the Georgia Tech Offices of Campus Services, Infrastructure & Sustainability Design and Construction, and HRL. These standards are for the guidance of Architects, Engineers, and Builders in the technical design of new buildings and additions to buildings; and are to be used in conjunction with the GT Yellow Book. As in the Yellow Book, the Standards herein are minimum standards. Actual design should be consistent with the overall program, building quality, and scope of project. The design should be in context with, and in harmony with, the existing buildings on campus with sensitivity to the surrounding pallet of materials and colors.
- B. If the Architect and/or the Engineer desire to make any exceptions to the Design Standards, written approval from **both** the Office of Facilities Management Design and Construction and the HRL must be obtained. Electronic mail communication to request the exceptions is acceptable.
- C. Basis-of-Design Product: Where Basis-of-Design products are indicated, the intent is to identify products that meet the requirements of GT HRL for the specific use identified. A/E shall identify comparable products in project specifications to meet the procurement requirements for the specific project.

2. Typical Program Requirements

- A. Custodial Closets:
 - 1. Provide a custodial closet, sized per GT Yellow Book Standards, at each resident floor:
 - a. At traditional dormitory housing, with shared restroom / shower facilities, custodial closet to be accessed separately from restroom / shower area.
 - 2. Provide a centralized storage room at each residence building, sized appropriately for bulk storage of maintenance supplies and equipment.
 - 3. Where custodial supplies are stored, provide mechanical exhaust, discharging to exterior.
- B. Restroom Facilities:
 - 1. For laundry rooms, study rooms, administrative areas, and spaces used by persons not resident to the building, provide access to public restroom facilities, sized appropriately for the occupant load.
 - 2. In residence halls served by shared restroom / shower facilities, provide single occupant restroom facilities at each floor to accommodate transgendered residents, and visitors of the opposite sex. At least one restroom per building shall include shower facilities.

3. Lighting: At lavatories and along toilet/urinal rows, provide LED lighting within a gypsum wallboard cove, located at the wall/ceiling intersection. Cove shall be configured so that light source is shielded by either the profile of the cove itself, or ½”x ½” white plastic egg crate grille.
 4. Lavatory:
 - a. At shared restroom facilities, lavatory shall be comprised of solid surface counter and apron with integral solid surface sink bowls. Counter shall be supported by steel tubes, angles, and/or bracket framing adequate for the load and span. Provide solid surface apron at face of steel frame. Wood or light gauge framing for lavatory counters is not allowed. Lavatory counter shall be open below, with pipe socks installed at drains per requirements of current State Accessibility Code and ADAAG.
 - b. At Apartment and Suite Style Housing, provide solid surface counter with integral solid surface sink bowl. Counter shall be supported on steel angle frame comprised of 4” x 3” x ¼” angle support frame continuous at front, back and sides. Provide solid surface apron at face of angle frame. Anchor frame to wall directly to structure or to solid blocking secured to framing.
 5. Resident Supply Storage: In each shared restroom/shower room, provide open shelving, cubbies, or other approved storage configuration for resident’s use to store personal care products. Storage shall be fabricated from solid surface material, consistent with the lavatory, toilet partition, and shower enclosure.
 6. Shower Bench: Within the shower area, provide a bench, length sufficient for the number of shower stalls. Bench shall be supported from wall with steel tubes, angles, and/or brackets adequate for the load and span. Provide one coat/towel hook for each shower stall above the bench.
 7. Shower Stalls: Shower facilities shall be constructed in conformance to the current State Accessibility Code, ADAAG, and Fair Housing Standards where applicable.
 - a. At shared restroom facilities, provide individual shower stalls. Where space permits, provide partition walls to enclose stall, finished with ¼” solid surface paneling. Shower floor shall be either 2”x2” porcelain mosaic tile with waterproof membrane on sloped mortar bed, or one-piece preformed solid surface shower pan.
 - b. At apartment and suite style housing, provide one of the following, per specific project requirements:
 - 1) Bathtub: ¼” 3-piece solid surface surround. Acrylic construction bathtub units not allowed.
 - 2) Shower: Ceramic tile.
 8. At all restrooms, including single occupant facilities, floor drains shall be provided. Include trap primers for single occupant restrooms adjacent to shared restroom facilities.
 9. All kitchens: provide soffits to ceiling above all wall cabinets.
- C. Resident Life Storage: Where feasible, provide a minimum 5’ x 5’ storage closet at each residential floor for use by Resident Life staff.
- D. ADA typical and ADA+ (enhanced levels of pathways & accommodations for significant mobility impairment): Establish minimum standards, (if higher than code) for room types

(hearing impaired, wheel chair accessible, companion accommodations, etc.) and distribution within building layout.

E. Access Control:

1. See Voice Data, Access Control, and Door Hardware Sections for typical access control requirements.
2. Provide proximity card access control at main mechanical, electrical, data rooms, elevator control rooms, and roof access doors and hatches.
3. At stair wells used by residents to circulate between floors, where locking of doors is allowed by Life Safety Code and Authorities Having Jurisdiction, provide lockset with key access per floor to allow re-entry by residents.
4. Meet with GT HRL to confirm and document elevator security, ADA, ADA+, access control requirements and detailed hardware functionality during preliminary design and contract documents phases of the project.

3. Typical Interior Finishes

- A. Typical Finishes: The following schedule lists finishes typically specified for residential facilities. A/E team to review finish selections with GT HRL as well as the Campus Interior Designer / GT Facilities Management Design and Construction. Refer to Division 9 guidelines herein for specific product requirements.
- B. General Note: In flat slab concrete structures, where finished ceiling is the bottom surface of the floor slab above, skim coat with paint can be substituted for painted Gypsum Wallboard Ceilings.
- C. If exposed concrete is anticipated, provide adequate preparation and protection during construction to alleviate pits and dirt.

TYPICAL FINISH SCHEDULE

Room Type	Finish Material				Remarks
	Flooring	Base	Wall	Ceiling	
Residential Areas:					
Residence Rooms	LVT	Rubber Cove	GWB or match existing in renovations	GWB	
Corridors	LVT	Rubber Cove	GWB or match existing in renovations	GWB	Provide abuse-resistant paint at walls. Provide corner guards. Provide abuse resistant GWB at stud framed partitions.
Lobbies – Primary	Seamless Resilient Flooring, Carpet, or a combination.	Contingent on floor finish selected	GWB or match existing in renovations	GWB / ACT	Provide abuse-resistant paint at walls. Provide corner guards. Provide abuse resistant GWB at stud framed partitions. Provide Walk-off carpet at entrance.
Lobbies – Secondary	Walk-Off Mat Carpet Tile	Rubber Cove	GWB or match existing in renovations	GWB / ACT	Provide abuse-resistant paint at walls. Provide corner guards. Provide abuse-resistant GWB at stud framed partitions. Provide Walk-off mat insert at entrance.
Stair - Discharge level	Walk-Off Mat Carpet Tile	Rubber Cove	GWB or CMU (CMU preferred)	GWB / ACT	Provide Acoustical Wall Panels. Provide abuse-resistant paint. Provide abuse-resistant GWB at stud framed partitions.

Room Type	Finish Material				Remarks
	Flooring	Base	Wall	Ceiling	
Stair – Typical	Rubber (Treads, risers, landings)	Rubber Cove	GWB or CMU (CMU preferred)	GWB / ACT	Provide Acoustical Wall Panels. Provide abuse- resistant paint. Provide abuse resistant GWB at stud-framed partitions.
Restrooms / Shower Rooms – Shared	Porcelain Tile	Porcelain Tile – Coved	Ceramic tile	GWB (Epoxy Paint)	Floor sloped to drains; provide continuous waterproofing membrane at wet areas.
Restrooms – Single Occupant	Porcelain Tile	Porcelain Tile – Coved	Ceramic tile	GWB Washable ACT. (Epoxy Paint)	Continuous waterproofing at wet areas. Slope to floor drain where feasible.
Restrooms – public	Porcelain Tile	Porcelain Tile – Coved	CMU/GWB and/or Ceramic Tile	GWB (Epoxy Paint)	Use Epoxy coating system for all painted wall and ceiling finishes. Provide abuse resistant GWB at stud-framed partitions.
Common Areas:					
Learning Centers(Access not limited to building residents)	Carpet	Carpet	CMU/GWB	ACT	Abuse-resistant paint at walls. Provide abuse resistant GWB at stud- framed partitions.
Study Rooms / Lounges (Access limited to building residents)	Carpet	Carpet	CMU/GWB	GWB	Abuse-resistant paint at walls. Provide abuse resistant GWB at stud- framed partitions.

Room Type	Finish Material				Remarks
	Flooring	Base	Wall	Ceiling	
Student Kitchens	Porcelain tile / LVT, Project dependent	Porcelain Tile, coved / Rubber cove with LVT	GWB Or match existing in renovations	GWB	Floor tile minimum 8"x8". Abuse-resistant paint at walls. Provide abuse resistant GWB at stud-framed partitions. Provide floor drain.
Laundry	Seamless Resilient	Seamless Resilient Cove	GWB Or match existing in Renovations	GWB / ACT	Provide abuse resistant GWB at stud-framed partitions. – Provide floor drains.
Apartment / Suite Style Units (Staff and Student Occupied):					
Living Room	LVT	Rubber Cove	GWB	GWB	Coordinate with HRL per Project.
Entry / Kitchen	LVT / Tile	Rubber Cove	GWB Or match existing in Renovations	GWB	Coordinate with HRL per Project.
Bedroom/Closet	LVT	Rubber Cove	GWB Or match existing in Renovations	GWB	Coordinate with HRL per Project.
Bathrooms	Porcelain Tile	Porcelain tile- Coved	GWB Or match existing in Renovations	GWB	Use Epoxy coating system for all painted wall and ceiling finishes. Provide Solid surface surround at tub/shower.
Laundry/Utility	Solid Vinyl Plank / Tile	Rubber cove	GWB Or match existing in Renovations	GWB	

Room Type	Finish Material				Remarks
	Flooring	Base	Wall	Ceiling	
Administrative Areas:					
Offices	Carpet	Rubber cove	GWB	ACT	
Conference Rooms / Seminar Rooms	Carpet	Rubber cove	GWB	ACT	
Corridors	LVT	Rubber cove	GWB	ACT	
Copy / Break	Solid Vinyl Plank / Tile	Rubber cove	GWB	ACT	
Reception	Solid Vinyl Plank / Tile or Porcelain Tile	Rubber Cove or Porcelain Tile	GWB	ACT	Provide walk-off mat carpet insert at exterior doors / entrances.
Support Spaces:					
Electrical / Data Closets / Mechanical Rooms	Sealed Concrete	Rubber cove	CMU / GWB	Open to Structure (Painted)	
Storage Rooms	Sealed Concrete	Rubber cove	CMU / GWB	ACT / Open to Structure – (Painted)	Ceiling finish requirements vary with storage type. Confirm with GT HRL.

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013515 Sustainable Design

1. DESIGN REQUIREMENTS

- A. Coordinate recycling storage areas with GT HRL.
- B. Refer to Mechanical, Electrical and Plumbing sections of Appendix A for sub-metering requirements specific to Housing projects.
- C. Bicycle Storage – Indoor Bicycle Storage, is encouraged. Guideline for number of spaces is as follows:
 - 1. Long-term storage: 1 space per eight (8) beds;
 - 2. Short-term storage: 1 space per twenty (20) beds.
- D. Electric Scooters / Charging – Confirm with GT HRL the number of scooter charging stations and electric scooter parking areas required for the project.

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045600- Masonry Repairs / Tuck-pointing

- A. Tuck-pointing and masonry repair work is to be done only by qualified and experienced craftsmen. Project mock-ups are required to verify skills of craftsmen. General contractor shall be responsible for the training and selection of tuck-pointing / masonry repair specialists:

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064000- Architectural Woodwork

- A. Plywood Substrates shall be APA B-D, Group 1 faces as follows:
1. Grades:
 - a. Provide exterior grade plywood substrate for all base cabinets, with or without sinks.
 - b. Provide Exposure 1 Grade (Type 2 adhesive) for all wall cabinets.
 2. Faces:
 - a. Provide “B” face for exposed and semi-exposed surfaces to receive plastic laminate, melamine or paint finish.
 - b. Provide “D” face for unexposed surfaces.
 3. Plywood and plywood adhesive shall be made with no added urea formaldehyde.
 4. Particleboard, Medium Density Fiberboard (MDF) and other similar composite panel products are not acceptable substrates for Architectural Millwork in wet areas; MDF acceptable in study rooms or other non-wet areas.
- B. Hardware:
1. Drawer Pulls: Satin Stainless steel, U-shaped wire pull, 4” centers.
 2. Drawer Slides:
 - a. Mounting: Side Mount
 - b. Type: Full extension, steel ball bearing
 - c. Capacity: 100 lb. capacity or Heavy Duty, whichever is greater.
 3. Hinges: Concealed European-style, self-closing.
- C. Cabinet Construction:
1. Quality Grade: AWI Custom
 2. Cabinet Doors and Drawer Fronts: Flush Overlay
 3. Drawer Construction: Dovetail joints
- D. Solid Surface Fabrications:
1. Solid acrylic or polyester and acrylic resin, ½” thickness.
 - a. Approved Manufacturers:
 1. Corian
 2. Transolid
 3. Wilsonart
 2. Tensile Strength (ASTM D 638): 6,000 PSI minimum.
 3. Flexural Strength (ASTM D 790): 8,000 PSI minimum
 4. At restroom lavatory counters:
 - a. Fabricate backsplash with cove integral with counter top.
 - b. Sink bowls to be integral with counter top, of the same material and finish. (Note, bowl colors may not be available in same color and pattern as counter, bowl color to be compatible with surrounding counter).
 - c. Provide painted, galvanized support steel under counters.
 5. Shower Wall Panels:
 - a. Thickness: ¼” minimum
 - b. Substrate: Cementitious backer board, or other approved substrate for wet areas, with waterproofing system installed continuous with floor waterproofing, compatible with panel adhesive.
 6. Shower Pans: Ceramic Tile, typical. Solid Surface of same material as wall panels, one-piece

construction, if required by HRL on a per Project basis.

7. Restroom Partitions: Refer to Division 10 section for additional requirements for partitions assemblies fabricated with solid surface material.
8. Window Sills: Provide Solid Surface Window Sill Stools of min. $\frac{3}{4}$ " thickness with rounded corners and eased edges. Cultured marble or quartz may be considered on a per Project basis with HRL review and approval.

END OF SECTION

073126 – Slate Shingles (if applicable for renovation)

- A. Materials: Quarried Slate Shingles, grade A, with 3-color variegation in mix percentage to match existing roof. Provide fully self-adhered high temperature underlayment under entire slate installation. Based on Camara Slate Products Natural Vermont Slate, basis of design, 18” long slates, standard width mix 14”, 12”, 11”, 10”, 9”, and color mix standard on East Campus as follows:
- 1. Unfading Mottled Green and Purple: 33%
 - 2. Unfading Green; 33%
 - 3. Royal Purple: 33%
- B. Provide mock-up of appropriate size (1/4 of a square of roof area) to verify color mix.

END OF SECTION

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076000 – Flashing and Sheet Metal

- C. Material: Exposed sheet metal fabrications, including copings, fascia, hanging gutter and downspout assemblies, conductor boxes, scuppers and other flashing exposed to public view to be fabricated out of Aluminum. Copper is not to be used within 10 feet of grade, unless approved by GT HRL for historical renovation.
- D. Finish: Two Coat, shop applied Fluoropolymer finish.

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077233 – Roof Hatches

- A. Where stair access to roof is not practical, provide insulated aluminum hatch for access to roof.
- B. Where hatch is not in an area accessible to students, provide either a fixed wall-mounted or ship's ladder. Provide side rails and safety cages per requirements of Authorities Having Jurisdiction.
- C. Hardware: Prep hatch to accept electronic lock hardware with access control.
- D. Insulated roof hatch with integral ladder and concealing door preferred at all locations where space allows.

END OF SECTION

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081000- Doors & Frames

- A. Hollow Metal Doors: Level III, 16 Gauge, Extra Heavy Duty.
- B. Hollow Metal Door Frames: 14 Gauge, welded frames for exterior or hollow metal frames in Masonry. 16 Gauge, welded frames are acceptable for interior use. Knock-down construction not allowed.
- C. Wood Doors:
 - 1. Finish: Clear Finish, stained
 - 2. Grade: Premium
 - 3. Veneer: Plain Sliced White Birch
- D. Storefront Entrance Doors:
 - 1. Top Rail: 8”
 - 2. Bottom Rail: 10”
 - 3. Side Stiles: 5” Wide stile

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083000- Access Doors & Panels

- A. Type: Flush with exposed flanges.
- B. Locking: Prepare door to receive cylinder lock, specified in Hardware Section. With HRL approval on a per Project basis, panels with security screw fixing may be allowed for cost savings.
- C. Locations: Coordinate locations with Architectural and Engineering drawings and indicate on Reflected Ceiling Plans.

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085000- Windows

- A. Windows:
 - 1. Type: Aluminum windows to be provided. Vinyl or clad wood window units are not allowed.
 - 2. Style: Style to be appropriate to the building Architecture. In renovations and additions to buildings of historical significance, extruded exterior- and interior-applied muntin grids with spacers and panning trims to match, replicate or restore existing or original window and casing assemblies.
 - 3. Openings: Where windows are operable, select Double Hung, Single Hung, Casement, or Awning based on building architecture. Provide hardware to limit opening to 4” maximum.

- B. Screens: Provide security screens at all ground level windows:
 - 1. Basis of Design Manufacturer: Kane Screen, Kane Sterling
 - 2. Model: Narrowline Operable
 - 3. Security Level: 5
 - 4. Access: Emergency egress from interior (where required by code), and key access from exterior for maintenance.

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087000 – Door Hardware

1. General

A. Cylinders:

1. Acceptable manufacturers:
 - a. Stanley-Best.
2. Characteristics:
 - a. Provide housings to accept Best cylinder cores that are provided by the Owner. Coordinate with Housing for procurement of permanent cores and housings. Base bid is to include housings by hardware vendor.
 - b. Install construction cylinders and housings as scheduled in the Hardware Sets. Note: all access panels and electrical panel boards are to have a keyed cylinder. Coordinate mortise cylinder with access panel manufacturer. Permanent cores by Owner.
 - c. Provide temporary keyed construction cylinders for all doors. Furnish 10 construction master keys and 3 construction control keys.

B. Locksets, Latch sets, Deadbolts:

1. Acceptable manufacturers: (Basis of design. Alternate manufacturers to be approved by Housing)
 - a. Schlage* L9000 series x 07L trim. (verify design for each project)
 2. Mortise Locksets and Latch sets: as scheduled.
- a. Cylindrical locks not permitted, except Schlage AD400 to be installed on roof hatches.
- b. Cylinder locks @ Access Panels: Must accept Best IC core.
3. Manufacturer: Schlage* L9000 Series
 4. Characteristics:
 - a. All locksets and latch sets shall have barrier free lever handles #07L design. (edit for each project)
 - b. Offices, conference rooms, work rooms, and classrooms, use Classroom function, L9070.
 - c. Custodial closets, electrical, mechanical spaces, and storage rooms, use Storeroom function, L9080.
 - d. Apartment or Dorm Bedroom entries off of common corridor, use Storeroom function with deadbolt, L9480.
 - e. Interior individual bedroom doors within an apartments, use L9456.
 - f. Bathrooms within apartments use privacy function with deadbolt L9440.
 - g. ADA rooms on corridors use Storeroom function with deadbolt, L9480 with one piece latch bolt and use with HES 1006 series electric strike. Coordinate with ADA door operator.
 - h. When low rise building stairs are locked use L9060 function. When high rise stairs are locked use L9060 function and coordinate unlocked floors with Housing and Fire Codes.
 5. Mortise Locksets and Latch sets: as scheduled.
 - a. Chassis: cold-rolled steel, handing field-changeable without disassembly.
 - b. Latch bolts: 3/4-inch throw stainless steel two-piece mechanical anti-friction type. Nylon inserts are not acceptable. Use one piece latch bolt at doors with electric strikes.
 - c. Lever Trim: through-bolted, accessible design, cast or solid rod lever as scheduled.

Spindles: independent breakaway.

- d. Thumbturns: accessible design not requiring pinching or twisting motions to operate. (Schlage EZ thumb turn)
- e. Deadbolts: stainless steel 1-inch throw.
- f. Electric operation: Manufacturer-installed continuous duty solenoid.
- g. Strikes: 16 gage curved stainless steel, bronze or brass with 1" deep box construction, lips of sufficient length to clear trim and protect clothing.
- h. Certifications:
 - 1. ANSI A156.13, 1994, Grade 1 Operational. (update standard, if needed)
 - 2. ANSI/ASTM F476-84 Grade 30 UL Listed.

C. Exit Devices:

- 1. Acceptable manufacturers:
 - a. Von Duprin*, 99, and 33 Series (Basis of design. Alternate manufacturers to be approved by HRL.)
- 2. Characteristics:
 - a. Electronic access point operated by Owner's electronic access control system shall have functions as follows:
 - 1. Double doors shall have a removable mullion with Von Duprin RX EL98 electric panic hardware
 - 2. Single doors shall have a Von Duprin RX98 panic hardware with a Von Duprin 6112 for new construction or a HES 9600 series electric strike for retrofit.
 - b. All exit devices shall be of one manufacturer.
 - 1. Exit devices shall be of modular design and assembly, allowing updated and/or replacement parts to be added to existing product in the field to bring product up to current design standards.
 - 2. Exit devices shall be able to be field modified and updated with specified "kits" necessary to upgrade for product electrification to accommodate future expansion of existing access control system, including, but not limited to request to exit, latch bolt monitoring and electric latch retraction.
 - c. EL devices shall use a 16-amp solenoid to activate a mechanical linkage to retract the latch.
 - d. Power supplies shall be Von Duprin PS914-2RS x BBK Series.
 - e. Exit devices on exterior doors shall be equipped with "request to exit" (RX) switches and "latch bolt monitor" (LX) switches connected to the alarm panel and monitored as part of the Owner's access control system.
 - f. The nearest Emergency Power Control Panel in the school will power the PS914-2RS power supplies.
 - g. Provide "surge suppression" for electrified door hardware. Coordinate with the systems integrator, the electrical contractor, the low voltage sub-contractor, the door hardware manufacturer's representative and the Owner's Representative to confirm the surge suppression unit to be used and where it shall be installed.
 - h. Conduit and necessary wiring shall be provided under Division 26.
 - i. All exit devices shall have US32D touchpads. All finished parts that are not US32D shall be US26D finish.
 - j. All exit devices shall be flush mounted. Provide manufacturer's standard shim kit to accommodate moldings for glass and vision lites. Exit devices that are not flush mounted must provide a filler bar on those doors where conflict with moldings for glass vision lites is not an issue.
 - k. Exit devices shall be attached with sex nuts and bolts on all doors. Finish on all exposed

fasteners shall match devices.

