



2022 Design Standards

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2022 Section A – Substructure

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A Substructure

A. General

1. The minimum standard concrete mix shall be 3,000 psi
2. Calcium chloride or admixtures containing chlorides shall not be used.
3. An approved air-entraining admixture shall be used for all concrete exposed to weather. When used, the concrete must be tested at the site immediately prior to placement to verify the proper amount of air-entrainment is present.
4. Aluminum (or any other material that is not compatible) conduits and pipes shall not be embedded in any concrete.
5. Reinforcing coverage in concrete must meet the requirements of the most current version of American Concrete Institute (ACI) 318.

A10 Foundations

A1020 Special Foundations

A1021 Pile Foundations

- A. Driven pilings or rammed aggregate foundations are not to be used without prior approval.

A1030 Slab on Grade

A. General

1. Control joints, isolation joints, and construction joints shall be designed, located, and otherwise clearly defined by the Designer.
2. Control joints shall be fully coordinated with interior partition walls.
3. Control joints shall be spaced no wider than 30 times the slab thickness.
4. Control joints are to be a depth of 1/3 the slab thickness.
5. If joints are to be saw cut, they must be sawed within 12 hours of concrete being poured if the overnight temperature is expected to be greater than 70° F, and within 24 hours in all other cases.

A1035 Under Slab Drainage and Insulation

- A. Basement drainage systems must be drawn and detailed to show the path of water from its source into some existing drainage structure. Consult Section G3030 – Storm Drainage Utilities.
- B. Drainage systems shall not rely on pumps or other mechanical means to remove water; instead, a positive gravity outfall situation shall be created.
- C. Drainage perforated piping shall include wrapping the pipe with a filter fabric sock and careful bedding of the pipe with the appropriate fill material.
- D. Use filter fabric over drain fields and at least 2 inches of stone under pipes.

A20 Basement Construction**A2010 Basement Excavation****A2013 Shoring**

- A. Shoring and/or sheet piling for basement excavation shall be designed by a registered Professional Engineer in the State of Alabama.

A2020 Basement Walls**A2022 Moisture Protection**

- A. For below grade waterproofing, use a composite self-adhering bitumen sheet membrane waterproofing system.
- B. Where shallow water table is indicated on soils report, a monolithic chemically adhered membrane or other similar system shall be specified by the designer or waterproofing consultant.
- C. All sheet waterproofing shall be protected by protection board/drainage mat assemblies.
- D. Waterproofing shall be terminated with a termination bar or liquid membrane per manufacturer's details at footings below grade and with counter flashings in the cavity wall assembly above grade.
- E. All waterproofing membranes must be installed to a minimum of 8" above the height of exterior finish grade.
- F. The exterior wall air/vapor barrier shall overlap the below grade waterproofing membrane to provide a continuous barrier.
- G. Wall joints below grade shall include a water stop.

A2023 Basement Wall Insulation

- A. Provide block or board insulating materials recommended by manufacturer for the indicated application.

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2022 Section B – Shell

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B Shell

A. General

1. The minimum standard concrete mix shall be 3,000 psi.
2. Calcium chloride or admixtures containing chlorides shall not be used.
3. An approved air-entraining admixture shall be used for all concrete exposed to weather. When used, the concrete must be tested at the site immediately prior to placement to verify the proper amount of air-entrainment is present.
4. Aluminum conduits and pipes shall not be embedded in any concrete.
5. Reinforcing coverage in concrete must meet the requirements of the most current version of American Concrete Institute (ACI) 318.
6. Metal panels shall not have custom colors using mica or other similar materials. Provide Pantone Matching System (PMS) color code for all metals.

B10 Superstructure

A. General

1. Two-way post-tensioned flat plate and wood structural systems shall not be used. Exceptions for cross-laminated timber (CLT) construction may be acceptable with approval.
2. No lightweight structural concrete is to be used without prior approval.
3. All welded connections shall be made by an American Welding Society (AWS) certified welder. The use of "pre-qualified welds" is encouraged.
4. All structural steel in exterior locations (such as cornices, parapets, handrails, guard rails, or canopies) shall be hot dip galvanized.

B1020 Roof Construction

- A. No lightweight insulating concrete shall be used in roof assemblies.