- l. On exterior pairs of doors, provide keyed removable mullions (KR). Refer to the drawings and door schedule for locations of keyed movable mullions. All mullions shall have 2 each stabilizers #154.
- m. Exit devices shall be "UL" listed for life safety. All exit devices for fire rated openings shall have "UL" labels for "Fire Exit Hardware."
- n. All exit devices mounted on labeled wood doors shall be mounted on the door per the door manufacturer's requirements. (Owner prefers exit devices to be through-bolted even on non-rated doors.)
- o. Dogging mechanism shall be "hook and eye" type. No plastic dogging cams or friction type dogging mechanism shall be allowed.
- p. Equip rim exit devices with a roller strike. Owner requires that the third locking screw is installed.
- q. All exit devices shall be non-handed.
- r. Touchpad shall extend a minimum of ½ of the door width. Touchpad height shall exceed height of mechanism case or rail assembly to eliminate pinch points. If touchpad height does not exceed height of mechanism case/rail assembly provide factory-installed insert/filler on top and bottom of touchpad along mechanism case/rail assembly to prevent pinch point. Plastic touchpads are not acceptable.
- s. All latch bolts to be the deadlocking type. Latch bolts shall have a self-lubricating coating to reduce wear. Plated or plastic-coated latch bolts are not acceptable.
- t. Exit devices shall be equipped with a fluid dampening device to reduce noise associated with the operation of the exit device.
- u. Exit devices shall include impact resistant, flush mounted end cap design to avoid damage due to carts and other heavy objects passing through an opening. End cap shall be of heavy-duty metal alloy construction and provide horizontal adjustment to provide alignment with device cover plate. When exit device end cap is installed, no raised edges shall protrude.

D. Closers and Door Control Devices:

1. Acceptable manufacturers:
2. LCN Closers*, 4040 XP series (Basis of design. Alternate manufacturers to be approved by Housing)
3. Characteristics:
 - a. Door closers shall have fully hydraulic, full rack and pinion action with a high strength cast iron cylinder.
 - b. Closers utilizing pressure relief valves (PRV) are not acceptable.
 - c. All closers shall be attached using sex nuts and through bolts only.
 - d. All closers shall utilize a stable fluid withstanding temperature range of 120°F to -30°F without seasonal adjustment of closer speed to properly close the door. Closers for fire-rated doors shall be provided with temperature stabilizing fluid that complies with standards UBC 7-2 (1997) and UL 10C.
 - e. Spring power shall be continuously adjustable over the full range of closer sizes and allow for reduced opening force for the physically handicapped. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed, and back check.
 - f. All closers shall have solid forged steel main arms (and "EDA" forearms for parallel arm closers) and where specified shall have a cast-in solid stop on the closer shoe ("CNS"). Where door travel on out-swing doors must be limited, use "S-CNS" type closers. Auxiliary stops are not required when Cush type closers are used.
 - g. All surface closers shall be certified to exceed ten million (10,000,000) full load cycles

by a recognized independent testing laboratory. All closers (overhead, surface and concealed) shall be of one manufacturer and carry manufacturer's ten-year warranty (electric closers to have two-year warranty).

- h. Access-Free Manual Closers: Where manual closers are indicated for doors required to be accessible to the physically handicapped provide adjustable units complying with ADA and ANSI A-117.1 provisions for door opening force.
- i. Closers to be installed to allow door swing as shown on plans. Doors swinging into exit corridors shall provide for corridor clear width as required by code. Where possible, mount closers inside rooms. Provide drop plates as dictated by the top rail dimensions. Provide Cush shoe supports and blade stop spacers where required to allow 5th screw attachment. Provide special templates and plates where needed for proper installation of closer and overhead holders as detailed in hardware sets.
- j. Powder coating finish to be certified to exceed 100 hours salt spray testing by ETL, an independent testing laboratory used by BHMA for ANSI certification.
- k. Magnetic Door Holders to be heavy duty wall- or floor-mounted with metal housing and complete mounting hardware. Provide 24V holding coils unless otherwise scheduled.

E. Power Operators:

- 1. Acceptable manufacturers:
 - a. LCN* 4600 Series (Building entries) (Basis of design. Alternate manufacturers to be approved by Housing)
 - b. Provide LCN SR Swing (9500 series) at interior high frequency doors. (i.e. Laundry rooms and exterior gates). (Basis of design. Alternate manufacturers to be approved by HRL).
- 2. Where low kinetic energy, as defined by ANSI Standard A156.19, power operators are indicated for doors required to be accessible to the disabled, provide electrically powered operators complying with the 2012 ADA for opening force and time to close standards.
- 3. Full closing force shall be provided when the power or assist cycle ends.
- 4. Where operators are used, provide electric strike or electrified exit devices with latch retraction feature.
- 5. All electrically powered operators shall include the following features or functions:
 - a. When an obstruction or resistance to the opening swing is encountered, the operator will pause at that point, then with up to two attempts to continue opening the door. If the obstruction or resistance remains, the operator will again pause the door.
 - b. Concealed main power and maintain hold open switches will be provided on the operator.
 - c. An electronically controlled clutch to provide adjustable opening force and speed.
 - d. A microprocessor to control all motor and clutch functions.
 - e. An on-board power supply capable of delivering both 12V and 24V outputs up to a maximum of 1.0 ampere combined load.
 - f. All input and output power wiring shall be protected by slow blow fuses. These fuses shall be easily replaceable without special tools or component replacement.

6. Actuators shall have a stainless-steel touch plate that features a blue filled handicap symbol. The actuator shall be weather resistant and provide normally open momentary contacts. The actuator is designed to mount in a standard single gang box (2" wide, 4" high, and 2" deep).
 7. Installation of the automatic door operators shall be performed by a factory trained and factory certified installer skilled in the installation of automatic door operators and equipment. All low voltage switch hookups are the responsibility of the operator installer, as well as temporary wiring hookup to plug into wall outlet for test of system. Final hookup of 115VAC power will be handled by and coordinated with the general contractor's electrical contractor.
 8. The contractor shall furnish a certificate executed by a representative of the manufacturer of the automatic door operators that all operators have been inspected and adjusted, are operating as designed and have been installed in accordance with the manufacturer's instructions.
- F. Floor Stops and Wall Bumpers:
1. Acceptable manufacturers:
 - a. Glynn Johnson
 - b. Ives*
 - c. Rockwood Manufacturing
 2. Ensure that floor stops will allow full contact with door face. Provide blocking in the wall where wall bumpers are used.
 3. Provide heavy duty stops (FS18S) at exterior doors when out of the path of travel.
- G. Protective Plates:
1. Acceptable manufacturers:
 - a. Trimco
 - b. Ives*
 - c. Rockwood Manufacturing
 - d. Custom Acrovyn Door Protection 4000 x custom color to be selected.
 2. Characteristics:
 - a. Provide manufacturers standard exposed fasteners for door trim units consisting of either machine screws or self-tapping screws.
 - b. Materials:
 1. Metal Plates: Stainless Steel, .050 inch (U.S. 18 gage).
 - c. Fabricate protection plates not more than 2 inches less than door width on hinge side and not more than 1 inch less than door width on pull side. Provide custom color plates to match architects sample where noted.
 - d. Heights:
 1. Kick plates to be 8 inches in height.
 2. Mop plates to be 8 inches in height. (Provide in wet areas and custodial closets)
 3. Armor plates 34 inches in height. (Provide at loading docks and trash rooms).
- H. Silencers:
1. Acceptable manufacturers:
 - a. Glynn Johnson*
 - b. Ives
 - c. Rockwood Manufacturing

2. Three for each single doors; four for pairs of doors. (Omit at doors with seals or weather strip)

- I. Security Equipment:
 1. Acceptable manufacturers:
 - VonDuprin*
 - a. Schlage
 - b. HES
 2. Characteristics:
 - a. Provide items as found in Hardware Headings.
 3. Coordinate security equipment with Electrical.

2. **Materials and Fabrication:**
 - A. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
 1. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.
 2. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.
 3. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent no standard units of type specified are available with concealed fasteners.
 4. Use thru-bolts or sex bolts for installation of all exit devices, door closers and overhead stops. Coordinate with wood doors and metal doors and frames. Where thru-bolts are used, as a means of reinforcing the work, provide sleeves for each thru-bolt or use sex screw fasteners.

3. Sample Hardware Schedule:

EXAMPLE OF HARDWARE SCHEDULE. SCHEDULE TO BE PROVIDED BY ARCHITECT'S
 HARDWARE CONSULTANT AS REQUIRED FOR EACH PROJECT.

HW SET: AL-01

DOOR: TYPICAL PAIR OF ALUM OR FRP ENTRY DOORS WITH CARD READER AND ADA
 OPERATOR

EACH TO HAVE:

2	CONTINUOUS HINGES	112HD x EPT	IVE
2	POWER TRANSFERS	EPT-10	VON
1	EXIT DEVICE	RX EL 99NL/OP	VON
1	EXIT DEVICES	RX EL 99 EO	VON
1	REMOVABLE MULLION	KR4954	VON
1	POWER SUPPLY	PS914 X 900-2RS X BBK	VON
1	CYLINDER	80-159	SCH
1	CYLINDER	80-132	SCH
2	CORES	GT HOUSING LOCK SHOP	
2	PULLS	8190-0 BY TYPE O MT.	IVE
2	CARD READERS	GT ACCESS CONTROL SVCS	
2	DOOR POSITION SWITCHES	GT ACCESS CONTROL SVCS	
1	CLOSER	4041 SCUSH X 4040-18PA	
		30/61 AS REQ	LCN
1	ADA CLOSER	4642 X 120VAC (RHR)	LCN
1	FLOOR STOP	FS18S (RHR LEAF)	
1	THRESHOLD	425 X RCE	NGP
1	SET SEALS	BY DOOR MFG	
2	SWEEPS	200SA	NGP
1	ASTRAGAL	BY DOOR MFG	

COORDINATE SECURITY HARDWARE WITH GT ACCESS CONTROL SERVICES AND ELECTRICAL
 CONTRACTORS. ACCESS BY CARD READER. ADA CARDS ACTIVATE OPERATOR.

HW SET: AL-02

DOOR: TYPICAL SINGLE ALUM OR FRP ENTRY DOOR WITH CARD READER AND ADA OPERATOR

EACH TO HAVE:

1	CONTINUOUS HINGES	112HD x EPT	IVE
1	POWER TRANSFERS	EPT-10	VON
1	EXIT DEVICE	RX 99NL/OP	VON
1	CYLINDER	80-159	SCH
1	CORES	GT HOUSING LOCK SHOP	
1	ELECTRIC STRIKE	6112 X 24VDC	VON
1	POWER SUPPLY	PS902 X BBK	VON
1	PULLS	8190-0 BY TYPE O MT.	IVE
2	CARD READERS	GT ACCESS CONTROL SVCS	
1	DOOR POSITION SWITCHES	GT ACCESS CONTROL SVCS	
1	ADA CLOSER	4642 X 120VAC (RHR)	LCN
1	FLOOR STOP	FS18S (RHR LEAF)	
1	THRESHOLD	425 X RCE	NGP
1	SET SEALS	BY DOOR MFG	
1	SWEEPS	200SA	NGP

COORDINATE SECURITY HARDWARE WITH GT ACCESS CONTROL SERVICES AND ELECTRICAL CONTRACTORS. ACCESS BY CARD READER. ADA CARDS ACTIVATE OPERATOR.

END OF SECTION

088000– Glazing

- A. Unframed Mirrors: Provide continuous, unframed mirrors at shared common hall restroom / shower rooms.
 - 1. Product requirements:
 - a. Thickness: ¼”
 - b. Glass Type: Mirror Select Quality plate or float glass with silver coating and electrolytically copper-plated back
 - c. Edge Finish: Grind and polish
 - d. Size: Equally spaced modules or as indicated on drawings. No horizontal joints accepted.
 - e. Installation: Apply to wall with mastic adhesive and continuous bottom “J” channel.
 - f. Location: Meet requirements of current State Accessibility Code and ADAAG.
- B. Elevator Shaft Glazing: Where glass back elevators are specified aligned with exterior aluminum framed glazing systems, provide laminate glazing, per the requirements of the current State Elevator Code and Authorities having jurisdiction.
- C. Exterior Glazing: Utilize energy efficient low-e glazing systems at all new or replacement exterior windows or areas of curtain wall or storefront.

END OF SECTION

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092000 – Gypsum Board Assemblies

- A. Level of Finish required for various portions of the project to be confirmed and documented with GT HRL project representative in early design stages.
- B. Abuse-Resistant Gypsum Wallboard: Provide in high traffic areas such as corridors, student lounge/study areas, and lobbies.
 - 1. Basis of Design Product(s)
 - a. National Gypsum Company, Hi-Impact Brand XP Wallboard
 - b. USG Corp., Fiberock VHI Abuse-Resistant Gypsum Panels
- C. Tile Backer Board: Cementitious backer board, ½” nominal thickness.
- D. Framing shall be minimum 20-gauge.
- E. At the interior face of exterior walls and at shaft enclosures, provide mold resistant gypsum wallboard.
 - 1. Basis of Design Product(s):
 - a. National Gypsum Company, Goldbond XP Gypsum Board.
 - b. USG Corp., Mold Tough Gypsum Panels.

END OF SECTION

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093000 - Tiling

- A. Refer to Finish Schedule in Section 010000 – Architectural - General, for typical room finishes per room type.
- B. Acceptable Materials:
 - 1. At wet areas, where floor is sloped to drains, provide 2"x2" (nominal) porcelain tile on sloped concrete or cured mud bed. See requirements below for description of waterproofing systems.
 - 2. Grout:
 - a. Floors – wet and dry areas: Epoxy Grout
 - b. Walls – wet areas: Epoxy Grout
 - c. Walls – dry areas: Polymer modified unsanded grout for joints up to 1/8". Polymer modified sanded grout for joints greater than 1/8".
 - 3. At walls, provide ceramic tile 4"x4" or larger, unless approved by GT Housing.
 - 4. Wall Base: At tile floors, provide cove base trim. Cove to be flush with floor tile, cove base set on top of floor tile is not acceptable.
- C. Floor Tile at Shared Restroom / Shower Areas: Provide waterproof membrane throughout restroom / shower area:
 - 1. Membrane to be continuous from floor to shower pan.
 - 2. Membrane to be continuous from shower pan to top of wall at shower enclosure.
 - 3. At walls other than shower enclosures, membrane to extend up walls a minimum of 8".
 - 4. Basis of Design Assembly for Waterproof Membrane: Specify a Tile Council of America (TCA) installation assembly appropriate for the selected waterproofing assembly.
- D. Showers Stalls:
 - 1. Alternate Shower Pan: As an alternate to porcelain tile on waterproof membrane and sloped mortar bed, a one-piece solid surface shower pan is acceptable. Confirm direction per project with GT HRL. Coordinate transition of waterproof membrane from floor to shower pan and from shower pan to enclosure walls.
- E. 24 Hour Flood Test: At all wet areas, perform a flood test of the installed waterproofing assembly prior to installing floor tile. Follow ASTM D5957-98R13 procedure.

END OF SECTION

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094000 – Ceilings

- A. Refer to Finish Schedule in Section 010000 – Architectural - General, for typical room finishes per room type.

- B. Lay-in Acoustical Tile Ceiling System:
 - 1. Suspension System: 2' x 2' x 15/16" wide intermediate duty standard white finish, typical; 2'x2'x 9/16" upon approval by HRL on a per Project basis..
 - 2. Ceiling Tile: Refer to GT Yellow book for ceiling tile requirements.

END OF SECTION

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096000 – Flooring

- A. Refer to Finish Schedule in Section 010000 – Architectural - General, for typical room finishes per room type.
- B. Carpeting: Carpet tiles, installed with manufacturer’s standard Glue-free adhesive squares, or as directed by selected carpet manufacturer. Basis of Design Manufacturer: Interface FLOR.
 - 1. Yarn weight: 18 oz./sq. yd. minimum
- C. Wall base at carpeted areas: Base shall be rolled rubber cove base.
 - 1. 4” minimum height.
- D. Walk-Off Mat:
 - 1. Approved Product: Walk-off Mat Carpet Tiles
 - 2. Basis of Design Product / Manufacturer: Triad Mat, Collins and Aikman Floor Coverings.
 - 3. Product Description: Tufted Loop, Nylon Carpet Fiber, Fiberglass reinforced polymer backing, 26 oz./sq. yd. weight minimum.
 - 4. Location: At all exterior doors, extend 10’ minimum.
 - 5. Installation: Mat to be flush with adjacent floor finish. Provide metal transition profile appropriate for adjacent finish.
- E. Stair Treads / Risers / Landings: Basis of Design by Roppe. Treads shall have a raised design with a square-edge nosing. Landing (excluding discharge level) to be 20”x20” rubber tile with raised design. Use for Renovation only.
- F. Seamless Resilient Flooring (Electrical, Data, Back-of-House): At back of house spaces:
 - 1. Basis of Design Product / Manufacturer: Stonres RTZ, Stonhard, Inc.
 - 2. Product Description: Seamless resilient urethane flooring system infused with rubber aggregate of similar design, with integral 6” high cove profile wall base.
- G. Porcelain Tile Floor: See tiling section (Option for Lobbies / Public Space option).
- H. Polished Concrete: (Option for Lobbies / Public spaces; subject to cart traffic during student move-in and move-out periods, provide durable surface with minimal joints. – Refer to G, above, and I., following.)
- I. Terrazzo: Epoxy thinset or mudset. Option for Lobbies / Public Spaces)
- J. Solid Vinyl Flooring: “Luxury Vinyl Tile”, including simulated wood flooring planks.
 - 1. Basis of Design Product / Manufacturer: Contour Series, Centiva
 - 2. Description: Class III Solid Vinyl Tile
 - 3. Thickness: 3 mm

4. Wear Layer Thickness: .80 mm
5. Adhesive: Per Manufacturer recommendation.

END OF SECTION

098000 – Acoustical Wall Treatment

- A. Provide Acoustical Wall Panels in stairways accessed by residents to circulate between floors.
 - 1. Basis of Design Product / Manufacturer: Metro Rebound, Wall Technology Inc. / Owens Corning.
 - 2. Product Description:
 - a. Minimum NRC of 0.75 per ASTM C-423-09a
 - b. Panel Construction:
 - 1) Thickness: 1”
 - 2) Edge Profile: Square
 - 3) Core: 6-7 PCF Fiberglass Board with Resin Hardened Edge
 - 4) Face Sheet: Impact resistant, perforated co-polymer.
 - 5) Finish: Manufacturer’s standard, acoustically transparent fabric. Custom fabric acceptable if allowed by panel manufacturer and approved by GT Housing and Campus Interior Designer.

END OF SECTION

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099000 – Painting and Coating

- A. Wet Areas / High Abuse: Provide epoxy-polyamide coating system.
- B. High Traffic / High Abuse / Dry Areas: Abuse Resistant Paint System
 - 1. Basis of Design Product / Manufacturer: Scuffmaster Scrub Tough, Master Coating Technologies.
 - 2. Product Description: Polyurethane-Fortified Eggshell Paint Finish, solid color.
 - 3. Substrates: Gypsum Wall Board, plaster, and CMU.
- C. Refer to neighborhood / district context and HRL for single P-1 color approved for neighborhood or district for Project.

END OF SECTION

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101400 – Signage

- A. Signage Design Standard: Contact GT Office of Facilities Management Design and Construction for current housing graphic design standards, including graphic files for approved logos and approved colors. Design to comply with currently adopted State accessibility Code and ADAAG.

- B. Product Description:
 - 1. Material:
 - a. General Room Identification Sign: One-Piece construction, 3/16” thick polycarbonate.
 - b. Resident Rooms Signs: Reference Glenn & Towers standard.
 - 2. Profile:
 - a. Letters: Raised letters / graphics 1/32” minimum.
 - b. Braille: Grade II, or as required by currently adopted State accessibility code and ADAAG.
 - 3. Edge Profile: Square.
 - 4. Edge Finish: Painted
 - 5. Fasteners: Countersunk, tamper-resistant fasteners, painted to match faceplate.
 - 6. Installation on glass: include opaque back plate.

END OF SECTION

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102113 – Toilet Compartments

- A. Toilet Partition Construction: Custom assembly fabricated from following components:
1. Material: HDPE material, as described in division 6 section, Architectural Woodwork:
 - a Pilaster: Minimum 1” Thickness
 - b Panels, urinal screens and doors: Minimum ½” thickness.
 - c Pilaster Shoes: Factory fabricated from solid surface material to match pilaster. Minimum ¼” thickness, minimum 6” height. Provide radiused top edge, and miter to follow profile of pilaster on all sides. Metal shoes not allowed.

 2. Hardware: Basis of Design Manufacturer: Jacknob Corporation
 - a Hinges: Cast stainless steel, satin finish; surface-mounted; self-closing hinge type. Provide two (2) hinges per door except at out swinging handicapped doors, which require three (3) hinges.
 - b Brackets: Full-length, continuous extruded aluminum.
 - c Pilaster Base: Galvanized anchorage device for attachment to floor and for leveling of compartment, consisting of threaded rods, saddle, lock washers, leveling nuts and brass or lead expansion shields. Anchors shall penetrate floor a minimum of 1”.
 - d Combination bumper / coat hook (In-swinging doors).
 - e Coat Hook with separate wall bumper (out-swinging doors).
 - f Fasteners: Stainless steel, tamper-resistant/one-way heads where exposed.

END OF SECTION

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102600 – Wall Protection Systems

- A. Corner Guards: Provide corner guards at outside corners at high traffic areas (i.e. corridors) and where exposed corners are subject to damage and abuse.
 - 1. Basis of Design Product and Manufacturer: Acrovyn SSM-20, Construction Specialties, Inc.
 - 2. Product Description: Surface Mounted Corner Guard. a Material: High impact vinyl acrylic extrusion.
 - b Size: 2” x 2”, full height

END OF SECTION

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102813 – Toilet Accessories

- A. Owner supplied / contractor Installed items:
 - 1. Items included:
 - a. Toilet tissue dispensers
 - b. Hand soap dispensers
 - 2. A/E to coordinate with GT HRL on current model supplied and locate on drawings to coordinate with adjacent construction/finishes and in compliance with current State accessibility Code and ADAAG.

- B. Toilet tissue dispensers: At restrooms in apartment style housing units, toilet tissue dispensers to be contractor supplied.
 - 1. Basis of Design product and manufacturer: Bobrick B-6867 for handicapped stalls; Kimberly Clark #09566 for standard (non-handicapped) stalls.

- C. Hand Dryers: Hand dryers to be provided in all public restrooms. Paper towels will not be stocked by GT Housing.
 - 1. Basis of Design product and manufacturer: Xlerator XL-SB, Excel Dryer Corporation. Provide stainless steel recess kit where required to meet State Accessibility Code and ADAAG.

- D. Feminine Napkin Disposal Cabinets: Not included in base building scope. Loose containers are typically provided by GT Housing.

- E. Framed Mirror Units: Bobrick #B-165, 18 x 30.

- F. Soap Dispenser: Kimberly Clark Twinpak Push Dispenser model #92551; push dispenser holding two 500 ml cartridges of soap.

- G. Robe hooks: Bobrick #B-682.

- H. Mop and Broom Holder: Provide in each custodial closet: Bobrick #B-223 by 24”.

- I. Robe Hooks:
 - 1. Locations: Provide adjacent to each shower stall. In addition, if a bench is provided within the shower area, provide a row of hooks above the bench, one per shower stall.
 - 2. Description: Surface mounted Hat and Coat Hook
 - 3. Basis of Design manufacturer and product: Bobrick B-682.

- J. Heavy-duty Shower Curtain Rod: Basis of Design manufacturer and product: Bobrick B-6047 by 5’-0” with flanges, stainless steel, heavy duty.

- K. Shower Seats: Bobrick #B-5171 right hand, #5181, left hand; shower, folding; phenolic.
- L. Shower Curtain:
 - 1. Basis of Design Manufacturer and Product: Bobrick 204 w/ type 204-1 hooks.
- M. Framed Mirror: Provide at wall hung lavatories, locate per requirements of current State Accessibility Code and ADAAG
 - 1. Basis of Design manufacturer and product: Bobrick B-165, 18" x 30" minimum.
- N. Shower Seat: Provide where required for accessible shower stalls, located and installed per State Accessibility Code and ADAAG.
 - 1. Basis of Design Manufacturer and Product: Bobrick B-517 and B-518, depending on left or right orientation.
 - 2. Secure directly to structure or to solid blocking fastened directly to structure.
- O. Pipe Insulation: Provide at wall mounted sinks and lavatories that do not have an apron installed to shield the drain piping and trap:
 - 1. Basis of Design Product and Manufacturer: Lav-Guard 2 by Truebro, Inc.
- P. Grab Bars: Install where required by current State Accessibility Code and ADAAG:
 - 1. Description: 1 ¼" diameter, peened grip finish, with mounting concealed by snap flange.
 - 2. Secure directly to structure or to solid blocking fastened directly to structure.

END OF SECTION

113000 – Residential Equipment

- A. Model / Manufacturer: Contact GT HRL for current appliance and equipment selections and specifications

- B. Communal Kitchens: The following lists equipment typically furnished and included in base building contract for shared kitchens:
 - 1. Microwave: Provide counter space and power for two tabletop units in each communal kitchen.
 - 2. Refrigerator: 18 cubic foot, top-freezer, stainless steel, energy star rated, without ice maker.
 - 3. Range: 30” glass-top electric range
 - a. Color: Stainless Steel, typical; coordinate per Project finishes.
 - b. Controls: Front controls, to meet requirements of current State Accessibility Code and ADAAG.
 - c. Where sides are exposed, specify with finished side panels.
 - 4. Range Hood: 36” wide range hood unit:
 - a. Duct directly to building exterior. Provide interlock fan at roof, to be energized when any kitchen exhaust fan is energized. Recirculating, filtered system. Basis of Design Manufacturer / Model: Broan Model 41000 or 41000MX.
 - b. Provide Dry Chemical Extinguishing system at each hood, complying with NFPA 96 and Authorities Having Jurisdiction. Locate equipment above hood, with a removable shroud of material and finish to match hood assembly. Provide vision port with finished escutcheon within shroud aligned with gauge controls for extinguishing system. Basis of design, Guardian Model G300A.
 - 5. Ice Maker / Storage Bin:
 - a. Storage Bin / Dispenser: 22” wide, 120 lb. capacity. Basis of Design Manufacturer / Model: Scotsman HD22
 - b. Ice Maker: 300 lb. capacity, mounted on top of Storage Bin / dispenser. Basis of Design Manufacturer / Model: Scotsman C0322.

- C. Apartment Style Kitchens: In apartment style kitchens in units occupied by both staff and students, the following lists equipment typically furnished and included in base building contracts:
 - 1. Over-the-range Microwave / Vent: White, 1.6 cubic foot, 950 Watt with 2-speed exhaust fan.
 - a. Where required by State Accessibility Code, ADAAG and/or Fair Housing Standards, provide power to accommodate table-top unit.
 - 2. Refrigerator: 18 cubic foot, top-freezer, white, energy star rated, with ice maker.
 - 3. Dishwasher: White, Energy-Star Rated.
 - 4. Range: 30” glass-top electric range

- a. In units required to meet State Accessibility Code, ADAAG, or Fair Housing Standards, provide unit with front controls.
 - b. Color: White
5. Washer/Dryer Units (Where required – confirm with GT Housing):
- a. Type: Stacked Washer/Dryer Combo. Front-load dryer above top-load washer.
 - b. Dryer heat: Electric
 - c. Capacity: Large capacity – 2.6 cubic foot
 - d. Color: White.

END OF SECTION

12 000 – Window Coverings

- A. Horizontal Louver Blinds (@ resident rooms, kitchens, small study rooms):
 - 1. Basis of Design Manufacturer / Model: Levelor Riviera
 - 2. Slats: Nominal 1” wide aluminum
 - 3. Operation: Wand Tilter
 - 4. Finish: Alabaster

- B. Mechanical Roller Shades (@ public, common rooms):
 - 1. Basis of Design Manufacturer / Model: Hunter Douglas RB 500 Manual or Motorized Roller Shades.
 - 2. Operation: Manual, typical. Motorized where approved or required by HRL per Project.
 - 3. Fabric: Fiberglass / Vinyl composite, Mermet M-Screen, Basis of Design; Color and Openness Factor to be selected on per-project and building opening orientation basis for Solar Heat Gain Coefficient and Visible Light Transmittance for balance of aesthetics, heat reflectance, shading, view-through, privacy, and glare control requirements for the space.

END OF SECTION

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129300 – Site Furnishings

- A. Confirm all Site Furnishings are consistent with current Campus Master Plan
- B. Cook Grill: Basis of Design Manufacturer / Model: R. J. Thomas Mfg Co., Model No. EC-26, with optional utility shelf.
 - 1. Installation: Direct bury base #B-2.
- C. Hot Coal Disposal Bin: Basis of Design Manufacturer / Model: Pilot Rock HCB / B-1.
- D. Trash Can: Victor Stanley, Inc. Ironsites (standard) 36-gallon side-door opening litter receptacle 5/8” solid steel top ring, (42) forty-two 3/8” x 1” vertical steel bars, with up-charge formed dome lid, black plastic liner, (5) five leveling feet & door latch; Color – VS-Bronze.
- E. Picnic Table: Landscape Forms Gretchen picnic table without umbrella hole, surface mount support, FSC Ipe with no finish, FSC 100%, RA-COC-011261, powder coat color: Bronze.
- F. Bench: Landscape Forms, Gretchen 72” long backed bench, freestanding / surface.
- G. Bike Rack, (outdoor): Dero Swerve Rack; Finish: Stainless Steel, Satin; stainless steel flanges.
- H. Vertical Bike Rack, (indoor): Dero, Ultra Space Saver, powder coat black, (fit to room).
- I. Bike Repair Center (indoor): Dero, Fixit Station, powder coat yellow.
- J. Other site furnishings: coordinate with campus Master Plan or Sector Plan standards.

END OF SECTION

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142000 – Elevators

- A. Hoist Mechanism: Machine-room-less (MRL) or Machine-less-room (MLR) electric traction elevator.
- B. Capacity: 3,500 – 4,500 lbs.
- C. Speed: 150 fpm min, greater speeds may be required depending on number of stops.
- D. Car Size: Service size, or as required by GT Housing and requirements of Authorities Having Jurisdiction for accommodation of stretcher.
- E. Car Enclosure:
 - A. Partial Glass Back: Where elevator hoist way is located on an exterior wall, provide elevator car enclosure with laminated glass back, aligned with corresponding glazing in hoist way enclosure, to provide visibility into the car for enhanced security.
 - B. Wall Panels: Custom heavy duty stainless steel wall panels.
 - a. Basis of Design Manufacturer: Rigidized Metals Corporation.
 - b. Finish: Random Swirl
 - c. Pattern: RB4 – Raised Square design
 - d. Material / Thickness: .060” Type 304, applied to ½” thick fire-retardant treated substrate panel, wrap metal over front and side edges of panel.
 - C. Ceiling: Manufacturer’s standard stainless steel ceiling panels, satin finish.
- F. Signalization:
 - A. Provide Vandal Resistant Controls and Signalization at Car Operating Panel, Hall Lanterns / Hall Position Indicators, and Hall Stations.
 - a. Impact, scratch, burn and splash resistant.
 - b. Textured stainless steel face plates
 - c. Buttons: non-projecting, metallic, and impact resistant with round amber call acceptance light.
 - d. Mounting: Flush.
- G. Security Hardware: Traveler cable to be specified with data connection for proximity card reader to interface with the car operating panel to provide card access security to each floor.

END OF SECTION

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211300 Fire Suppression Sprinkler Systems

1.01 Water Based Fire Extinguishing Systems

- A. Automatic Sprinkler System Installation
 - 1. Automatic sprinklers systems shall be installed throughout all new construction projects and in all major renovation projects in accordance with the requirements of the adopted NFPA 13 and 13R, the International Building Code, and the appropriate Georgia Institute of Technology sprinkler system specification.
- B. Special Requirements: The requirements below supersede the requirements of NFPA 13, 13R, and the International Building Code:
 - 1. Automatic sprinklers shall be installed in all new construction projects and in all renovation projects. This includes elevator machine rooms, boiler rooms, mechanical equipment rooms, walk-in freezers and cold rooms, essential electronic facilities, electrical closets, telephone closets, emergency generator rooms, uninterruptible power service and battery rooms, electrical switchgear rooms, transformer vaults, data rooms, etc.
 - 2. All sprinkler systems shall be wet-pipe sprinkler systems, unless installed in areas subject to freezing.
 - 3. In areas subject to freezing, install dry-pipe sprinkler systems, dry pendent sprinklers, or provide heat in the space, and/or reroute the sprinkler piping. Heat tape shall not be used on sprinkler piping.
 - 4. Antifreeze sprinkler systems must be approved prior to any installation.
 - 5. Pre-action type sprinkler systems shall use nitrogen systems instead of compressed air.
 - 6. All dry systems shall use nitrogen system instead of compressed air system.

2.01 Sprinkler System Design

- A. Sprinkler systems shall be hydraulically calculated in accordance with the requirements specified in NFPA 13 and 13R.
- B. Special Requirements. The requirements below supersede the design requirements of NFPA 13 and 13R:
 - 1. Sprinkler systems shall be designed using a minimum system design area of 1,500 sq. ft. and shall not be decreased below this value.
 - 2. In rooms containing shelving units for hazardous materials and/ or flammable/ combustible liquids, the sprinkler designer shall determine the Hazard Group per NFPA standards and certify that the design meets the requirements for the use of the space and the conditions of storage. All shop drawings must be signed and sealed by a registered fire protection engineer.

3.01 Seismic Protection

- A. Seismic protection shall be installed on all projects.

4.01 Types of Sprinklers

- A. Quick-response sprinklers (QRS) shall be installed in all new construction and renovation projects in accordance with the requirements specified in NFPA 13 and 13R.
- B. Special Requirements. The requirements below supersede the requirements of NFPA 13 and 13R:
 - 1. All sprinklers installed in any new construction or renovation projects shall be both Underwriters Laboratories Inc. (UL) listed and Factory Mutual Engineering and Research Corporation (FM) approved.

2. All quick-response glass bulb sprinklers shall be equipped with a protective device to reduce damage prior to installation. The protective device shall be removed after sprinklers are installed.
3. U.L. listed concealed sprinklers are allowed only when approved by the Georgia Tech Fire Marshal's Office.
4. Sprinklers equipped with "O-ring" water seals shall not be utilized in any new construction or renovation projects.
5. All sprinkler escutcheons installed in any new construction or renovation projects shall be Underwriters Laboratories Inc. (UL) listed or Factory Mutual Engineering and Research Corporation (FM) approved.
6. QRS sprinklers shall not be installed in high temperature areas (e.g., high temperature areas defined in NFPA 13 or elevator machine rooms, etc.) in a building. Standard response sprinklers shall be installed of the appropriate temperature rating.
7. Flow control (On-off) sprinklers shall not be installed in any new construction or renovation projects.
8. All automatic sprinklers installed less than 7 feet above the floor shall be equipped with sprinkler guards to provide protection against accidental damage.
9. Any sprinkler in a corrosive atmosphere shall be wax coated.
10. Any sprinklers in rack storage shall have sprinkler guards.
11. Any sprinkler installed where accidental discharge could occur shall have sprinkler guards

5.01 Sprinkler Piping System

- A. Sprinkler piping, fittings, control valves, check valves, and drain assemblies shall meet the requirements of NFPA 13 with Georgia Amendments.
- B. Special Requirements. The requirements below supersede the requirements of NFPA 13:
 1. Black steel piping and/or copper tubing shall be used for all wet-pipe sprinkler piping. Chlorinated polyvinyl chloride (CPVC) sprinkler piping shall be allowed to be installed only when approved by the Georgia Tech Fire Marshal's Office.
 2. Galvanized (internal and external) sprinkler piping shall be used for all dry-pipe sprinkler systems.
 3. Steel pipe sizes 2 inches and smaller shall be Schedule 40 and shall be threaded.
 4. Steel pipe sizes larger than 2 inches shall be minimum Schedule 10. Piping less than Schedule 40 shall be roll grooved.
 5. Threadable light wall pipe shall not be used.
 6. Piping having a corrosion resistant ratio less than 1 shall not be used.
 7. Plain-end fittings shall not be used.

6.01 Special Sprinkler System Requirements

- A. Sprinklers in Spaces Housing Electrical Equipment.
 1. All elevator machine rooms will be provided with separate manual isolation valves and a separate water flow switch located outside the room in an accessible location. Tamper switches will be provided on all such valves.
 2. All electrical switchgear rooms and transformer vaults will be provided with separate manual isolation valves and a separate water flow switch located outside the room in an accessible location. Tamper switches shall be provided on all such valves.
 3. All essential electronic facilities shall be provided with separate manual isolation valves and a separate water flow switch located outside the room in an accessible location. Tamper switches shall be provided on all such valves.
 4. Sprinklers installed in electrical rooms and electrical closets shall be equipped with sprinkler guards to provide protection against accidental damage.

END OF SECTION

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220553 - Identification for Plumbing Piping and Equipment

- A. Equipment Labels: Metal Labels for Equipment: Material and Thickness: Brass, 0.032-inch minimum thickness and having predrilled or stamped holes for attachment hardware. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch. Minimum Letter Size: 1/4 inch. Fasteners: Stainless-steel rivets or self-tapping screws. Label Content: Include equipment's Drawing designation or unique equipment number. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by- 11-inch paper. Equipment schedule shall be included in operation and maintenance data.

- B. Pipe Labels: General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions. Lettering Size: At least 1-1/2 high. Provide pipe labels on 10-foot centers, piping change of directions, wall penetrations and branch takeoffs, inside mechanical room or equivalent spaces. Provide pipe labels on 20-foot centers, piping change of directions, wall penetrations and branch takeoffs, in all other spaces.

- C. Valve Tags: Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware. Fasteners: Brass S-hook. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses. Valve-tag schedule shall be included in operation and maintenance data. Provide plastic label with white background and black lettering, sized to fit and adhered to the metal T-bar ceiling grid. Locate labels directly below valve.

END OF SECTION

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221116 – Underground Pre-Insulated Domestic Water Piping

1. General:

- A. Provide pre-insulated domestic underground pipe, outside the footprint of the building connecting city mains and or from service meters on piping 2-1/2 inches and smaller.
- B. Provide domestic ductile iron underground pipe, outside the footprint of the building connecting city mains and or from service meters on piping 3 inches and larger.
- C. Provide identification plastic-tape for warning and identification of buried piping. Warning and identification shall be "CAUTION BURIED DOMESTIC PIPING BELOW" or similar wording. Use permanent code and letter coloring unaffected by moisture and other substances contained in trench backfill material.

2. Underground Domestic Ductile-iron pipe (3” and larger):

- A. Mechanical-Joint, Ductile-Iron Pipe shall comply with AWWA C151, with mechanical-joint bell and plain spigot end. Ductile-Iron Fittings shall be AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

3. Underground Domestic Pre-Insulated Piping (2-1/2” and smaller):

- A. Specify a complete HDPE jacketed system of factory pre-insulated copper piping for the domestic water service. Domestic Hot, Cold and Return Water: Carrier pipe shall be copper type “K”, ASTM B-88 standard weight for all sizes. Copper pipe should have ends cut square and beveled for butt-welding. Straight sections of factory insulated pipe shall have 6" of exposed pipe at each end for field joint fabrication. The jacket throughout the entire system shall incorporate electric fusion, butt fusion, or extrusion welding at all fittings, joint closures, or other points of connection. This shall create a jacket that is seamless throughout the entire system with the exception of anchors, whose water shed rings are sealed with a Raychem Dirax or Canusa GTS-65 wrap prohibiting the ingress of water. All pre-insulated pipe, fittings, insulating materials, and technical support shall be provided by the Pre-insulated Piping System manufacturer.
- B. Fittings shall be factory prefabricated and pre-insulated with urethane to the thickness specified and jacketed with a molded or mitered, extrusion welded PE jacket. Carrier pipe fittings shall be butt welded, except sizes smaller than 2' shall be socket-welded. Fittings include expansion loops, elbows, tees, reducers and anchors.
- C. Field Service: Specify field service provided by a factory representative. The factory representative will be available at the job to test all HDPE fusion welds, check pipe installation,

conduct system pressure testing, inspect field joint insulation, and observe backfilling techniques.

END OF SECTION

221316 – Plumbing Piping, Valves and Specialties

1. Sanitary Waste And Vent Piping:

- A. Soil, Waste, and Vent Piping below ground: Piping: Hub-and-spigot cast-iron soil pipe, ASTM A 74. Fittings: Hub-and-spigot cast-iron soil pipe fittings, ASTM C 564 neoprene rubber gaskets, lubricant, and compression joints, ASTM A 74, Service Class.
- B. Soil, Waste, and Vent Piping above ground: Piping: Hubless cast-iron soil pipe, CISPI 301. Fittings: Hubless cast-iron soil pipe fittings; stainless-steel, or cast-iron couplings for hubless cast-iron soil pipe and fittings; and hubless joints, with ASTM C 564 neoprene sealing sleeve, with stainless-steel corrugated shield-and-clamp assembly, CISPI 301. Sealing gasket: ASTM C 564 neoprene sealing gasket, with cast-iron housing and stainless steel bolts.

2. Natural Gas Distribution:

- A. Piping: ASTM A 53, Type S, Grade A, Schedule 40, seamless, plain ends. Fittings: Malleable- Iron, ASME B16.3, Class 150, standard pattern, with threads conforming to ASME B1.20.1.
- B. Underground Polyethylene (PE) Gas Piping: Pipe: ASTM D 2513, 100 psig working pressure, Standard Dimension Ratio (SDR), the ratio of pipe diameter to wall thickness, 11.5 maximum. Socket Fittings: ASTM D 2683. Butt-Fusion Fittings: ASTM D 2513, molded. Provide tracing wire for underground piping.
- C. Provide identification plastic-tape for warning and identification of buried piping. Warning and identification shall be "CAUTION BURIED NATURAL GAS PIPING BELOW" or similar wording. Use permanent code and letter coloring unaffected by moisture and other substances contained in trench backfill material. Provide 10 AWG copper tracer wire for locating PE piping. Insulation color shall meet the APWA color code standard for identification of buried utilities.
- D. Risers: Manufacturer's standard riser, transition from plastic to steel pipe with 7 to 12 mil thick epoxy coating. Use swaged gas-tight construction with O-ring seals, metal insert, and protective sleeve. Provide remote bolt-on or bracket riser supports.
- E. Provide metal sleeve on plastic piping turning up above grade for grounding and cathodic protection. Exposed plastic piping should be protected with metal sleeve.

3. Rainwater (Interior):

- A. Piping Above and Below Ground 8" and smaller: Polyvinyl chloride, schedule 40, ASTM D1785-1991 with solvent cement joint connections.
- B. Rainwater piping passing through fire rated partitions and return air plenums shall be wrapped with fire rated material or cast iron.

4. Domestic Valves:

- A. Provide body with rising stem Gate Valves on lines 4" and Larger: MSS SP-70; Class 125 iron body, bronze mounted, with body and bonnet conforming to ASTM A 126 Class B; with flanged ends, "Teflon" impregnated packing, and two-piece backing gland assembly.
- B. Provide Ball Valves on lines less than 4": Rated for 150 psi saturated steam pressure, 400 psi WOG pressure; 3-piece construction; with bronze body conforming to ASTM B 62, conventional port, chrome-plated brass ball, replaceable "Teflon" or "TFE" seats and seals, blowout proof stem, and vinyl-covered steel handle. Provide solder ends for condenser water, chilled water, and domestic hot and cold water service, threaded ends for heating hot water and low-pressure steam.

5. Backflow Preventers:

- A. Provide full size Bypass with valve around backflow preventers with valve isolations.

6. Water Pressure Regulators:

- A. Provide full size Bypass with valve around water pressure regulators with valve isolations.

7. Hose Bibbs:

- A. Provide frost-proof metal recessed and lockable access panels with power washer and hose bibb connection adjacent to every entrance and adjacent to roof mounted equipment. Bronze body, with renewable composition disc, 1/2 or 3/4 inch (DN 15 or DN 20) threaded or solder-joint inlet. Provide ASME B1.20.7 garden-hose threads on outlet and integral or field-installed, non-removable, drainable, hose-connection vacuum breaker.

8. Water Meters

- A. Provide full size Bypass with valve around water meters. Group service to laundry facilities in buildings on separate meter tied into the building automation system.

9. Floor and Shower Drains

- A. Provide square grate for all floor and shower drains in tile locations.

10. Clean Outs

- A. Where possible provide wall clean-out for maintenance.
- B. Provide clean-outs at bottom of every vertical riser, and at alternating floors with an access panel.

11. Shut off valves

- A. Provide shut off control valve for each restroom on all floors.

END OF SECTION

224000 Plumbing Fixtures

Add garbage disposal requirement for all common area kitchens, apartments

BUILDING TYPE	TYPE of FIXTURE or EQUIPMENT	Water Usage (GALLONS/USE)
Resident Hall, Student Dorm	Widespread faucets (under counter mounted) with solid brass pop-up lavatory drain	0.5 gpm aerator, sensor operated
Resident Apartment or Staff Apartment	Widespread faucets (under counter mounted) with solid brass pop-up lavatory drain	0.5 gpm aerator, manual hot and cold operated
Resident Hall, Student Dorm Kitchens	Widespread faucets (under counter mounted) (NO SPRAYER)	2.2 gpm, manual hot and cold operated
Resident Apartment Kitchens	Widespread faucets (under counter mounted) WITH SPRAYER	2.2 gpm, manual hot and cold operated
Resident Hall, Student Dorm	Floor Mounted Toilets and Flush Valve (TOTO Basis of Design)	1.28 gallon per flush, sensor operated high efficiency
Resident Apartment or Staff Apartment	Floor Mounted Toilets and Flush Valve (TOTO Basis of Design)	1.28 gallon per flush, manual operated high efficiency
Resident Hall, Student Dorm	Urinals (TOTO Basis of Design)	0.125 gpf, sensor operated
Resident Hall, Student Dorm (Gang Bathroom)	Showerheads Shower Valve: Pressure balancing shower valve, Scald-Guard valve	1.0 gpm vandal resistant wall mounted type with Bricor shower head attached to small extension 6’6” height off finished floor to head.
Resident Apartment	Showerheads Shower Valve: Pressure balancing shower valve, Scald-Guard valve	1.0 gpm arm type Bricor shower head 6’6” height off finished floor to head.
Resident Hall, Student Dorm, Resident Apartment	Domestic Water Heaters – provide instantaneous or semi-instantaneous. Provide sacrificial anode to prevent corrosion of piping.	N/A
Resident Hall, Student Dorm,	Water cooler with bottle filler (ELKAY MODEL LZSTL8WSSK, basis of design)	N/A

END OF SECTION

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230001 – Mechanical General and Design

1. MECHANICAL CODES AND STANDARDS

- A. Yellow Book 230000.1.01.
- B. Sustainable Design – Refer to Yellow Book 01 81 13 Sustainable Design Requirements.
- C. ASHRAE Standard 15-2019 Standard for Refrigeration Systems.
- D. ASHRAE Guideline 36-2018 High-Performance Sequences of Operation for HVAC Systems.
- E. ASHRAE Standard 52.2-2017 Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.
- F. ASHRAE Standard 55-2020 Thermal Environmental Conditions for Human Occupancy (ANSI Approved).
- G. ASHRAE Standard 62.1-2019 Ventilation for Acceptable Indoor Air Quality.
- H. ASHRAE Standard 90.1-2010 Energy Standard for Buildings Except Low-Rise Residential Buildings.