B20 Exterior Enclosures

A. General

1. A building envelope assembly mockup panel shall be provided as detailed by the Designer, in the Construction Documents. The mockup panel shall be constructed by the appropriate contractor(s) for approval of workmanship and final building envelope material approval and shall be built on site after the beginning of construction and prior to beginning the building envelope work. The materials used shall be provided by the project suppliers and shall represent the final product in all aspects. The panel shall be protected from construction operations but shall remain in place and exposed to the elements until all building envelope work has been approved by the Designer and Owner.
2. Field Testing:
 1. Required on mockup assemblies for all new construction projects.
 2. The testing shall meet the following minimum standard:

1. AAMA 501.2 for Storefronts, Curtain Walls, and Sloped Glazing Systems
2. AAMA 502 for Punched Windows and Doors
3. Minimum of 2 field test required. One after installation and one at 50% project completion.

B2010 Exterior Walls**B2011 Exterior Wall Construction**

- A. Exterior Insulation and Finishing System (EIFS) and single-wythe uncoated concrete masonry unit walls are not acceptable.
- B. Brick masonry units with a smooth-faced texture free of blemishes is required. Any brick that is aesthetically blemished with cracks or chips may be considered for rejection or replacement. Special shapes shall be manufactured, not field cut.
- C. Provide tooled concave mortar joints.
- D. There shall be no site mixing of mortar colors. Bags shall come from the manufacturer with premixed colors with only sand and water added at the site. Sand shall be added in consistent amounts using a measured box rather than shovel counts.
- E. Where existing buildings are repointed, existing mortar and brick shall be tested for strength and composition to facilitate in determining replacement mortar type. Utilize the following testing standards:
 1. ASTM C1713 for Historic Mortar
 2. ASTM C270 for Unit Masonry
- F. Mortar Mix:
 1. Admixtures are not permitted.
 2. Temper of mix more than once not permitted.
- G. Stone shall match Indiana Limestone Company Empire Rustic Buff Smooth.
- H. Architectural precast concrete must be fabricated using the wet cast method.
- I. The Contract Documents shall note that the Contractor is responsible for protecting the work during construction including physical protection and protection from temperature extremes.
- J. Through wall flashing assemblies:
 1. Shall consist of a stainless steel “base” pan and a 40-mil asphalt-modified waterproofing membrane.
 2. Shall be warranted by the manufacturer.
 3. The membrane shall be terminated on the stainless-steel base flashing 1” back from the exterior face of the masonry veneer.
 4. Termination of the membrane at the dampproofed backup wall shall be a minimum of 8” above the drainage medium, approximately 16” above the shelf angle/horizontal projection.
 5. Provide a continuous stainless steel termination bar or liquid termination at the top of the membrane flashing.
 6. Stainless steel base flashing shall be 26 gauge, T304 alloy with 2D (dull) finish.

7. Flashing splice shall be at least four inches in length and covered with a third piece of stainless-steel base flashing, full bedded in sealant. The hemmed edge of the base flashing shall extend beyond the face of the masonry veneer.
8. Provide end dams at vertical terminations and dissimilar systems.
9. Acceptable manufacturers for through-wall flashing systems:
 1. WR Grace
 2. Polyguard
 3. Carlisle
- K. Provide flashing at all necessary locations; including window and door headers, shelf angles, parapets, roofing transitions and where masonry walls rest on a slab on grade.
- L. Provide full-height weep vents in the vertical joint.
- M. 2-coat hylar resin finishes such as Kynar are preferred.
- N. Clear anodized aluminum finishes are not acceptable.
- O. The finish shall be provided with a 20-year warranty.
- P. If cavity wall construction utilizing light gauge framing and Dens Glass Gold sheathing board is provided, seal joints between sheathing boards and apply 2" fiberglass mesh tape fully embedded in sealant, before damp proofing is applied. All products utilized must be compatible.
- Q. Wall Insulation and Vapor Retarder
 1. Provide rigid board insulation in the masonry cavity.
 2. Provide emulsion-based cavity wall damp proofing.
 3. All damp proofing systems must be water-based and they must be applied pinhole free.
 4. The outer face of the inner wythe, or the entire face of the sheathing board shall be coated with damp proofing.
 5. Sealants behind the veneer wall (adjacent to damp proofing) shall be polyurethane.
 6. Acceptable manufacturers for damp proofing:
 1. Karnak
 2. Sonneborn
 3. WR Meadows
- R. Joint Sealants
 1. Use silicone sealants at exterior joints. Exterior joints shall be pull tested to determine that silicone is the most suitable product. A high-quality silicone and polyurethane hybrid sealant may be considered if silicone proves not to be suitable for exterior joints. Expansion joints shall be a minimum of ½" width and are not to exceed a ¾" width. Control joints shall be a width between 3/8" and 1/2". All tolerances of existing structures that do not meet these requirements shall be reviewed for necessary changes to meet these requirements.
 2. Provide the following sealant types at these exterior conditions:
 1. Masonry-to-masonry or Masonry-to-stone
 1. Dow 790
 2. Tremco Spectrum
 3. Pecora 890