2. MECHANICALLY VENTILATED SPACES

- A. Meet the minimum requirements of ASHRAE Standard 62.1-2019.

3. PIPE IDENTIFICATION SYSTEM

- A. All piping shall be labeled to show direction of flow and identify service. Labels shall be applied every 20 feet, change in direction, and on both sides of wall penetrations.
- B. All valves shall be provided with valve tags indicating type, service and ID. Valve location shall be identified on ceiling grid. Valve ID shall be indicated on the as-built drawings.
- C. Pipe labels shall be preprinted, color coded, with lettering indicating service and showing flow direction in accordance with ASME A13.1.

4. WATER TREATMENT

- A. Coordinate with GT Housing Department for contractor information specific to project.

5. CAMPUS CHILLED WATER SYSTEM

- A. Cooling coil condensate shall be collected to a holding tank for re-use; coordinate with plumbing.
- B. Holding tank requirements shall be coordinated with the GT Yellow Book 339000 CISTERNS.
- C. In the event that the project site does not allow for a holding tank, the cooling coil condensate shall be collected to a central location for future connection to a holding tank.

END OF SECTION

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230002 – HVAC – General and Design

1. CONDITIONING REQUIREMENTS

- A. Air Conditioning and Heating: Student bedrooms, living rooms, storage corridors, kitchens, study rooms, stairwells, offices, bathrooms, vending machine rooms, laundry rooms and elevator lobbies.
- B. Dedicated Air Conditioning: Telecommunications rooms, elevator machine rooms, and electrical rooms containing transformers where total heat release exceeds 6,000 BTU/hr.
- C. Mechanical/Ventilation: Custodial closets, toilet rooms, shower rooms, , electrical and mechanical equipment rooms.
- D. Dedicated Ventilation: Chemical storage and cleaning supply rooms.

2. INTERNAL LOADS

- A. All spaces shall be designed per ASHRAE Standard 90.1-2019

3. OUTSIDE AIR

- A. All spaces shall be designed per ASHRAE Standard 62.1-2019
- B. All outside air shall be dehumidified and conditioned prior to entering the building.
- C. All outside air shall be supplied by a dedicated outside air system containing full energy recovery (sensible and latent).

4. TEMPERATURE CONTROL

- A. Living Areas: Zone maximum one dorm room or apartment per zone.
- B. Corridors: Dedicated system, single floor per zone maximum.
- C. Offices, Study Rooms, Conference Rooms: Zone maximum three (3) spaces per thermostat zone.
- D. Laundry Rooms and Kitchens: Dedicated system, single zone.
- E. Provide carbon dioxide (CO₂) demand control ventilation (DCV) for high occupant spaces (greater than 25 people per 1,000 square feet). CO₂ sensors shall only be used if there is energy savings to be gained.
- F. Provide carbon monoxide (CO) monitors in laundry rooms (gas fired)
- G. Provide CO monitors in fuel or gas fired boiler rooms.
- H. Provide alarm at 35 parts per million (ppm) with 20-30 minute delay of notification going to Environmental Health and Safety. Interlock with fire alarm system

5. AIR FILTRATION

- A. All air filters shall be provided as recommended by ASHRAE Standard 52.2.

6. APPROVED AIR CONDITIONING SYSTEM

- A. Ceiling mounted fan coil and/or air handling units shall not be used unless approved by housing.
- B. Fan Coil Units (4-Pipe System): Minimum 3-row chilled water coil, heating hot water coil

- located in the pre-heat location, 3-speed direct drive fan, modulating 2-way pressure independent water control valves, and filter. Fan coil units sized at medium speed.
- C. Air Handling Units (4-Pipe System): Minimum 6-row chilled water coil, heating hot water coil located in the pre-heat location, 3-speed direct drive (PSC or ECM) fan, modulating 2-way pressure independent water control valves, and filter.
 - D. Fan Coil Unit (Cooling Only): 3-pipe chilled water coil, 3-speed direct drive fan, modulating 2-way pressure independent control valve, and filter.
 - E. Fan Coil Unit (Heating/Ventilation Only): Heating hot water coil, modulating 2-way pressure independent control valve, and filter.
 - F. Fan coil unit chilled water and heating water piping connections shall not be on the same side of the fan coil unit. Heating water shall be left side connections and chilled water shall be right side connections.
 - G. Energy Recovery Unit (ERU): 4-pipe chilled and heating hot water coils, dual enthalpy and sensible energy recovery wheels or total energy wheel with run around coil and variable frequency drive (VFD) supply and exhaust fans. Pre-heat and reheat coils, coil access sections, bypass capability, and segmented energy wheels that allow piece-by-piece wheel removal for service. The unit shall be a packaged system, factory tested with factory provided controls to provide temperature and humidity control. Unit shall be capable to supply 70°F at 42% RH (adj.). Unit shall be designed and installed with adequate clearance for cleaning/ maintenance.
 - H. Premium efficiency motors shall be provided for all motors over 1 HP.
- 7. APPROVED CHILLED AND HOT WATER PIPING DISTRIBUTIONS**
- A. Chilled Water System: System shall be variable secondary pumping through the building with the campus loop acting as the primary loop. System shall bridge to the primary campus loop with automatic pump bypass. System shall maintain a 6 to 8 psi (adj.) differential pressure across the critical zone FCU coil and valve in the loop. Provide pressure reset controls strategy for pump speed controls.
 - B. Provide maximum 10% chilled water bypass utilizing a pressure independent control valve.
 - C. Each FCU and AHU shall have a 2-way modulating, pressure independent control valve. The control valve shall be provided with manual dial to calibrate flow. Control valves shall be automatically balancing.
 - D. Heating Hot Water System: System shall be variable primary pumping through a shell and tube, steam to heating hot water converter, or a condensing boiler plant. System shall control from return water temperature, maintain supply water temperature at maximum 160°F (adj.) and be provided with outdoor temperature reset. Condensing boiler return water maximum temperature shall be 110°F.
 - E. Provide a cathodic protection system for all hot water systems.
 - F. Pipe risers shall be provided with isolation valves and automatic air vents at the high points. Provide drain valves and drains at bottom of all risers.

END OF SECTION

23003 Space Conditions

1.01 DESIGN AND OPERATIONAL CONDITIONS:

- A. Refer to the Yellow Book 230003 SPACE CONDITIONS for design points for other spaces. Specific to Housing, the following design points shall be used to design, size, and select all equipment. The construction documents shall indicate that the controls contractor shall set all control equipment to maintain the operational set points, not the design points.

ROOM TYPE	DESIGN				OPERATION	
	SUMMER		WINTER		SUMMER	WINTER
	DB	RH	DB	RH	DB	DB
Student Bedrooms	75	60	72	30	73±2.5	70±2.5
Study Rooms	75	60	72	30	73±2.5	70±2.5
Lounges	75	60	72	-	73±2.5	70±2.5
Recreation Rooms	75	60	72	-	73±2.5	70±2.5

END OF SECTION

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230519 – Metering and Related Piping

- A. Refer to the Yellow Book 230519 METERING AND RELATED PIPING.
- B. Individual Buildings shall be metered for electric, natural gas, domestic cold water, domestic hot water, chilled water, steam, steam condensate, and/or heating hot water. Coordinate all metering with The Office of Facilities Management Design and Construction.
- C. Laundry rooms shall be metered separate for water, electric and natural gas consumption.
- D. All buildings to be metered individually in multi-building complexes.
- E. Leasing centers and parking decks shall be metered separate.
- F. Sub-metering shall be per design and shall be coordinated with GT Housing Department.

END OF SECTION

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230800 – Commissioning

1. DESCRIPTION

- A. Refer to Yellow Book 01 91 00 COMMISSIONING GENERAL REQUIREMENTS and 01 78 01 COMMISSIONING CLOSEOUT PROCEDURES.
- B. Provide enhanced commissioning on all projects.
- C. Include post-occupancy commissioning on a quarterly basis for the 1st year of building occupancy.

2. SYSTEMS TO BE COMMISSIONED

- A. Fan Coil Units (FCU)
- B. Air Handling Units (AHU)
- C. Energy Recovery Units (ERU)
- D. Outside Air Units (OAU)
- E. Fans
- F. Dryer Exhaust System

END OF SECTION

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230900 – DDC Controls and HVAC Instrumentation

1. REFERENCES

- A. Refer to Yellow Book 23 09 00 DDC CONTROLS AND HVAC INSTRUMENTATION. Note that the Georgia Tech Controls technical specification is available for internal download on the Design & Construction forms site for incorporation into bid documents.

2. DETAILS OF CONTROLS

- A. Fan coils/air handling units shall have the following: LCD display thermostat indicating room and set point temperature, 0-10V/4-20 mA signal for water control valves, high and low temperature limit lockout with adjustable set points, occupancy sensor (motion and infrared) for HVAC shut down.
- B. Building system temperature set points and lockouts shall be controlled individually and/or by whole building.
- C. Energy recovery (ERU) and outside air units (OAU) shall have the following: LCD display thermostat indicating space temperature. LCD display humidistat indicating space humidity. Thermostat outputs shall interface with the control package provided by the unit manufacturer. Unit controls shall be interlocked to the building automation system (BAS) for monitoring and control.
- D. All controls shall be Direct Digital Control (DDC).
- E. Boiler plant heating hot water loop controls shall include water temperature reset based on outdoor air temperature.

3. EQUIPMENT

- A. Manual volume, air balancing dampers located over inaccessible ceilings shall be provided with remote actuators.
- B. Fire/smoke and/or smoke dampers shall be provided with automatic **(REMOTE)** smoke detector reset.
- C. Automatic flow control valves: Valves shall be 2-way pressure independent modulating flow control valves. Valves shall modulate the water coil flow to match the load and be provided with gpm dial for balancing. Valves shall be self-balancing and have 100% authority.
- D. Valve actuator shall be driven by a 24V AC/DC motor and shall accept 0-10V DC, 2-10V DC, 0-20 mA, 4-20 mA, 2-position or 3-point floating electric input signal. Actuator shall be capable of providing same as input, 0-10V DC, 2-10V DC, 0-20 mA, 4-20 mA, feedback signal to the control system. Valves and actuators shall have a 5-year product warranty.

- E. Valves in insulated piping systems shall have an extension on the valve to facilitate operation of valve without compromising insulation thickness.
- F. All fan coil and air handling units shall be provided with a condensate overflow switch to shut down the unit.
- G. Provide pressure and temperature test ports (pete's plugs) for all major HVAC equipment.
- H. Provide remote wireless thermostats for all FCUs.

END OF SECTION

230901 – Compressed Air Piping Systems

1. PNEUMATIC CONTROL SYSTEMS

- A. New construction shall be provided with direct digital/electronic controls.
- B. See 230900 DDC CONTROLS AND HVAC INSTRUMENTATION.

END OF SECTION

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231112 – Campus Chilled Water Distribution System

1. CAMPUS CHILLED WATER DISTRIBUTION SYSTEM

- A. Secondary building chilled water connection to the primary campus chilled water distribution system shall be direct with isolation valves. Provide isolation valves, pressure and temperature ports, thermostats, pressure gauges, and temperature and pressure sensors for Metasys campus control system interlock on both the supply and return piping connection.
- B. Campus bypass to the chilled water loop shall not be provided.
- C. Isolation valves shall be double offset, high performance butterfly valves.
- D. Provide minimum 2'-0" clearance around all sides of chilled water pumps for maintenance access.

END OF SECTION

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231113 – Hydronic Piping

1. VALVES, STRAINERS, UNIONS AND FLANGES

- A. Fan coil and air handling unit coil connections shall have flexible hose connections, isolation valves, unions, pressure and temperature ports on both supply and return sides of each hydronic coil. The supply side of the coil shall have a strainer and the control valve shall be located on the return side of each hydronic coil. Provide pressure and temperature ports (pete's plugs) on supply and return sides of control valves.
- B. Provide pressure test ports across all pressure independent control devices.

2. PENETRATIONS OF WALLS AND FLOORS

- A. Underground wall penetrations shall be provided with pipe sleeve and link seal.
- B. All rated penetrations shall be fire-stopped.

3. INTERIOR CHILLED WATER SYSTEMS

- A. All cold water piping shall be closed cell rigid foam insulation with vapor retarder film and tape. Fiberglass is not allowed for cold water/below ambient service piping.
- B. Elbows, valves, tees, unions, and fillings shall be insulated with pre-formed blocks and covers.
- C. Insulation shall have a 25/50 flame spread/smoke developed rating.
- D. Valves requiring access and maintenance shall be provided with an insulated valve wrap that is easily removable and resealed. Approved manufacturer: No-sweat valve wraps or submit for equal.
- E. Chilled water and condensate piping shall be insulated continuous to the coil connections, including over condensate drain pans. Provide Armaflex insulating tape or approved equal.
- F. All flexible hoses shall be insulated. Insulation shall be tight, provide Armaflex insulating tape or approved equal.
- G. Pro-press pipe fittings allowed up to 2" pipe.

END OF SECTION

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232123 – Hydronic Pumps

1. PUMP CHARACTERISTICS

- A. Provide premium efficiency motors for variable speed drive applications.
- B. Pumps shall be selected for maximum efficiency with life cycle cost compared to initial cost.
- C. Large pump systems shall have primary and standby operation.
- D. Pumps shall have built-in bypass.

END OF SECTION

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234100 – Air Treatment – Filters

1. FILTER CHARACTERISTICS

- A. Filter selection shall comply with ASHRAE Standard 52.2. Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.

END OF SECTION

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237200 – Ventilation Systems

1. GENERAL

- A. Exhaust duct serving high humidity areas (shower rooms, etc.) shall be constructed of aluminum.
- B. Exhaust fans shall be direct drive where possible and provided with solid state speed controller for balancing.
- C. Common area residential kitchen exhaust duct risers shall be U.L. listed, zero clearance, double wall, factory insulated grease duct.
- D. Common area kitchen range exhaust hoods shall be provided with fire suppression system and shall be tied into the building fire alarm system.

END OF SECTION

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237313 – Indoor Central-Station Air-Handling Units

1. GENERAL

- A. Premium efficiency motors shall be provided for all motors over 1 HP.

END OF SECTION

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238123 – Computer Room Air Conditioning Units

- A. MDF Rooms and IDF closets shall be provided with dedicated chilled water fan coil units. Units shall be located outside the computer room where possible. Fan coil units located inside computer rooms shall be ductless with all control valves and valve accessories located exterior to the room. No piping shall be routed above electronic equipment. If water piping must be routed above electronic equipment, piping shall be properly protected.
- B. Dedicated DX cooling systems are acceptable **only** when chilled water is not available.

END OF SECTION

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238234 – EPA Title V Requirements

1. GENERAL

- A. All natural gas fired equipment requires coordination with the GT Department of Environmental Health & Safety. Equipment selections and characteristics shall be submitted early in the design. Submittals shall be provided to the GT project manager for submission to the GT Department of Environmental Health & Safety.

END OF SECTION

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260000 – Electrical - General

This appendix establishes housing design standards for both renovation and new construction of campus housing that are not listed in the Yellow Book. Please refer to the Georgia Tech Yellow Book for all other engineering guidelines and design standards not listed in this appendix.

1. GENERAL REQUIREMENTS:

2. Emergency generators are required for all residence buildings, regardless of size.

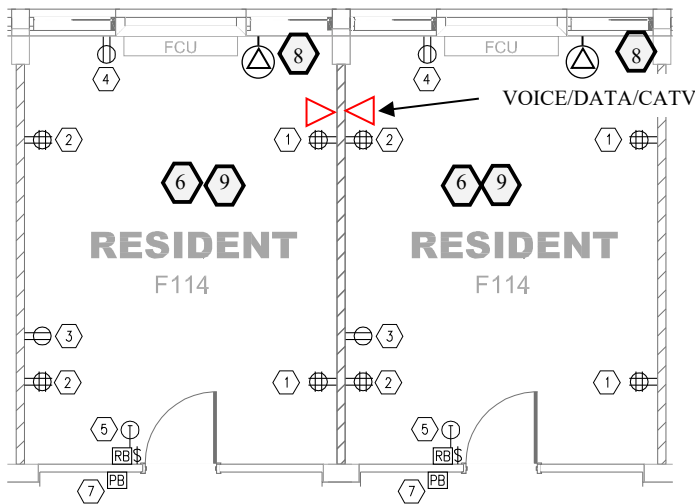
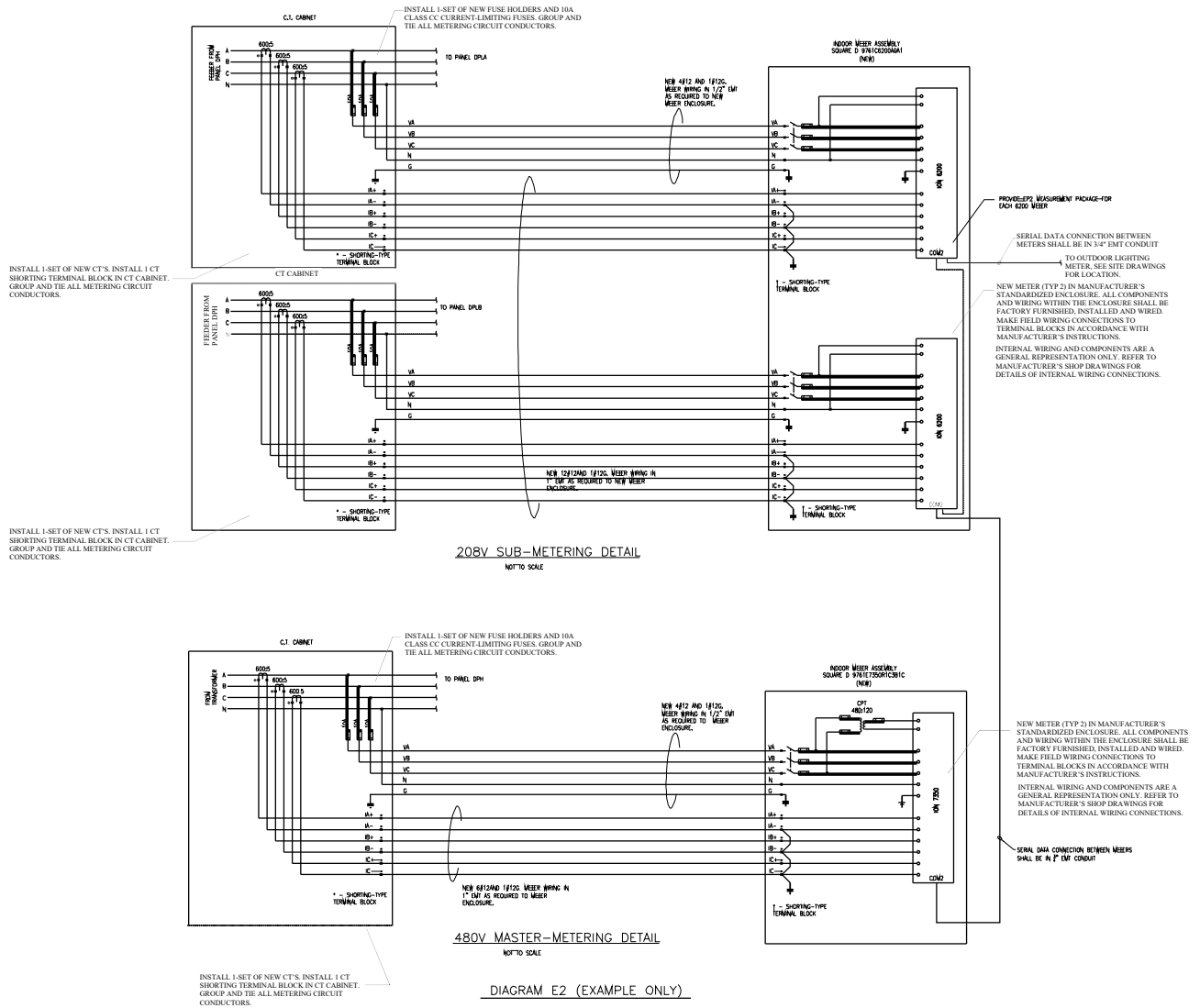


DIAGRAM E1

KEY NOTES: 

1. SURFACE BOX WITH VERTICAL SURFACE-MOUNTED RACEWAY TO CEILING.
2. SURFACE BOX WITH NIPPLE THROUGH WALL (BACK TO BACK BOXES).
3. SURFACE BOX WITH HORIZONTAL SURFACE MOUNTED RACEWAY FROM ADJACENT BOX.
4. FLUSH BOX WITH CONCEALED WIRING. BREAK BLOCK IN EXISTING CMU WALL FOR BOX INSTALLATION. PATCH WALL PER ARCHITECTURAL REQUIREMENTS.
5. CONDITION 1 (WITHOUT AUDIO VISUAL ALERT SYSTEM): SURFACE BOX FOR THERMOSTAT DIRECTLY ABOVE AND ALIGNED WITH SURFACE BOX FOR LIGHT SWITCH. MOUNT TIGHT TO EDGE OF DOOR FRAME. LIGHT SWITCH WIRING AND THERMOSTAT WIRING IN VERTICAL SURFACE-MOUNTED RACEWAYS TO CEILING.

CONDITION 2 (WITH AUDIO VISUAL DOOR ALERT SYSTEM): SURFACE BOX FOR THERMOSTAT CENTERED ABOVE BOXES FOR LIGHT SWITCH AND DOOR ALERT RESET. MOUNT LIGHT SWITCH BOX TIGHT TO EDGE OF DOOR FRAME. LIGHT SWITCH WIRING, THERMOSTAT WIRING, AND DOOR ALERT SYSTEM WIRING IN VERTICAL SURFACE-MOUNTED RACEWAYS TO CEILING, UNLESS NOTED OTHERWISE.
6. SURFACE BOX WITH VERTICAL SURFACE-MOUNTED RACEWAY TO CEILING IN NORTHEAST CORNER ROOMS ONLY. SURFACE BOX WITH NIPPLE THROUGH WALL IN NORTHWEST AND SOUTHWEST CORNER ROOMS.
7. WHERE PRESENT, DOOR ALERT PUSHBUTTONS TO BE RECESSED IN WALL. ALL PUSHBUTTONS TO BE AT THE SAME DISTANCE FROM FRAME (MAX 12") AND SAME HEIGHT ABOVE FLOOR.
8. ROOM FCU'S SHOULD BE ON SEPARATE CIRCUITS FROM ROOM RECEPTACLES.
9. IDENTIFY (E.G. WITH GREY COVER PLATE) WHERE MINI-FRIDGES OR SIMILAR APPLIANCES SHOULD BE PLUGGED IN BEDROOMS.



260500 – Common Work Results for Electrical

1. DEFINITIONS

- A. Apartment Unit - A single unit, providing complete and independent living facilities for one or more persons, including permanent provisions for living, sleeping, cooking, and sanitation.
- B. Dorm Room – A sleeping room without permanent provisions for cooking.

2. CODES AND STANDARDS

- A. Sustainable Design— Electrical system design shall meet the minimum requirements to achieve rating system certification, with emphasis placed on energy savings.

END OF SECTION

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260519 – Low-Voltage Electrical Power Conductors and Cables

1. BRANCH CIRCUITS

- A. A dedicated homerun junction box shall be provided in each dorm room. Consideration should be given to the location of the homerun junction box within dormitory rooms (where the branch circuits are pulled from a common electrical closet). These junction boxes must be accessible. Access can be gained through the removal of the light fixture in the ceiling, a blank cover plate on the junction box, or an access panel will need to be provided at the location of the junction box.
- B. AFCI protection shall be provided in accordance with the requirements of the NEC for dwelling units and shall also be provided for branch circuits serving dorm rooms.
- C. Garbage disposers shall be provided in all communal and private kitchens. Provide branch circuiting for connection of this equipment. Confirm with Georgia Tech HRL for all requirements.
- D. A minimum of two branch circuits shall be provided in all communal kitchens for microwaves.
- E. Provide labeling of branch circuits at each device location for future maintenance use.
Labeling shall be placed on the inside of the cover plate so that it cannot be easily removed.
- F. Type NM cable is prohibited.

END OF SECTION

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260533 – Raceways and Boxes for Electrical Systems

1. CONDUIT AND RACEWAY

- A. Surface raceways shall be metallic and shall not be smaller than Wiremold 700 series.
- B. Non-metallic tubing is prohibited unless approved by Georgia Tech Housing.

2. INSTALLATION

- A. Consideration shall be given during the renovation of an existing building to limit the amount of exposed raceway used. Where possible, outlet boxes should be located in back to back conditions to limit the surface raceway to one side of the wall. See diagram E1 for further details.
- B. Anchors and Fasteners:
 - 1. Concrete Structural Elements: Use precast inserts, expansion anchors, powder-actuated anchors, or preset inserts.
 - 2. Steel Structural Elements: Use beam clamps, steel spring clips, steel ramset fasteners, or welded fasteners.
 - 3. Concrete Surfaces: Use self-drilling anchors or expansion anchors.
 - 4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts or hollow wall fasteners.
 - 5. Solid Masonry Walls: Use expansion anchors or preset inserts.
 - 6. Sheet Metal: Use sheet metal screws.

END OF SECTION

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260573 – Short Circuit and Coordination Study

1. SHORT-CIRCUIT, COORDINATION AND ARC-FLASH HAZARD STUDIES

A. Studies shall include the load centers in all apartment units.

2. ARC-FLASH HAZARD WARNING LABELS

A. Warning labels shall be provided for all applicable power distribution equipment including load centers in all apartment units.

END OF SECTION

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260923 – Lighting Control Devices

1. OCCUPANCY SENSORS

- A. Occupancy sensors shall be hard-wired in all new construction.
- B. Wireless occupancy sensor systems may be used in renovation projects or retrofit applications where hard-wired systems cannot be easily installed.
- C. Wireless occupancy sensors shall be powered entirely by energy-harvesting solar cells. Consideration shall be given to the location of these sensors to minimize the amount of time spent in complete darkness in order to maintain the solar exposure necessary to operate.
- D. Minimum time delay shall be 30 minutes unless requested otherwise by Georgia Tech Housing.
- E. Occupancy sensors shall not be used in dorm rooms and/or apartment units. Manual controls shall be used in these areas.
- F. In multiple common area/corridor applications, each corridor shall be treated as an individually controlled space.
- G. Manual “off” wall switches shall be provided in study rooms and communal kitchens where lighting is controlled by an occupancy sensor.

END OF SECTION

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262416 – Panelboards

1. LOAD CENTERS

- A. Load Centers shall be used for all staff apartments within a dormitory building. These load centers shall be located within the apartment unit.

- B. A load center shall be provided for all door control circuits and shall be located within the APC enclosure provided by Division 280000 to house the door controls. Coordinate each load center size with the APC enclosure.

END OF SECTION

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262813 – Electricity Metering

1. INSTALLATION

- A. A metering detail shall be provided in the design documents indicating how the master meter and sub-meters (if any) are to be connected. Refer to Diagram E2 as an example of this requirement.
- B. Coordinate all sub-metering requirements with Georgia Tech Housing.

END OF SECTION

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262726 – Wiring Devices

1. WIRING DEVICES

- A. A weatherproof GFCI receptacle shall be provided adjacent to all hose bibbs on the building exterior.

END OF SECTION

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263300 – Battery Equipment

1. UNINTERRUPTIBLE POWER SUPPLY

- A. A UPS shall be provided for door controls and communications electronics, including network switches, telecoms equipment, etc. A maintenance bypass shall be provided to service the UPS.

END OF SECTION

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265100 – Interior Lighting

1. INTERIOR LIGHTING

- A. The use of LED recessed downlights is required. Other LED applications can be used as approved by Georgia Tech Housing.
- B. LED lamps are to be specified for general lighting.
- C. LED strip lights shall be used at all vanities and toilet walls in communal bathrooms. These lights are to be located within the wallboard cove with an egg crate grill by architect.
- D. All lensed LED fixtures shall be provided with a #19 pattern lens, 0.156” thickness.
- E. Wall sconce fixtures in resident hall corridors are discouraged.
- F. Wireguards shall be provided on all bare-lamp fixtures located in mechanical, electrical, and storage rooms.
- G. A junction box with a blank cover plate shall be provided on the wall 46” AFF to center at the entrances to all communal bathrooms. A 1/2" conduit shall be provided from this box to the lighting circuit at occupancy sensor or other accessible point as shown for interconnection of future switches.
- H. Provide consistency in color temperatures in visually adjacent spaces.
- I. The following are recommended color temperatures for spaces.
 - a. Bedroom: 3000K
 - b. Corridors: 3500K
 - c. Community Kitchen: 3500K
 - d. Kitchen (Inside the Dormitory): 3000K
 - e. Study Areas (Outside the Dormitory): 3500K
 - f. Study Areas (Inside the Dormitory): 3500K
 - g. Ganged Bathrooms: 3500K
 - h. Private Bathrooms: 3000K
 - i. Stairway: 3500K
 - j. Exterior entries: 4000K

END OF SECTION

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265600 Exterior Lighting

1. EXTERIOR LIGHTING

- A. Coordinate with housing as to what is considered campus site lighting and what will be considered building lighting for each project.
- B. The use of in ground light fixtures or on stair risers is prohibited unless otherwise approved by Georgia Tech Housing.
- C. All exterior lights (poles and building floods) shall have an ID sticker at reading level below them.

END OF SECTION

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270500 Common Work Results for Communications

1. General

Housing Building projects shall adhere with the Georgia Tech Yellow Book Requirements plus the following additional requirements:

- A. Number of telecom rooms shall be minimized per housing building. Requirement shall be to ensure that the 90 meter cabling rule is satisfied. In general, designers shall confirm that cabling distances are not in excess of ~250' to accommodate for service loops.
- B. In housing buildings, stacked telecom chases shall be provided to allow cabling distances to be minimized.
- C. For telecom outlets in housing buildings, designer shall require deep back boxes with tile rings to accommodate bend radius of coaxial cables.
- D. Telecom outlet boxes shall be provided with dedicated 1" EMT from outlet box to telecom room/chase. Where outlet boxes are mounted on same wall or back to-back, single homerun may be shared by two back boxes but conduit size to be adjusted to be in accordance with maximum 40% cabling fill in any given raceway.
- E. For housing renovation projects, surface mount raceway shall be permitted from surface mount outlet box to ceiling space. For areas with inaccessible ceilings, minimum 8" x 8" ceiling mount access panel shall be required in each student room to accommodate transition between surface mount raceway and EMT conduit above ceilings.
- F. Locations of wireless data access point cabling outlets shall be determined by Georgia Tech Housing.
- G. In fitness spaces, one CATV outlet shall be required per fitness machine.
- H. All laundry equipment shall be network based. Coordinate with Georgia Tech Housing for cabling requirements.
- I. All ATM machines in housing buildings shall be provided with Category 5e data outlet. Coordinate with manufacturer for outlet height requirement.
- J. Housing building irrigation systems shall be networked based and will require Category 5e data circuits. Coordinate with location of irrigation controllers.

2. Telecommunication Outlet Components/Configurations:

- A. Housing Student Room: (1) cat5e data outlet and (1) cat5e voice outlet shall be provided per student bed & (1) CATV outlet shall be provided per student room.

- B. Housing Study Rooms – Each housing study room shall be provided with (1) Cat5e data outlet, (1) Cat 5e voice outlet, and (1) CATV outlet mounted at 72” AFF.

END OF SECTION

274100 Multimedia Infrastructure

1. General

- A. Housing buildings may be equipped with classrooms. When this is the case, all of the requirements noted in the Georgia Tech Yellow Book shall apply.
- B. In Housing buildings, noted conference rooms shall be equipped with audio/visual systems that will be required to be coordinated with Georgia Tech multimedia standards. The general requirements of conference rooms shall include the following:
 - 1. Flat panel LCD screen with integral speaker systems – Sized & provided by Georgia Tech
 - 2. The AV Input Plate Module placed in two 2-gang electrical housings at outlet height. Location is in the front of the room to the left of the flat panel LCD screen. All connections to the input plate must be designed for quick disconnect. Refer to Georgia Tech Audio Visual Standards for specific requirements .
 - 3. AV grommet wall plate module placed in two 2-gang electrical housings placed behind flat panel LCD screen for cable routing between AV Input Plate and LCD screen.

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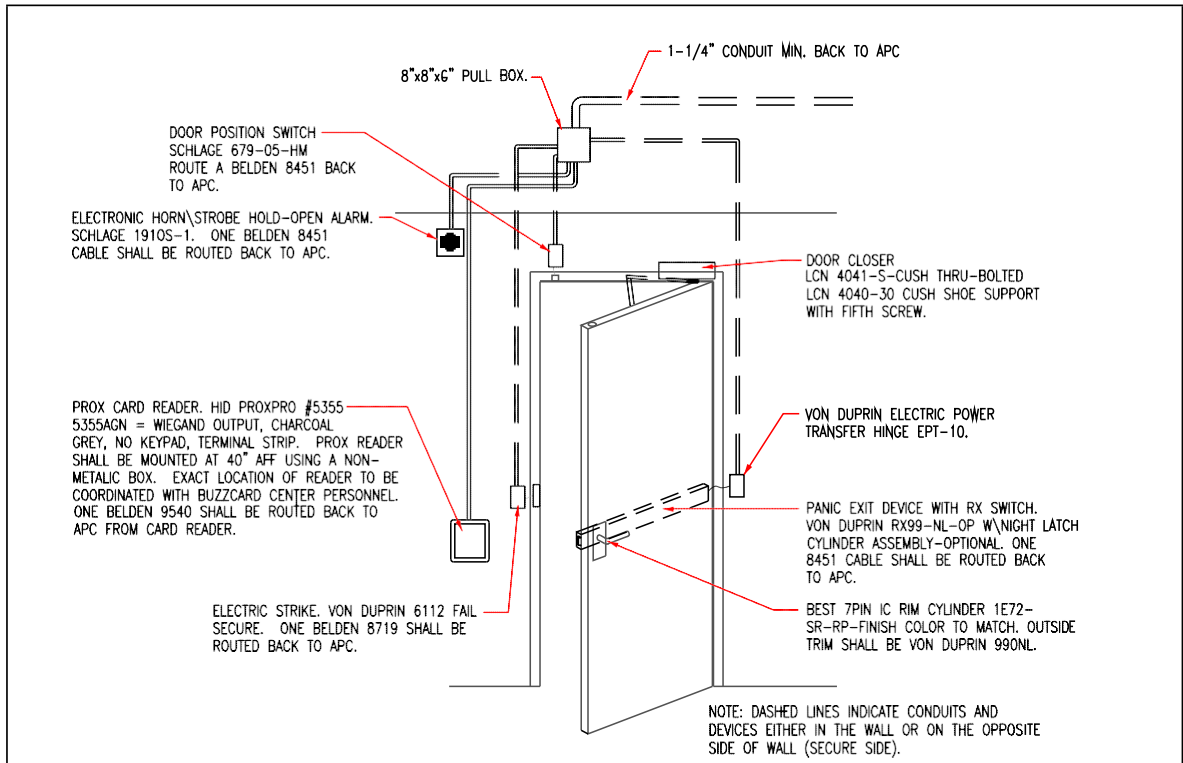
281300 Access Control

1. General

- A. Georgia Tech Housing Access Control Systems (ACS) shall be based on the products of Blackboard to integrate with existing systems.
- B. When routing cabling through hollow metal door frames, the security contractor shall be responsible for drilling holes in door frames and all holes shall be de-burred of all rough edges. In addition, a protective plastic bushing shall be installed in all drilled holes to ensure a smooth path for all installed cabling.
- C. All doors provided with electronic access control and/or security systems shall contain conduit in the door frames. This includes store-front doors.
- D. All openings provided with electric door hardware shall be equipped with mechanical key override.
- E. All security & access control systems shall be powered from Optional Standby panel boards.
- F. For Housing projects, the following security & access control requirements shall be provided:
 - 1. Composite cables may be utilized for wiring all security and access control components at a given door opening. Composite cables are typically provided by the Contractor unless indicated otherwise.
 - a Note 1 – For doors with electronic latch retraction, in addition to the composite cables, the contractor shall be responsible for routing 2 pairs of 12AWG stranded twisted cables to each opening. This is required because composite cables are not equipped with appropriate cables for this hardware type.
 - b Note 2 – Contractor to confirm that 40% conduit fill is not exceeded.
 - c Note 3 – Cable for Proximity Reader is not included in composite cable and contractor shall be responsible to provide.
 - 2. Door position switch sensors shall be provided on all roof hatches and attic doors. Requirement for card readers on roof hatches and attic doors shall be confirmed by the Housing Department.
 - 3. Card readers, electric door hardware, and door position switches shall be required on the main mechanical room door, main telecom room door, and main electrical room door in

each housing building. Electronic wireless lock only to be used when reviewed and approved by Housing.

4. Card reader access shall be provided on both sides of main roof doors. All roof doors shall be wired for intrusion detection.
5. All ADA doors shall be provided with long range card readers and electric door hardware.
6. Resident corridors shall be provided with card access control. This includes the requirement for card readers in elevators when an elevator provides direct access from common area assembly spaces & program spaces to resident housing corridors. In assembly or program space, card reader shall be required to call elevator.
7. New buildings should have a card reader from the stairwell into the corridor. Free exit to stairwell from corridor shall be provided.
8. Access control readers shall be multi-technology readers.
9. See pages following for typical door installation details.



Type "A" Door – Full Access		
Qty.	Description	Product
1	Proximity Card Reader	HID #5355 ProxPro (5355AGN => Wiegand Output, Charcoal Gray, No Keypad, Terminal Strip)
1	Manual Door Closer	LCN #4041 S-CUSH, Thru-Bolted, Match Finish
1	Manual Door Closer Installation Accessory	LCN #4040-30, CUSH Shoe Support, Fifth Screw
1	Electric Strike *	Von Duprin #6112, 24VDC, Fail-Secure (FS), Match Finish
1	Rim Exit Device	Von Duprin #RX99-NL-OP, Night Latch Cylinder Assembly-Optional Pull, Match Finish
1	Trim	Von Duprin #990NL
1	Door Position Switch	Schlage #679-05 HM, Hollow Metal
1	Electronic Horn	Door & Frame, Concealed SPDT Magnetic Switch Schlage #1910S-1, Horn w/Strobe, 24VDC
1	Best 7 pin IC Rim Cylinder	Best #1E72-SR-RP, Match Finish
*Where "blade stops" occur on aluminum frames, use Von Duprin 6113 Blade Stop Shim 010053-XX		

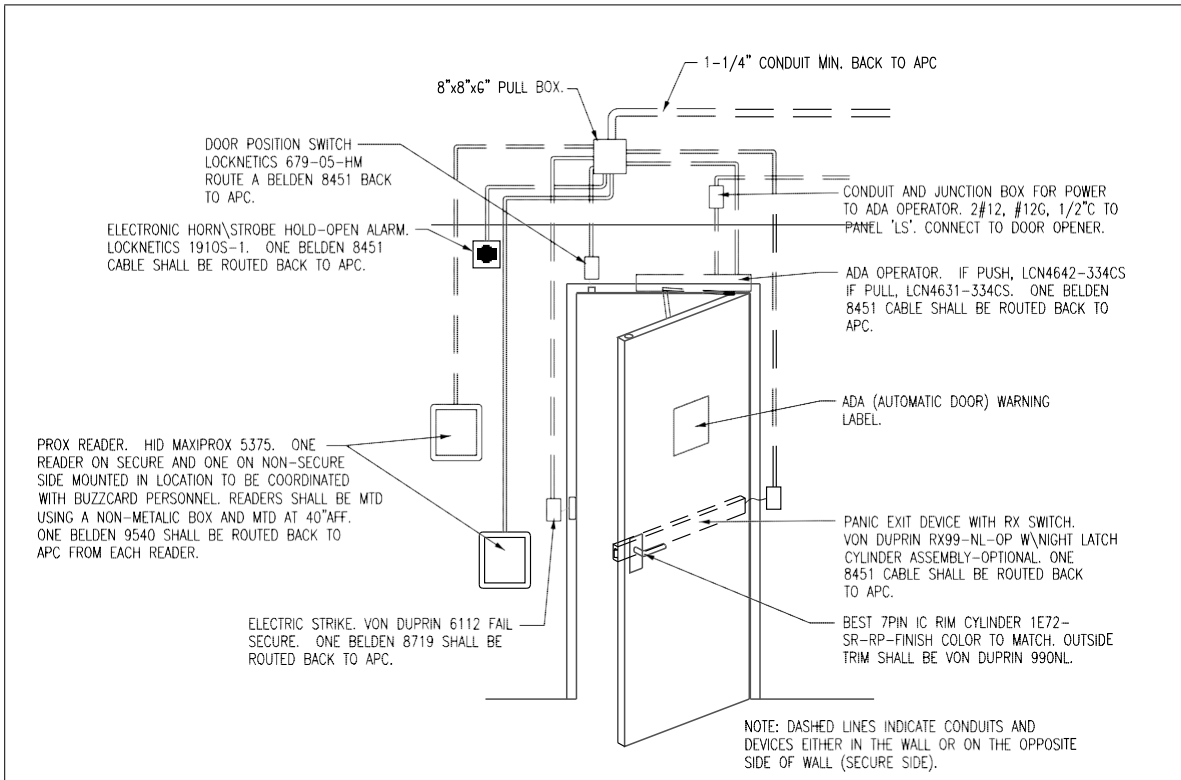
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TYPICAL TYPE "A"
 FULL ACCESS DOOR

GENERAL NOTE: FOR DOORS WITH ELECTRONIC LATCH RETRACTION, IN ADDITION TO THE COMPOSITE CABLES, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ROUTING 2 PAIRS OF 12AWG STRANDED TWISTED CABLES TO EACH OPENING. THIS IS REQUIRED BECAUSE COMPOSITE CABLES ARE NOT EQUIPPED WITH APPROPRIATE CABLES FOR THIS HARDWARE TYPE.


 J&A ENGINEERING CONSULTANTS PHONE: (770) 817-4220 FAX: (770) 234-6878 4343 Shallowford Road Suite F5, Marietta, GA 30062	Project Title: GA TECH STANDARDS	Project No: 13002 Sheet Ref: NONE Scale: NONE Drawn By: K. PERKINS
	Sketch Title: TYPICAL TYPE "A" DOOR	5/3/2013 Print Date: SK-01 Drawing No.
Electronic Path: P:\2013\13002 GA TECH STANDARDS PROJECT\IN HOUSE\LV\SK-01.DWG		



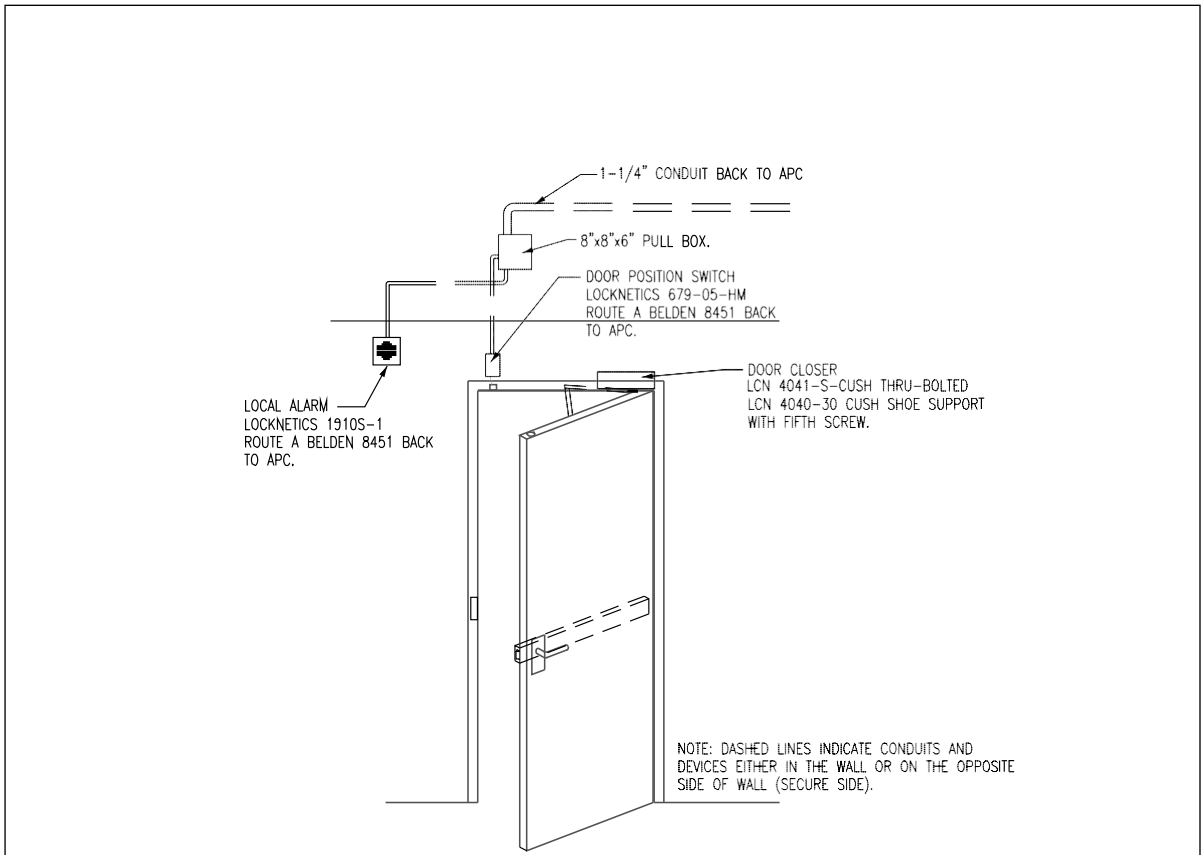
Type "B" Door – Full Access, ADA		
Qty.	Description	Product
2	Proximity Card Reader	HID #5375 MaxiProx, Charcoal Gray
1	Automatic Door Operator	Push Device – LCN #4642-334CS, Match Finish Pull Device – LCN #4631-334CS, Match Finish
1	Electric Strike *	Von Duprin #6112, 24VDC, Fail-Secure (FS), Match Finish
1	Rim Exit Device	Von Duprin #RX99-NL-OP, Night Latch Cylinder Assembly-Optional Pull, Match Finish
1	Trim	Von Duprin #990NL
1	Door Position Switch	Locknetics #679-05 HM, Hollow Metal Door & Frame, Concealed SPDT Magnetic Switch
1	Electronic Horn	Locknetics #1910S-1, Horn w/Strobe, 24VDC
1	Best 7 pin IC Rim Cylinder	Best #1E72-SR-RP, Match Finish

*Where "blade stops" occur on aluminum frames, use Von Duprin 6113 Blade Stop Shim 010055-XX

PLAN NOT TO SCALE **1** TYPICAL TYPE "B" DOOR FULL ACCESS ADA DOOR

 <p>PHONE: (770) 817-4220 FAX: (770) 234-6878 4343 Shallowford Road Suite F5, Marietta, GA 30062</p>	Project Title: GA TECH STANDARDS	Project No: 13002 Sheet Ref: NONE Scale: NONE Drawn By: K. PERKINS
	Sketch Title: TYPICAL TYPE "B" DOOR	2/6/2013 Print Date: SK-02 Drawing No.

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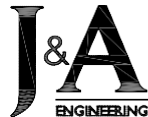


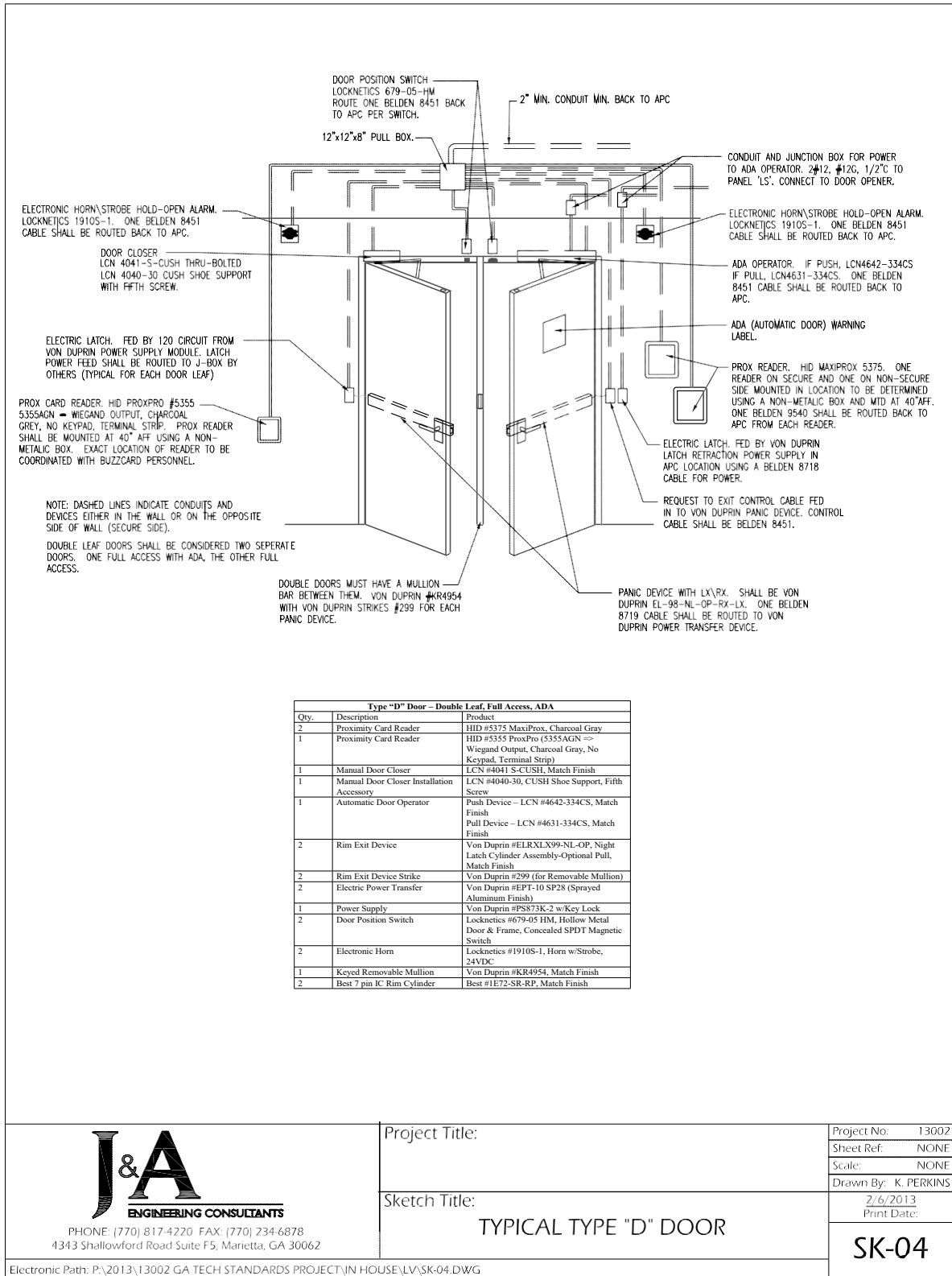
Type "C" Door – Monitor Only		
Qty.	Description	Product
1	Manual Door Closer	LCN #4041 S-CUSH, Match Finish
1	Manual Door Closer Installation Accessory	LCN #4040-30, CUSH Shoe Support, Fifth Screw
1	Door Position Switch	Locknetics #679-05 HM, Hollow Metal Door & Frame, Concealed SPDT Magnetic Switch
1	Electronic Horn	Locknetics #1910S-1, Horn w/Strobe, 24VDC

PLAN
 NOT TO SCALE

1

TYPICAL TYPE "C" DOOR
 MONITOR ONLY DOOR

 ENGINEERING CONSULTANTS PHONE: (770) 817-4220 FAX: (770) 234-6878 4343 Shallowford Road Suite F5, Marietta, GA 30062	Project Title: GA TECH STANDARDS	Project No: 13002 Sheet Ref: NONE Scale: NONE Drawn By: K. PERKINS
	Sketch Title: TYPICAL TYPE "C" DOOR	2/6/2013 Print Date:
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PHONE: (770) 817-4220 FAX: (770) 234-6878
 4343 Shallowford Road Suite F5, Marietta, GA 30062

Project Title:

Sketch Title:

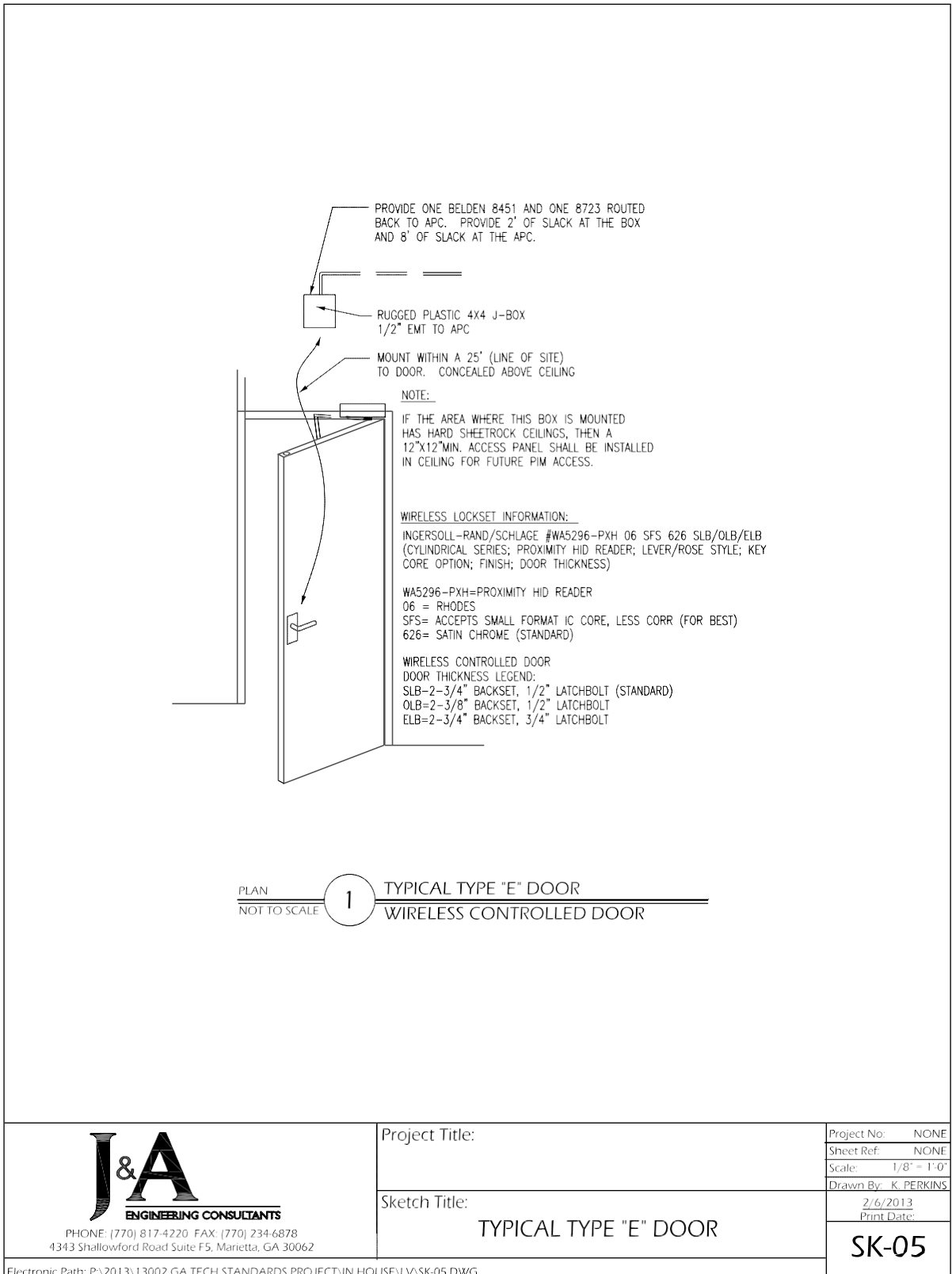
TYPICAL TYPE "D" DOOR

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 Sheet Ref: NONE
 Scale: NONE
 Drawn By: K. PERKINS

2/6/2013
 Print Date:

SK-04

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PLAN
NOT TO SCALE

1 TYPICAL ACCESS CONTROL BUILD-OUT

GENERAL NOTES:

- ALL CABLING FOR DOOR CONTROLS AND DATA CABLING IN SUPPORT OF DOOR ACCESS SHALL BE IN EMT CONDUIT OF APPROPRIATE SIZE. CABLING RUNS TO MULTIPLE DOORS IN ONE AREA MAY BE COMBINED IN SINGLE, LARGER CONDUITS. PULL BOXES SHALL BE PLACED AT REGULAR INTERVALS. BOXES SHALL BE OF APPROPRIATE SIZE TO ALLOW FOR CABLE PULLING AND MAINTAIN CABLE BEND RADIUS LIMITS.
- SEPARATE CONDUITS SHALL BE RUN FOR 120V POWER FEEDS TO DOOR OPENERS AND LATCH RETRACTORS. MULTIPLE POWER FEEDS TO SINGLE LOCATIONS MAY BE COMBINED PROVIDED CONDUITS ARE SIZED APPROPRIATELY.
- FIRE STOP ALL PENETRATIONS THROUGH WALLS AND FLOOR SLAB, RATED OR NON-RATED. CABLE PENETRATIONS THROUGH WALLS SHALL BE CORE DRILLED TO A SIZE THAT IS JUST LARGER THAN NECESSARY, BUT NO LARGER THAN 1.5X THE DIAMETER OF THE CONDUIT SLEEVE OR THE CABLE BUNDLE PENETRATING THE WALL. ALL PENETRATIONS THRU FLOOR AND FIRE WALLS SHALL BE SLEEVED. FIRESTOPPING SHALL COMPLY WITH ASTM 814 AND NFPA 251.
- CONDUIT SHALL BE ROUTED CONCEALED IN WALL WHERE POSSIBLE. PULL BOXES AND DEVICE BOXES SHALL ALSO BE CONCEALED WHERE POSSIBLE. OTHERWISE, PULL BOX AND CONDUIT HOME-RUN TO APC SHALL BE ROUTED ON SECURE SIDE OF DOOR. CONDUITS RUN ON NON-SECURE SIDE OF DOOR SHALL BE ROUTED SUCH TO MINIMIZE THE ABILITY TO BREAK CONDUIT OPEN AND ACCESS CABLING.
- PLYWOOD BACKBOARDS SHALL BE 3/4" BD-INT OF PA GRADE PLYWOOD. PAINT BOTH SIDES AND EDGES WITH 2 COATS "GREEN" FIRE-RETARDANT PAINT. UNLESS A SPECIFIC SIZE IS INDICATED ON THE DRAWING, PLYWOOD BACKBOARD SIZE SHALL BE 4" WIDE X 8" HIGH (MINIMUM).
- FURNISH AND INSTALL UL-LISTED, PLENUM-RATED, 4-PAIR, CATEGORY 5e UTP DATA STATION CABLE FROM TELECOM ROOM TO EACH DATA PORT LOCATION. TERMINATE DATA STATION CABLES ON CAT5e PATCH PANEL(S) IN TELECOM ROOM. CONTRACTOR SHALL FURNISH AND INSTALL APPROPRIATE NUMBER OF 48-PORT, HIGH DENSITY, CAT5e PATCH PANELS TO TERMINATE ALL CAT5e DATA STATION CABLES. UNLESS SPECIFICALLY INDICATED OTHERWISE, ALL PATCH PANELS SHALL BE 48-PORT. FURNISH AND INSTALL A WIRE MANAGEMENT PANEL ABOVE AND BELOW EACH PATCH PANEL. WIRE MANAGEMENT PANEL SHALL HAVE 4 HORIZONTAL, 4 VERTICAL, AND 24 INDIVIDUAL WIRE CLIPS.
- PROVIDE TWO (2) 7' CATEGORY 5e RED PATCH CABLE FOR EACH RJ-45 (DATA) PORT.
- LABEL ALL DATA CABLES IN ACCORDANCE WITH GEORGIA TECH SPECIFICATIONS.
- TEST ALL DATA AND VOICE CABLES PER GEORGIA TECH SPECIFICATIONS. REFERENCE TEST REPORTS TO GEORGIA TECH CABLE IDENTIFICATION STANDARDS.
- WHERE "BLADE STOPS" OCCUR ON ALUMINUM FRAMES, CONTRACTOR SHALL USE VON DUPRIN 6112, 24 VDC, BLADE STOP SHM #0155-XX.
- FINISH OF DOOR HARDWARE SHALL MATCH EXISTING HARDWARE FINISHES.
- ALL ACCESS CONTROL CABLES RUNS SHALL BE CONTINUOUS WITH NO SPLICES ALONG THE ENTIRE LENGTH OF THE RUN FROM APC TO POINT OF CONNECTION/TERMINATION WITH DOOR HARDWARE DEVICES.

Buzzer Center Access Control Composite Table					
Device	Qty.	Individual Lead Color	Belden Cable #	# of Conductors	AWG
Door Position Switch	1	Yellow & White/Yellow	8451	2	22
Electronic Horn	1	Green & White/Green	8451	2	22
Electric Strike/Latch Retraction	1	Red & White/Green	8719	2	16
Request to Exit	1	Violet & White/Violet	8451	2	22
Door Operator	1	Orange & White/Orange	8451	2	22
Spare Cable	1	Blue & White/Blue	8451	2	22
Spare Cable	1	Brown & White/Brown	8719	2	16

OWNER TO PROVIDE COMPOSITE ACCESS CONTROL CABLE FOR ALL DOOR HARDWARE DEVICES. CONTRACTOR TO PROVIDE CABLE FOR PROXIMITY CARD READERS (BELDEN 9540) AND POWER FEED CABLES (BELDEN 8718) FOR LATCH RETRACTION AND ADA OPERATORS.

 PHONE: (770) 817-4220 FAX: (770) 234-6878 4343 Shallowford Road Suite F5, Marietta, GA 30062	Project Title:	Project No: 13002
	GA TECH STANDARDS	Sheet Ref: NONE
	Sketch Title:	Scale: NONE
	TYPICAL ACCESS CONTROL	Drawn By: K. PERKINS
		2/6/2013 Print Date:
		SK-06

Electronic Path: P:\2013\13002 GA TECH STANDARDS PROJECT\IN HOUSE\LV\SK-06.DWG

END OF SECTION

282300 Video Surveillance

1. General

- A. For housing projects, the following video surveillance components shall be provided:
 - 1. All elevators and elevator lobbies shall be pre-wired for video surveillance cameras.
 - 2. All building entrances shall be pre-wired for video surveillance cameras.

END OF SECTION

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283100 – Fire Detection and Alarm

1. DEVICE LOCATIONS

- A. A fire alarm horn/speaker shall be located in every sleeping room unless directed otherwise by Georgia Tech Housing. Sound levels shall be limited to the code required minimum.
- B. Smoke detectors shall be installed at the bottom of the first landing and in the ceiling above the top landing of every stairwell.
- C. It is the preference of Georgia Tech housing to use system connected smoke detectors in dorm rooms and single/multiple station smoke alarms shall be used in apartment units.

2. FIRE ALARM SYSTEMS

- A. The fire alarm control panel shall have internet-based capabilities to provide email notifications to campus personnel.
- B. Coordinate all fire alarm requirements with the campus fire marshal.

3. MISCELLANEOUS

- A. All ranges located in communal kitchens shall be provided with a means to automatically disconnect power in a fire alarm condition. Automatic reset shall be provided to restore power once the fire alarm condition has been cleared.

4. GEORGIA TECH HOUSING REQUIRED SPECIFICATION, ATTACHED.

END OF SECTION

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283176 – Fire Alarm and Voice Evacuation System

PART 1 - GENERAL

1.1 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Use the latest edition, unless noted otherwise.
- B. ASME INTERNATIONAL (ASME)
1. ASME A17.1 Safety Code for Elevators and Escalators
- C. FM GLOBAL (FM)
1. FM APP GUIDE Approval Guide <http://www.approvalguide.com/>
- D. INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)
1. IEEE C62.41.1 Guide on the Surges Environment in Low-Voltage (1000 V and Less) AC Power Circuits
 2. IEEE C62.41.2 Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits
- E. INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)
1. IEC 60268-16 Sound System Equipment-Part 16: Objective rating of speech intelligibility by speech transmission indexes
- F. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
1. NFPA 170 (2018) Standard for Fire Safety and Emergency Symbols, with Georgia Amendments
 2. NFPA 70 (2020) National Electrical Code®, with Georgia Amendments
 3. NFPA 72 (2019) National Fire Alarm and Signaling Code®, with Georgia Amendments
 4. NFPA 90A (2018) Installation of Air Conditioning and Ventilating Systems, with Georgia Amendments
- G. UNDERWRITERS LABORATORIES (UL)
1. UL 1480 Standard for Speakers for Fire Alarm, Emergency, and Commercial and Professional Use
 2. UL 1638 Visual Signaling Appliances - Private Mode Emergency and General Utility Signaling
 3. UL 1971 Signaling Devices for the Hearing Impaired
 4. UL 2017 General Purpose Signaling Devices and Systems
 5. UL 268 Smoke Detectors for Fire Protective Signaling Systems
 6. UL 464 Audible Signal Appliances
 7. UL 521 Heat Detectors for Fire Protective Signaling Systems
 8. UL 864 Control Units and Accessories for Fire Alarm Systems
 9. UL Fire Prot Dir Fire Protection Equipment Directory
 10. UL Elect Const Electrical Construction Equipment Directory

1.2 SYSTEM DESCRIPTION

- A. This work includes providing a new, complete, analog/addressable fire alarm system as described herein and on the contract drawings for the entire building. Include in the system wiring, raceways, pull boxes, terminal cabinets, outlet and mounting boxes, control equipment, alarm, and supervisory signal initiating devices, alarm notification appliances, supervising station fire alarm system transmitter, and other accessories and miscellaneous items required for a complete operating system even though each item is not specifically mentioned or described. Provide system complete and ready for operation.
- B. Provide equipment, materials, installation, workmanship, inspection, and testing in strict accordance with the required and advisory provisions of NFPA 72, except as modified herein. The system layout on the drawings shows the intent of coverage and devices/equipment are shown in suggested locations. Submit plan view drawing showing device locations, terminal cabinet locations, junction boxes, other related equipment, conduit routing, wire counts, circuit identification in each conduit, and circuit layouts for all floors. Drawings shall comply with the requirements of NFPA 170. Final quantity, system layout, and coordination are the responsibility of the contractor.
- C. Technical data and computer software (meaning technical data that relates to computer software) that are specifically identified in this project, and may be defined/required in other sections, shall be delivered, strictly in accordance with the CONTRACT CLAUSES. Identify data delivered by reference to the particular specification section paragraph against which it is furnished. Data to be submitted shall include complete system, equipment and software descriptions. Descriptions shall show how the equipment will operate as a system to meet the performance requirements of this contract. The data package shall also include the following:
 - 1. Identification of programmable portions of system equipment and capabilities.
 - 2. Description of system revision and expansion capabilities and methods of implementation detailing both equipment and software requirements.
 - 3. Provision of operational software data on all modes of programmable portions of the fire alarm and detection system.
 - 4. Description of fire alarm control panel equipment operation.
 - 5. Description of auxiliary and remote equipment operation.
 - 6. Library of application software.
 - 7. Operation and maintenance manuals.
- D. Keys and locks for equipment shall be identical. Provide not less than six keys of each type required. Master all keys and locks to a single key. Locks shall be Best 7-pin.

1.3 SUBMITTALS

- A. Submit the following:
 - 1. Shop Drawings
 - a. Wiring Diagrams: Point-to-point wiring diagrams showing the points of connection and terminals used for electrical field connections in the system, including interconnections between the equipment or systems that are supervised or controlled by the system. Diagrams shall show connections from field devices to the FACP and remote fire control units, initiating circuits, switches, relays and terminals. Complete riser diagrams

- indicating the wiring sequence of devices and their connections to the control equipment. Include floor plans showing the locations of devices and equipment.
- b. System Layout: Plan view drawing showing device locations, terminal cabinet locations, junction boxes, other related equipment, conduit routing, wire counts, circuit identification in each circuit, and circuit and conduit layouts for all floors. Drawings shall comply with the requirements of NFPA 170, Fire Safety Symbols.
 - c. System Operation: A complete list of device addresses and corresponding messages.
 - d. Notification Appliances: Data on each circuit to indicate that there is at least 25 percent spare capacity for notification appliances and 25 percent spare capacity for initiating devices. Annotate data for each circuit on the drawings.
 - e. Amplifiers: Data to indicate that the amplifiers have sufficient capacity to simultaneously drive all notification speakers plus 25 percent spare capacity. Annotate data for each circuit on the drawings.
2. Product Data: Annotated catalog data, in table format on the drawings, showing manufacturer's name, model, and catalog number for equipment and components.
 - a. Technical data and computer software.
 - b. Fire alarm control panel (FACP)
 - c. Terminal cabinets
 - d. Manual stations
 - e. Batteries
 - f. Battery chargers
 - g. Smoke detectors
 - h. Heat detectors
 - i. Wiring and cable
 - j. Notification appliances
 - k. Addressable interface devices
 - l. DACT
 - m. Amplifiers
 - n. Electromagnetic door hold open devices
 3. System Operation: A complete description of the system operation in matrix format on the drawings.
 4. Battery Power: Battery calculations as required in paragraph Battery Power Calculations. Submit a voltage drop calculation to indicate that sufficient voltage is available for proper operation of the system and all components, at a minimum rated voltage of the system operating on batteries.
 5. Certificates: Submit certification for designer, supervisor and technicians.
 6. Field Report: A unique identifier for each device, including the control panel and initiating and indicating devices, with an indication of test results, and signature of the factory-trained technician of the control panel manufacturer and equipment installer. Include the NFPA 72 Record of Completion and Inspection and Testing Forms with the appropriate test reports.
 7. Operation and Maintenance (O&M) Instructions: One hard copy of operation and maintenance instructions, indexed and in booklet form and one electronic copy on a flash drive. The operation and maintenance instructions shall be a single volume or in separate volumes. Manuals shall be approved prior to training.
 8. As-Built Drawings: One hard copy set and one electronic set on a flash drive, including software back-up and CAD based drawings in latest version of AutoCAD and DXF format of as-built drawings and schematics. The drawings shall include complete wiring diagrams showing connections between devices and equipment, both factory and field wired.

Include a riser diagram and drawings showing the as-built location of devices and equipment. Include final point address list on the drawings. The drawings shall show the system as installed, including deviations from both the project drawings and the approved shop drawings. These drawings shall be submitted within 2 weeks after the final acceptance test of the system. At least one set of as-built (marked-up) drawings shall be provided at the time of, or prior to the final acceptance test.

1.4 QUALITY ASSURANCE

- A. In NFPA publications referred to herein, consider advisory provisions to be mandatory, as though the word “shall” has been substituted for “should” wherever it appears.
- B. The recommended practices stated in the manufacturer’s literature or documentation shall be considered as mandatory requirements.
- C. Qualifications - Design Services: Shop (Working) drawings and calculations shall be prepared and signed by a Qualified Registered Professional Engineer or a NICET Level 3 Fire Alarm. For the purposes of meeting this requirement, a qualified engineer is defined as an individual meeting one of the following conditions:
 - 1. A registered professional engineer having passed the NCEES examination in fire protection engineering.
 - 2. Registered professional engineer with verification of experience and at least five years of current experience in the design of the fire protection and detection systems.
- D. Qualifications - Supervisor: A NICET Level III or IV fire alarm technician shall supervise the installation of the fire alarm system. The fire alarm technician shall be factory-trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.
- E. Qualifications - Technician: Fire alarm technicians with a minimum of 4 years of experience utilized to assist in the installation and termination of fire alarm devices, cabinets and panels. The fire alarm technicians installing the equipment shall be factory-trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.
- F. Qualifications - Installer: Fire alarm installer with a minimum of 2 years of experience utilized to assist in the installation of fire alarm devices, cabinets and panels. An electrician shall be allowed to install wire, cable, conduit and backboxes for the fire alarm system. The fire alarm installer shall be factory-trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.
- G. Qualifications - Test Personnel: Fire alarm technicians with a minimum of 8 years of experience utilized to test and certify the installation of the fire alarm devices, cabinets and panels. The fire alarm technicians testing the equipment shall be factory-trained in the installation, adjustment, testing, and operation of the equipment specified herein and on the drawings.
- H. Regulatory Requirements for Fire alarm System: Furnish equipment that is compatible and is UL-listed, FM-approved, or listed by a nationally recognized testing laboratory for the intended use. Where the terms “listed” or “approved” appear in this specification section, they shall mean listed in UL Fir Prot Dir or FP APP GUIDE. The omission of these terms under the description of any item of equipment described shall not be construed as waiving this requirement. All listings by testing laboratories shall be from an existing ANSI or UL published standard.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect equipment delivered and placed in storage from the weather, humidity, and temperature variation, dirt and dust, and other contaminants.

1.6 OPERATION AND MAINTENANCE (O&M) INSTRUCTIONS

- A. The interior fire alarm system operation and maintenance instructions shall include:

1. Operating manual outlining step-by-step procedures required for system startup, operation, and shutdown. The manual shall include the manufacturer's name, model number, service manual, parts list, and complete description of equipment and their basic operating features.
2. Maintenance manual listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guide. The manuals shall include conduit layout, equipment layout, and simplified wiring, and control diagrams of the system as installed.
3. The manuals shall include complete procedures for system revision and expansion, detailing both equipment and software requirements.
4. Software delivered for this project shall be provided, on each type of CD/DVD media utilized.
5. Printouts of configuration settings for all devices.
6. Routine maintenance checklist. The routine maintenance checklist shall be arranged in columnar format. The first column shall list all installed devices, the second column shall state the maintenance activity or state no maintenance required, the third column shall state the frequency of the maintenance activity, and the fourth column for additional comments or reference.

1.7 EXTRA MATERIALS

- A. Repair Service/Replacement Parts: During warranty period, the service technician shall be on-site within 24 hours after notification. All repairs shall be completed within 24 hours of arrival on-site.
- B. Interchangeable Parts: The Contractor shall supply, as part of the contract, the following spare parts in new condition, in boxes, with installation guides. Spare parts shall be delivered to the Owner at the time of the final acceptance testing.
- C. Spare Parts: Furnish the following spare parts and accessories:
 1. Automatic detection devices: Two percent of the installed quantity of each type, but no less than two devices of each type.
 2. Manual fire alarm stations: Two percent of the installed quantity of each type, but no less than two devices of each type.
 3. Audible and visible devices: One percent of the installed quantity, but no less than two devices of each type.
 4. Light bulbs: Five of each for each type of lamp used in the system.
 5. Fuses: Five of each for each type, rating, and size of fuse used in the system.
 6. Keys: A minimum of three sets of keys shall be provided and appropriately identified.
 7. Surge protective devices: One low voltage, one telephone, and one 120 volt surge protective device.
 8. Addressable control and monitor modules: Two percent of the installed quantity of each

type, but no less than two devices of each type.

- D. Special Tools: Software, connecting cables and proprietary equipment, necessary for the maintenance, testing, and reprogramming of the equipment shall be furnished to the Owner.
- E. Spare Parts Cabinet: A wall-mounted, metal, locking cabinet no less than 22 gage steel in black baked-on enamel shall be provided and installed by the Contractor as directed by the GT project manager. The cabinet(s) shall be equipped with at least three shelves to store all spare parts, O&M manuals (one copy), shop drawings, and as-built drawings. Contractor shall make an inventory list of all items to be kept inside cabinet. Include on the list the number of all spare parts and keys to be provided. Give inventory list to GT project manager during acceptance of the fire alarm system for verification of items in the cabinet. GT project manager will sign off on list when all items on list appear in the cabinet. The cabinet shall be provided with a permanent label stating "FIRE ALARM SPARE PARTS".

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Submit annotated catalog data as required in the paragraph SUBMITTALS, in table format on the drawings, showing manufacturer's name, model, voltage, and catalog numbers for equipment and components. Submitted shop drawings shall not be smaller than the Contract Drawings.
- B. Standard Products: Provide materials, equipment, and devices that have been tested by a nationally recognized testing laboratory, such as UL or FM, and listed or approved for fire protection service when so required by NFPA 72 or this specification section. Select material from one manufacturer, where possible, and not a combination of manufacturers, for any particular classification of materials. Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least 2 years prior to bid opening.
- C. Nameplates: Major components of equipment shall have the manufacturer's name, address, type or style, model or serial number, catalog number, date of installation, installing contractor's name and address, and the contract number provided on a new plate permanently affixed to the item or equipment. Major components include, but are not limited to FACPs, DACT or terminal cabinets. Nameplates shall be etched metal or plastic, permanently attached by screws to panels or adjacent walls.
- D. Acceptable Manufacturers: Acceptable manufacturers are SimplexGrinnell (4100) and Notifier.

2.2 GENERAL PRODUCT REQUIREMENT

- A. All fire alarm equipment shall be listed for use under the applicable reference standards.

2.3 SYSTEM OPERATION

- A. The addressable interior fire alarm and voice evacuation system shall be a complete, supervised, non-coded, analog/addressable fire alarm system conforming to NFPA 72, UL 864, and UL 2017. The system shall be activated into the alarm mode by actuation of any alarm initiating device. The system shall remain in the alarm mode until the initiating device is reset and the control panel is reset and restored to normal.
- B. Alarm Initiating Devices and Notification Appliances: The system shall operate in the alarm mode upon actuation of any alarm initiating device. The system shall remain in the alarm mode until initiating device(s) is/are reset and the control panel is manually reset and restored to normal. Audible and visual appliances and systems shall comply with NFPA 72 and as specified herein. Fire alarm

system components requiring power, except for the control panel power supply, shall operate on 24 Volts dc.

- C. Functions and Operating Features: The system shall provide the following functions and operating features:
1. The FACP shall provide power, annunciation, supervision, and control for the system. Addressable systems shall be microcomputer (microprocessor or microcontroller) based with a minimum word size of eight bits with sufficient memory to perform as specified.
 2. Provide Class B initiating device circuits.
 3. Provide Class B signaling line circuits for each floor.
 4. Provide Class B notification appliance circuits. The visual alarm notification appliances shall have the flash rates synchronized as required by NFPA 72.
 5. Provide electrical supervision of the primary power (AC) supply, presence of the battery, battery voltage, and placement of system modules within the control panel.
 6. Provide an audible and visual trouble signal to activate upon a single break or open condition, or ground fault. The trouble signal shall also operate upon loss of primary power (AC) supply, absence of a battery supply, low battery voltage, or removal of alarm or supervisory panel modules. Provide a trouble alarm silence feature that shall silence the audible trouble signal, without affecting the visual indicator. After the system returns to normal operating conditions, the trouble signal shall again sound until the trouble is acknowledged. A smoke detector in the process of being verified for the actual presence of smoke shall not initiate a trouble condition.
 7. Provide program capability via switches in a locked portion of the FACP to bypass the automatic notification appliance circuits, air handler shutdown, door hold-open release, and elevator recall features. Operation of this programming shall indicate this action on the FACP display and printer output.
 8. Provide alarm verification capability for smoke detectors. Alarm verification shall initially be set for 0 seconds.
 9. Alarm, supervisory, and/or trouble signals shall be automatically transmitted to the remote supervising station.
 10. Alarm functions shall override trouble or supervisory functions. Supervisory functions shall override trouble functions.
 11. The system shall be capable of being programmed from the panel's keyboard. Programmed information shall be stored in non-volatile memory.
 12. The system shall be capable of operating, supervising, and/or monitoring both addressable and non-addressable alarm and supervisory devices.
 13. There shall be no limit, other than maximum system capacity, as to the number of addressable devices that may be in alarm simultaneously.
 14. Where the fire alarm system is responsible for initiating an action in another emergency control device or system, such as an HVAC system or an elevator system, the addressable fire alarm relay shall be within 3 feet of the control device.
 15. An alarm signal shall automatically initiate the following functions:
 - a. Transmission of an alarm signal to the remote supervising station.

- b. Visual indication of the device operated on the control panel (FACP) and on the annunciator panel.
 - c. Continuous actuation of all alarm notification appliances.
 - d. Recording of the event electronically in the history log of the fire control system unit.
 - e. Release of doors held open by electromagnetic devices.
 - f. Operation of a smoke detector in an elevator lobby or other location associated with the automatic recall of elevators, shall recall the elevators in addition to other requirements of this paragraph.
 - g. Operation of a heat detector serving an elevator machine room or elevator shall operate shunt trip circuit breaker(s) to shut down power to the elevators in accordance with ASME A17.1.
16. A supervisory signal shall automatically initiate the following functions:
- a. Visual indication of the device operated on the FACP and on the annunciator panel, and sound the audible alarm at the respective panel.
 - b. Operation of a duct smoke detector shall shut down the appropriate air handler in accordance with NFPA 90A in addition to other requirements of this paragraph and as allowed by NFPA 72.
 - c. Transmission of a supervisory signal to the remote supervising station.
 - d. Recording of the event electronically in the history log of the control unit.
17. A trouble condition shall automatically initiate the following functions:
- a. Visual indication of the system trouble on the FACP and on the annunciator panel, and sound the audible alarm at the respective panel.
 - b. Transmission of a trouble signal to the remote supervising station.
 - c. Recording of the event in the history log of the control unit.
18. The maximum permissible elapsed time between the actuation of an initiating device and its indication at the FACP is 10 seconds.
19. The maximum elapsed time between the occurrence of the trouble condition and its indication at the FACP is 200 seconds.

2.4 SYSTEM MONITORING

- A. Valves: Each valve affecting the proper operation of a fire protection system, including automatic sprinkler control valves and sprinkler service entrance valve shall be electrically monitored to ensure its proper position. Provide each tamper switch with a separate address; unless they are within the same room, then a maximum of five can use the same address.

2.5 OVERVOLTAGE AND SURGE PROTECTION

- A. Signaling Line Circuit Surge Protection: For systems having circuits located outdoors, communications equipment shall comply with the applicable requirements of IEEE C62.41.1 and IEEE C62.41.2. Cables and conductors that serve as communications links shall have surge protection circuits installed at each end that meet the following waveform(s):
1. A 10 microsecond by 1000 microsecond waveform with a peak voltage of 1500 volts and a peak current of 60 amperes.
 2. An 8 microsecond by 20 microsecond waveform with a peak voltage of 1000 volts and a peak current of 500 amperes. Protection shall be provided at the equipment. Additional triple electrode gas surge protectors, rated for the application, shall be installed on each wireline circuit within 3 feet of the building cable entrance. Fuses shall not be used for surge protection.
- B. Detector Wiring Surge Protection: Digital and analog inputs and outputs shall be protected against

surges induced by detector wiring installed outdoors and as shown. The inputs and outputs shall be tested with the following waveform(s):

1. A 10 by 1000 microsecond waveform with a peak voltage of 1500 volts and a peak current of 60 amperes.
2. An 8 by 20 microsecond waveform with a peak voltage of 1000 volts and a peak current of 500 amperes. Fuses shall not be used for surge protection.

2.6 ADDRESSABLE INTERFACE DEVICES

- A. The initiating device being monitored shall be configured as a Class B initiating device circuit. The system shall be capable of defining any module as an alarm module and report alarm trouble, loss of polling, or as a supervisory module, and reporting supervisory short, supervisory open or loss of polling such as waterflow switches, valve supervisory switches, relays for output function actuation, etc. The module shall be UL-listed or FM-approved as compatible with the control panel. The monitor module shall provide address setting means compatible with the control panel's SLC supervision and store an internal identifying code. Monitor module shall contain an integral LED that flashes each time the monitor module is polled and is visible through the device cover plate. Pull stations with a monitor module in a common backbox are not required to have an LED.

2.7 ADDRESSABLE CONTROL MODULE

- A. The control module shall be capable of operating as a relay (dry contact form C) for interfacing the control panel with other systems, and to control door holders or initiate elevator fire service. The module shall be UL-listed or FM-approved as compatible with the control panel. The indicating device or the external load being controlled shall be configured as a Class B notification appliance circuit. The system shall be capable of supervising, audible, visual and dry contact circuits. The control module shall have both an input and output address. The supervision shall detect a short on the supervised circuit and shall prevent power from being applied to the circuit. The control module shall provide address setting means compatible with the control panel's SLC supervision and store an internal identifying code. The control module shall contain an integral LED that flashes each time the control module is polled and is visible through the device cover plate. Control modules shall be located in environmental areas that reflect the conditions to which they were listed.

2.8 COMBINATION FIXED TEMPERATURE AND RATE-OF-RISE HEAT DETECTORS

- A. Provide heat detectors for detection of fire by combination fixed temperature and rate-of-rise principle. Heat detector spacing shall be rated in accordance with UL 521. Detectors shall be supported independently of wiring connections. Contacts shall be self-resetting after response to rate-of-rise principle. Under fixed temperature actuation, the detector shall have a permanent external indication which is readily visible. The UL 521 test rating for the fixed temperature portion shall be 135 degrees F, 200 degrees F in attic spaces. The UL 521 test rating for the Rate-of-Rise detectors shall be rated for 50 by 50 feet.

2.9 SMOKE DETECTORS

- A. Photoelectric Smoke Detectors: Provide addressable photoelectric smoke detectors as follows:
 1. Provide analog/addressable photoelectric smoke detectors utilizing the photoelectric light scattering principle for operation in accordance with UL 268. Smoke detectors shall be listed for use with the fire alarm control panel.
 2. Provide self-restoring type detectors that do not require any re-adjustment after actuation at the FACP to restore them to normal operation. Detectors shall be UL-listed as smoke-automatic

fire detectors.

3. Components shall be rust and corrosion resistant. Vibration shall have no effect on the detector's operation. Protect the detection chamber with a fine mesh metallic screen that prevents the entrance of insects or airborne materials. The screen shall not inhibit the movement of smoke particles into the chamber.
 4. Provide twist lock bases for detectors. Sleeping room detectors shall be provided with sounder bases that produces a minimum of 90 dBA at 10 feet. The detectors shall maintain contact with their bases without the use of springs. Provide companion mounting base with screw terminals for each conductor. Terminate field wiring on the screw terminals. The detector shall have a visual indicator to show actuation.
 5. The detector address shall identify the particular unit, its location within the system, and its sensitivity setting. Detectors shall be of the low voltage type rated for use on a 24 VDC system.
 6. An operator at the control panel, having a proper access level, shall have the capability to manually access the following information for each initiating device.
 - a. Primary status.
 - b. Device type.
 - c. Present average value.
 - d. Present sensitivity selected.
 - e. Detector range (normal, dirty, etc.)
- B. Duct Smoke Detectors: Duct-mounted photoelectric smoke detectors shall be furnished and installed where indicated and in accordance with NFPA 90A. Units shall consist of a smoke detector as specified in paragraph Photoelectric Smoke Detectors, mounted in a special housing fitted with duct sampling tubes. Detector circuitry shall be mounted in a metallic enclosure exterior to the duct. (It is not permitted to cut the duct insulation to install the duct detector directly on the duct.) Detectors shall have a manual reset. Detectors shall be rated for air velocities that include air flows between 500 and 4000 fpm. Detectors shall be powered from the fire alarm panel.
1. Sampling tubes shall run the full width of the duct. The duct detector package shall conform to the requirements of NFPA 90A and UL 268 and shall be UL-listed for use in air-handling systems. The control functions, operation, reset, and bypass shall be controlled from the fire alarm control panel.
 2. Lights to indicate the operation and alarm condition; and the test and reset buttons shall be visible and accessible with the unit installed and the cover in place. Remote indicators shall be provided where required by NFPA 72 and these shall be provided with test and reset switches.
 3. Remote lamps and switches as well as the affected fan units shall be properly identified in etched plastic placards. Detectors shall provide for control of auxiliary contacts for shutdown. Auxiliary contacts provided for this function shall be located within 3 feet of the controlled circuit or appliance. The detectors shall be supplied by the fire alarm system manufacturer to ensure complete system compatibility.
- C. Smoke Detector Testing: Smoke detectors shall be tested in accordance with NFPA 72[®] and manufacturer's recommended calibrated test method. Submit smoke detector testing procedures for approval. In addition to the NFPA 72 requirements, smoke detector sensitivity shall be tested during the preliminary tests.

2.10 ELECTRIC POWER

- A. Primary Power: Power shall be 120 VAC service for the FACP from the normal AC service to the

building in accordance with NFPA 72.

2.11 SECONDARY POWER SUPPLY

- A. Provide for system operation in the event of primary power source failure. Transfer from normal to auxiliary (secondary) power or restoration from auxiliary to normal power shall be automatic and shall not cause transmission of a false alarm.
- B. Batteries: Provide sealed, maintenance-free, lead-acid batteries as the source for emergency power to the FACP. Batteries shall contain suspended electrolyte. The battery system shall be maintained in a fully charged condition by means of a solid-state battery charger. Provide an automatic transfer switch to transfer the load to the batteries in the event of the failure of primary power.
 - 1. Capacity: Battery size shall have sufficient capacity to operate the fire alarm system under supervisory and trouble conditions, including audible trouble signal devices for 24 hours and audible and visual signal devices under alarm conditions for an additional 15 minutes.
 - 2. Battery Power Calculations: Verify that battery capacity exceeds supervisory and alarm power requirements. Substantiate the battery calculations for alarm, alert, and supervisory power requirements. Include ampere-hour requirements for each system component and each panel component, and compliance with UL 864. Provide complete battery calculations for the alarm, alert, and supervisory power requirements. Include a 1.2 derating factor in calculations. Submit ampere-hour requirements for each system component with the calculations.
 - 3. For battery calculations use the following assumptions: Assume a starting voltage of 24 VDC for starting the calculations to size the batteries. Calculate the required amp-hours for the specified standby time, and then calculate the required amp-hours for the specified alarm time. Calculate the nominal battery voltage after operation on batteries for the specified time period.
- C. Battery Chargers: Provide a solid state, fully automatic, variable charging rate battery charger. The charger shall be capable of providing 120 percent of the connected system load and shall maintain the batteries at full charge. In the event the batteries are fully discharged (20.4 Volts dc), the charger shall recharge the batteries back to 95 percent of full charge within 48 hours after a single discharge cycle as described in paragraph Capacity above. Provide pilot light to indicate when batteries are manually placed on a high rate of charge as part of the unit assembly if a high-rate switch is provided.

2.12 FIRE ALARM CONTROL UNIT (FACP)

- A. Provide a complete control panel fully enclosed in a lockable steel cabinet as specified herein. Operations required for testing or for normal care and maintenance of the systems shall be performed from the front of the enclosure. If more than a single unit is required at a location to form a complete control panel, the unit cabinets shall match.
 - 1. Each control unit shall provide power, supervision, control and logic for the entire system, utilizing solid state, modular components, internally mounted and arranged for easy access. Each control unit shall be suitable for operation on a 120 volt, 60 hertz, normal building power supply. Provide each panel with supervisory functions for power failure, internal component placement, and operation.
 - 2. Visual indication of alarm, supervisory, or trouble initiation on the fire alarm control panel shall be by liquid crystal display or similar means with a minimum of 80 characters. The FACP shall have the capability to temporarily deactivate the fire alarm audible notification appliances while delivering voice messages.
 - 3. Provide secure operator console for initiating recorded messages, strobes, and displays; and for delivering live voice messages. Provide capacity for at least eight prerecorded messages. Provide

the ability to automatically repeat prerecorded messages. Provide a secure microphone for delivering live messages. Provide adequate discrete outputs to temporarily deactivate fire alarm audible notification, and initiate/synchronize strobes. Provide a complete set of self-diagnostics for controller and appliance network. Provide local diagnostic information display and local diagnostic information and system event log file.

- B. Cabinet: Install control panel components in cabinets large enough to accommodate all components and also to allow ample gutter space for interconnection of panels as well as field wiring. The enclosure shall be identified by an engraved laminated phenolic resin nameplate. Lettering on the nameplate shall say “Fire Alarm Control Panel” and shall not be less than 1-inch high. Provide prominent rigid plastic or metal identification plates for lamps, circuits, meters, fuses, and switches. The cabinet shall be provided in a sturdy steel housing, complete with backbox, hinged steel door with cylinder lock, and surface mounting provisions. Provide a full set of as-built drawings at the FACP.
- C. Provide power and control modules to perform all functions of the FACP. Provide audible signals to indicate any alarm, supervisory, or trouble condition. The alarm signals shall be different from the trouble signal. Connect circuit conductors entering or leaving the panel to screw-type terminals with each terminal marked for identification. Locate diodes and resistors, if any, on screw terminals in the FACP. Circuits operating at 24 VDC shall not operate at less than the UL-listed voltage at the detector or appliance connected. Circuits operating at any other voltage shall not have a voltage drop exceeding 10 percent of nominal voltage.
- D. Silencing Switches.
1. Alarm Silencing Switch: Provide an alarm silencing switch at the FACP that shall silence the audible and visual signal but not affect the visual alarm indicator. This switch shall be overridden upon activation of a subsequent alarm.
 2. Supervisory/Trouble Silencing Switch: Provide supervisory and trouble silencing switch that shall silence the audible trouble and supervisory signal, but not extinguish the visual indicator. This switch shall be overridden upon activation of a subsequent alarm, supervision, or trouble condition. Audible trouble indication must resound automatically every 24 hours after the silencing feature has been operated.
- E. Non-Interfering: Power and supervise each circuit such that a signal from one device does not prevent the receipt of signals from any other device. Circuits shall be manually reset by switch from the FACP after the initiating device or devices have been restored to normal.
- F. Audible Notification System: The audible notification system shall comply with the requirements of NFPA 72 for emergency voice/alarm communications, except as specified herein. The system shall be a one-way multi-channel voice notification system incorporating user selectability of a minimum of eight distinct sounds for tone signaling, and the incorporation of a voice module for delivery of prerecorded messages. Audible appliances shall produce a temporal code 3 tone (temporal code 4 for carbon monoxide detector) for three cycles followed by a voice message that is repeated until the control panel is reset or silenced. Automatic messages shall be broadcast through speakers throughout the building/facility. A live voice message shall override the automatic audible output through use of a microphone input at the control panel.
1. Where audible appliances are installed in sleeping areas, they shall produce a low frequency alarm signal of 520 Hz.
 2. When using the microphone, live messages shall be broadcast throughout a selected floor or floors or all call. The system shall be capable of operating all speakers at the same time. The microprocessor shall actively interrogate circuitry, field wiring, and digital coding necessary for the immediate and accurate rebroadcasting of the stored voice data into the appropriate

amplifier input. Loss of operating power, supervisory power, or any other malfunction that could render the digitalized voice module inoperative shall automatically cause the temporal code 3 (or code 4 as applicable) tone to take over all functions assigned to the failed unit in the event an alarm is activated.

3. Notification appliance circuits (NAC) shall be provided for the activation of strobe appliances. The activation of the NAC circuits shall follow the operation of the speaker NAC circuits. Audio output shall be selectable for line level. Amplifier outputs shall not be greater than 100 watts RMS output. The strobe NAC circuits shall provide at least 2 amps of 24 VDC power to operate strobes and have the ability to synchronize all strobes.
- G. Outputs and Operational Modules: All outputs and operational modules shall be fully supervised with on-board diagnostics and trouble reporting circuits. Provide form C contacts for system alarm and trouble conditions. Provide circuits for operation of auxiliary appliance during trouble conditions.
 - H. Memory: Provide each control unit with non-volatile memory and logic for all functions. The use of long-life batteries, capacitors, or other age-dependent devices shall not be considered as equal to non-volatile processors, PROMS, or EPROMS.
 - I. Field Programmability: Provide control units and control panels that are fully field programmable for control, initiation, notification, supervisory, and trouble functions of both input and output. The system program configuration shall be menu driven. System changes shall be password protected and shall be accomplished using personal computer-based equipment. Any proprietary equipment or proprietary software needed by qualified technicians to implement future changes to the fire alarm system shall be provided as part of this contract.
 - J. Input/output Modifications: The FACP shall contain features that allow the bypassing of input devices from the system or the modification of system outputs. These control features shall consist of a panel mounted keypad. Any bypass or modification to the system shall indicate a trouble condition on the FACP.
 - K. Resetting: Provide the necessary controls to prevent the resetting of any alarm, supervisory, or trouble signal while the alarm, supervisory, or trouble condition on the system still exists.
 - L. Instructions: Provide a typeset printed or typewritten instruction card mounted behind a Lexan plastic or glass cover in a stainless steel or aluminum frame. Install the instructions on the interior of the FACP. The card shall show those steps to be taken by an operator when a signal is received as well as the functional operation of the system under all conditions, normal, alarm, supervisory, and trouble. The instructions shall be approved by the Owner before being posted.
 - M. Walk Test: The FACP shall have a walk test feature. When using this feature, operation of initiating devices shall result in limited system outputs, so that the notification appliances operate for only a few seconds and the event is indicated on the system printer, but no other outputs occur.
 - N. History Logging: In addition to the required printer output, the control panel shall have the ability to store a minimum of 400 events in a log. These events shall be stored in a battery-protected memory and shall remain in the memory until the memory is downloaded or cleared manually. Resetting of the control panel shall not clear the memory.
- 2.13 AMPLIFIERS, PREAMPLIFIERS, TONE GENERATORS
- A. Any amplifiers, preamplifiers, tone generators, digitalized voice generators, and other hardware necessary for a complete, operational, textual audible circuit conforming to NFPA 72 shall be housed in a remote FACP, terminal cabinet, or in the FACP.
 - B. Operation: The system shall automatically operate and control all building speakers except those

installed in the stairs and within elevator cabs. The speakers in the stairs and elevator cabs shall operate only when the microphone is used to deliver live messages.

- C. Construction: Amplifiers shall utilize computer grade solid state components and shall be provided with output protection devices sufficient to protect the amplifier against any transient surges up to 10 times the highest rated voltage in the system.
- D. Inputs: Equip each system with separate inputs for the tone generator, digitalized voice driver and panel mounted microphone. Microphone inputs shall be of the low impedance balance line type. Both microphone and tone generator input shall be operational on any amplifier.
- E. Tone Generator: The tone generator shall be of the modular, plug-in type with securely attached labels to identify the component as a tone generator and to identify the specific tone it produces. The tone generator shall produce a code 3 temporal tone (temporal 4 for carbon monoxide detector) and shall be constantly repeated until interrupted by the digitalized voice message, the microphone input, or the alarm silence mode as specified. The tone generator shall be single channel with an automatic backup generator per channel such that failure of the primary tone generator causes the backup generator to automatically take over the functions of the failed unit and also causes transfer of the common trouble relay.
- F. Protection Circuits: Each amplifier shall be constantly supervised for any condition that could render the amplifier inoperable at its maximum output. Failure of any component shall cause automatic transfer to a designated backup amplifier, illumination of a visual “amplifier trouble” indicator on the control panel, and appropriate logging of the condition electronically.

2.14 ANNUNCIATOR

- A. Annunciator Panel: Provide an annunciator that includes an LCD display duplicating the display and indicating lamps at the FACP. Switches shall be provided to permit acknowledging, silencing, and resetting functions for alarm, supervisory, and trouble signals. Access to these switches shall be controlled by a campus standard Best Lock. Locks shall be Best 7-pin in accordance with the campus keying system. The alphanumeric display shall provide English language descriptions of the device name, address, actual building location, type and status for each alarm, supervisory and trouble event. The alphanumeric display and status indicators shall be visible with all doors closed and locked.
- B. A building floor plan shall be provided mounted (behind Plexiglas or similar protective material) at the annunciator location. The floor plan shall indicate all rooms by name and number including the location of stairs and elevators. The floor plan shall show all devices and their programmed address to facilitate their physical location from the LCD display information.
- C. Programming: Where programming for the operation of the annunciator is accomplished by a separate software program that the software for the FACP, the software program shall not require reprogramming after loss of power. The software shall be reprogrammable in the field.

2.15 MANUAL STATIONS

- A. Provide metal or plastic, semi-flush-mounted, double-action, addressable manual stations, that are not subject to operation by jarring or vibration. Stations shall be equipped with screw terminals for each conductor. Stations that require the replacement of any portion of the device after activation are not permitted. Stations shall be finished in fire engine red with molded raised lettering operating instructions of contrasting color. The use of a key or wrench shall be required to reset the station. Stations shall have a separate screw terminal for each conductor.

2.16 NOTIFICATION APPLIANCES

- A. Fire alarm Speakers: Audible appliances shall conform to the applicable requirements of UL 464.

Appliances shall be connected into notification appliance circuits. Surface-mounted audible appliances shall be painted red or white. Recessed audible appliances shall be installed with a grill that is painted red or white.

1. Speakers shall conform to the applicable requirements of UL 1480. Speakers shall have six different sound output levels and operate with audio line input levels of 70.7 VRMs and 25 VRMs, by means of selectable tap settings. Tap settings shall include taps of 1/4, 1/2, 1, and 2 watt. Speakers shall incorporate a high efficiency speaker for maximum output at minimum power across a frequency range of 400 Hz to 4,000 Hz and shall have a sealed back construction. Speakers shall be capable of installation on standard 4-inch square electrical boxes. Where speakers and strobes are provided in the same location, they may be combined into a single unit. All inputs shall be polarized for compatibility with standard reverse polarity supervision of circuit wiring via the FACP.
 2. Provide speaker mounting plates constructed of cold rolled steel having a minimum thickness of 16-gage or molded high impact plastic and equipped with mounting holes and other openings as needed for a complete installation. Fabrication marks and holes shall be ground and finished to provide a smooth and neat appearance for each plate. Each plate shall be primed and painted.
 3. Speakers shall utilize screw terminals for termination of all field wiring.
- B. Visual Notification Appliances: Visual notification appliances shall conform to the applicable requirements of UL 1971 and conform to the Americans With Disabilities Act (ADA). Fire alarm notification appliances shall have clear high intensity optic lens, xenon flash tubes, and output white light and be marked “Fire” in red letters. The light pattern shall be disbursed so that it is visible above and below the strobe and from a 90-degree angle on both sides of the strobe. Strobe flash rate shall be 1 flash per second and a minimum of 15 candela based on the UL 1971 test. Strobes shall be semi-flush-mounted. Where more than two appliances are located in the same room, or corridor or field of view, provide synchronized operation. Devices shall use screw terminals for all field wiring.

2.17 ENVIRONMENTAL ENCLOSURES OR GUARDS

- A. Environmental enclosures shall be provided to permit fire alarm components to be used in areas that exceed the environmental limits of the listing. The enclosure shall be listed for the device or appliance as either a manufactured part number or as a listed compatible accessory for the UL category that the component is currently listed. Guards required to deter mechanical damage shall be either a listed manufactured part or a listed accessory for the category of the initiating device or notification appliance.

2.18 DIGITAL ALARM COMMUNICATOR TRANSMITTER (DACT)

- A. Provide DACT that is integral with the FACP. Transmitter shall have a means to transmit alarm, supervisory, and trouble conditions via a single transmitter. Transmitter shall be capable of initiating a test signal daily at any selected time. Transmitter shall be arranged to seize telephone circuits in accordance with NFPA 72.

2.19 WIRING

- A. Alarm Wiring: SLC and IDC wiring shall be solid copper cable in accordance with the manufacturer’s requirements. Copper signaling line circuits and initiating device circuit field wiring shall be No. 18 AWG size twisted and shielded solid conductors at a minimum. Visual notification appliance circuit conductors, that contain notification appliances other than speakers, shall be solid copper No. 14 AWG size conductors at a minimum. Speaker circuits shall be stranded or solid copper No. 16 AWG size twisted and shielded conductors at a minimum. Wire size shall be sufficient to prevent voltage drop problems. Power wiring, operating at 120 VAC minimum, shall be a minimum of No. 12 AWG solid copper having similar insulation. Acceptable power-limited cables are FPL, FPLR or FPLP as

appropriate with red colored covering. Nonpower-limited cables shall comply with NFPA 70.

2.20 ELECTROMAGNETIC DOOR HOLD-OPEN DEVICES

- A. Provide where shown on drawings. The armature portion shall be mounted on the door and shall have an adjusting screw for setting the angle of the contact plate. Mount the electro-magnetic release on the wall or in a wall recess behind the door, except where no wall and then mount on floor. The activation of the fire alarm system shall release all doors on the circuit to close. Total projection of the door holder release shall not exceed 4 inches. Door holders shall be powered by the fire alarm system (24 VDC) but not require battery backup power.

PART 3 - EXECUTION

3.1 DEVICE/EQUIPMENT INSTALLATION

- A. FACP: Locate the FACP where indicated on the drawings. Mount the enclosure with the top of the cabinet 6 feet above the finished floor or center the cabinet at 5 feet, whichever is lower. Conductor terminations shall be labeled and a drawing containing conductors, their labels, their circuits, and their interconnection shall be permanently mounted in the FACP.
- B. Manual Stations: Locate manual stations as required by NFPA 72 and as shown on the drawings. Mount stations so that their operating handles are no more than 4 feet above the finished floor. Mount stations so they are located no farther than 5 feet from the exit door they serve; measured horizontally.
- C. Notification Appliance Devices: Locate notification appliance devices as required by NFPA 72.
- D. Smoke and Heat Detectors: Locate detectors as required by NFPA 72 and their listing on a 4-inch mounting box. Install heat detectors not less than 4 inches from a side wall to the near edge. Heat detectors located on the wall shall have the top of the detector at least 4 inches below the ceiling, but not more than 12 inches below the ceiling. Smoke detectors are permitted to be on the wall no lower than 12 inches from the ceiling with no minimum distance from the ceiling. Install smoke detectors no closer than 5 feet from air-handling supply outlets.
- E. Annunciator: Locate the annunciator as shown on the drawings. Flush-mount the panel, with the top of the panel 6 feet above the finished floor or center the panel at 5 feet, whichever is lower.

3.2 SYSTEM FIELD WIRING

- A. Wiring within Cabinets, Enclosures, and Boxes: Provide wiring installed in a neat and workmanlike manner and installed parallel with or at right angles to the sides and back of any box, enclosure, or cabinet. Conductors that are terminated, spliced, or otherwise interrupted in any enclosure, cabinet, mounting, or junction box shall be connected to screw-type terminal blocks. Mark each terminal in accordance with the wiring diagrams of the system. The use of wire nuts or similar devices is prohibited. Wiring shall conform to NFPA 70.
- B. Terminal Cabinets: Terminal size shall be appropriate for the size of the wiring to be connected. Minimum size is 8 inches by 8 inches. Only screw-type terminals are permitted.
- C. Alarm Wiring: Voltages shall not be mixed in any junction box, housing, or device, except those containing power supplies and control relays. Provide all wiring in electrical metallic conduit. Conceal conduit in finished areas. The use of flexible conduit not exceeding a 6-foot length shall be permitted in initiating device or notification appliance circuits. Run conduit or tubing (rigid, IMC, EMT, FMC, etc., as permitted by NFPA 72 and NFPA 70) concealed unless specifically indicated otherwise on the drawings. Utilize shielded wiring where recommended by the manufacturer. For shielded wiring, ground the shield at only one point that is in or adjacent to the FACP. Pigtail or T-

tap connections to signal line circuits, initiating device circuits, and notification appliance circuits are prohibited. Color coding is required for circuits and shall be maintained throughout the circuit. Conductors used for the same functions shall be similarly color coded. Wiring shall conform to NFPA 70.

- D. Conductor Terminations: Labeling of conductors at terminal blocks in terminal cabinets, and the FACP shall be provided at each conductor connection. Each conductor or cable shall have a shrink-wrap label to provide a unique and specific designation. Each terminal cabinet, FACP, NAC panel, and remote FACP shall contain a laminated drawing that indicates each conductor, its label, circuit, and terminal. The laminated drawing shall be neat, using 12-point lettering minimum size, and mounted within each cabinet, panel, or unit so that it does not interfere with the wiring or terminals. Conductor terminations shall be

labeled and a drawing containing conductors, their labels, their circuits, and their interconnection shall be permanently mounted in the terminal cabinet.

3.3 FIRESTOPPING

- A. Provide firestopping for holes at conduit penetrations through floor slabs, fire-rated walls, partitions, with fire-rated doors, corridor walls, and vertical service shafts.

3.4 PAINTING

- A. Paint exposed electrical, fire alarm conduit, and surface metal raceway to match adjacent finishes in exposed areas. Paint junction boxes red in unfinished areas. Conduits and surface metal raceways shall be painted with a 1-inch wide red band every 10 feet in unfinished areas.

3.5 FIELD QUALITY CONTROL

- A. Testing Procedures: Submit detailed test procedures, prepared and signed by a NICET Level III Fire Alarm Technician, and signed by a representative of the installing company, for the fire detection and alarm system 14 days prior to performing system tests. Detailed test procedures shall list all components of the installed system such as initiating devices and circuits, notification appliances and circuits, signaling line devices and circuits, control devices/equipment, batteries, transmitting and receiving equipment, power sources/supply, annunciators, special hazard equipment, emergency communication equipment, interface equipment, and transient (surge) suppressors. Test procedures shall include sequence of testing, time estimate for each test, and sample test data forms. The test data forms shall be in a check-off format (pass/fail with space to add applicable test data; similar to the form in NFPA 72) and shall be used for the preliminary testing and the acceptance testing. The test data forms shall record the test results and shall:

1. Identify the NFPA Class of all initiating device circuits (IDC), notification appliance circuits (NAC), and voice notification system circuits (NAC audio), and signaling line circuits (SLC).
2. Identify each test required by NFPA 72 Test Methods and required test herein to be performed on each component, and describe how this test shall be performed.
3. Identify each component and circuit as to type, location within the facility, and unique identity within the installed system. Provide necessary floor plan sheets showing each component location, test location, and alphanumeric identity.
4. Identify all test equipment and personnel required to perform each test (including equipment necessary for testing smoke detectors).
5. Provide space to identify the date and time of each test. Provide space to identify the names and signatures of the individuals conducting and witnessing each test.

B. Test Stages.

1. Preliminary Testing: Conduct preliminary tests to ensure that devices and circuits are functioning properly. Tests shall meet the requirements of paragraph entitled “Minimum System Tests”. After preliminary testing is complete, provide a letter certifying that the installation is complete and fully operable. The letter shall state that each initiating and indicating device was tested in place and functioned properly; panel functions were tested and operated properly; and shall include the names and titles of the witnesses to the preliminary tests. The contractor and an authorized

representative from each supplier of equipment shall be in attendance at the preliminary testing to make necessary adjustments.

2. Request for Formal Inspection and Tests: When tests have been completed and corrections made, submit a signed, dated certificate with a request for formal inspection and tests to the Owner.
3. Final Testing: Notify the Owner in writing when the system is ready for final acceptance testing. Submit request for test at least 15 calendar days prior to the test date. The tests shall be performed in accordance with the approved test procedures in the presence of the Owner. Furnish instruments and personnel required for the tests. A final acceptance test will not be scheduled until the following are provided at the job site:
 - a. The systems manufacturer’s technical representative.
 - b. Marked-up red line drawings of the system as actually installed.
 - c. Loop resistance test results.
 - d. Complete program printout including input/output addresses.

The final tests will be witnessed by the Owner. At this time, any and all required tests shall be repeated at their discretion.

4. System Acceptance: Following acceptance of the system, as-built drawings and O&M manuals shall be delivered to the Owner for review and acceptance. At least one set of as-built (marked-up) drawings shall be provided at the time of, or prior to the final acceptance test.

C. Minimum System Tests: Test the system in accordance with the procedures outlined in NFPA 72 and IEC 60268-16. The required tests are as follows:

1. Loop Resistance Tests: Measure and record the resistance of each circuit with each pair of conductors in the circuit short-circuited at the farthest point from the circuit origin. Test results shall be recorded for use at the final acceptance test.
2. Verify the absence of unwanted voltages between circuit conductors and ground. The tests shall be accomplished at the preliminary test with results available at the final system test.
3. Verify that the control unit is in the normal condition as detailed in the manufacturer’s O&M manual.
4. Test each initiating device and notification appliance and circuit for proper operation and response at the control unit. Smoke detectors shall be tested in accordance with manufacturer’s recommended calibrated test method. Use of magnets is prohibited. Testing of duct smoke detectors shall comply with the requirements of NFPA 72 except that, for item 12(e) (Supervision) in Table 14.4.2.2, disconnect at least 20 percent of devices. If there is a failure at these devices, then supervision shall be tested at each device.
5. Test the system for specified functions in accordance with the contract drawings and specification and the manufacturer’s O&M manual.

6. Test both primary and secondary power. Verify, by test, the secondary power supply is capable of operating the system for the time period and in the manner specified.
7. Determine that the system is operable under trouble conditions as specified.
8. Visually inspect wiring.
9. Test battery charger and batteries.
10. Verify that software control and data files have been entered or programmed into the FACP. Hard copy records of the software shall be provided to the Owner.
11. Verify that red-line drawings are accurate.
12. Disconnect the verification feature for smoke detectors during tests to minimize the amount of smoke needed to activate the detector.
13. Measure the voltage drop at the most remote appliance (based on wire length) on each notification appliance circuit.
14. Open the circuit at not less than 10 percent of alarm initiating devices and notification appliances to test the wiring supervisory feature.
15. Measure and record both ambient and fire alarm signal sound levels in representative spaces throughout the building.

3.6 INSTRUCTION

- A. Instructor: Include in the project the services of an instructor, who has received specific training from the manufacturer for the training of other persons regarding the inspection, testing, and maintenance of the system provided. The instructor shall train the employees designated by the Owner, in the care, adjustment, maintenance, and operation of the fire alarm system. Each instructor shall be thoroughly familiar with all parts of this installation. The instructor shall be trained in operating theory as well as in practical O&M work. Submit the instructor's information and qualifications including the training history.
- B. Required Instruction Time: Provide 8 hours of instruction after final acceptance of the system. The instruction shall be given during regular working hours on such dates and times as selected by the Owner. The instruction may be divided into two or more periods at the discretion of the Owner. The training shall allow for rescheduling for unforeseen maintenance and/or fire department responses.
- C. Technical Training: Equipment manufacturer or a factory representative shall provide 1-day of on-site training. Training shall allow for classroom instruction as well as individual hands-on programming, troubleshooting, and diagnostics exercises.

3.7 TECHNICAL DATA AND COMPUTER SOFTWARE

- A. Provide, in manual format, lesson plans, operating instructions, maintenance procedures, and training data for the training courses. The operations training shall familiarize designated personnel with proper operation of the installed system. The maintenance training course shall provide the designated personnel adequate knowledge required to diagnose, repair, maintain, and expand functions inherent to the system.

END OF SECTION