2. Metal-to-metal or Metal-to-masonry
 1. Dow Corning 795
 2. Tremco Spectrum 2
 3. Pecora 895
3. Stone-to-stone or Metal-to-stone
 1. Dow 756
4. CMU-to-CMU or CMU-to-concrete
 1. Sika Flex 2C
 2. Sonneborn NP-2
 3. Dymeric 240 FC
5. Masonry flashing splice
 1. Dow Corning 795
 2. Tremco Spectrum 2
 3. Pecora 895

B2012 Parapets

- A. Parapet heights shall be considered to meet the minimum of 42" height above the finished roof system or whichever is greater to meet the minimum height for OSHA fall protection at roof system perimeters.
- B. Coping systems shall have minimum skyward sealant joints with minimum 40 mil high temperature waterproofing underlayment that overlaps with a continuous and compatible building envelope waterproofing system.
- C. All metal coping systems shall consist of a minimum of 24 gauge for coping covers, anchor plates with integral support chair (18 gauge for galvanized steel or .063" aluminum) installed at 5'-0" on-center. Coping systems must be a concealed fastener snap-on coping, ANSI/SPRI/FM 4435/ES-1 Certified. Coping covers shall be manufactured for positive drainage. Anchor plates shall be galvanized steel or aluminum to accommodate any inconsistencies in the walls. Custom mitered corners shall be included.

B2020 Exterior Windows**B2021 Windows**

- A. Window frames shall be aluminum and of weather-tight design.
- B. Windowsills shall be masonry, stone, or architectural precast concrete.
- C. The bottom of windowsills shall be considered for a minimum 8" above a finished exterior horizontal surface to allow flashing height for roofing and waterproofing systems.
- D. Exterior window wall assemblies for multiple stories shall be curtain wall construction.
- E. Punched window openings can utilize pre-manufactured window waterproofing systems provided they meet the following minimum criteria:
 1. Have flange for secondary water control.
 2. Minimum air filtration of .06 cfm/sq. ft when tested at 6.24 psf.
 3. No water penetration when tested at 10 psf.

- F. Do not fasten window heads up through shelf angles.
- G. Glazing
 - 1. When insulating glass is used, it shall be hermetically sealed to prevent condensation between the two layers of glass and shall have a 10-year warranty.
 - 2. Gaskets for storefront and curtain wall systems shall be high performing gaskets and factory applied sealants that avoid shrinkage and failure during the lifespan of the window.

B2030 Exterior Doors

- A. General
 - 1. Doors shall have a maximum height of 8'-0" and a minimum height of 6'-8".
 - 2. All doors shall have a minimum width of 3' 0".
 - 3. Doors shall be standard 3'x 7' where possible.
 - 4. Exterior doors shall be aluminum or galvanized 16-gauge steel.
 - 5. Exterior steel doors shall be 16-gauge hollow metal construction.
 - 6. All exterior door frames shall be aluminum or galvanized 14-gauge steel.
 - 7. Frame shall be welded and ground smooth.
 - 8. Knock down or unwelded frames are not acceptable.
 - 9. Vertical rod devices are not acceptable.
 - 10. Roof access doors shall be installed a minimum 8" above the finished roof system.
 - 11. Single-leaf door openings are preferred to double-leaf door openings. If double-leaf door openings are required by the project, provide a keyed removable mullion.
 - 12. Aluminum storefront doors shall be wide-stile only with a 12" bottom rail.
 - 13. Exterior Doors shall be provided with electrified panic hardware and shall be monitored by the access control system.
 - 14. Exterior openings which are not hinged such as large sliding or overhead coiling doors shall be monitored.
 - 15. All exterior doors shall be capable of real-time remote programming and or monitoring by the Auburn University Access Control Center and the Auburn University Department Campus Safety and Security.
- B. Door Hardware
 - 1. Refer to Auburn University Door Hardware Standards Document.

B30 Roofing

- A. Exposed fasteners are not acceptable on metal roofing assemblies, unless specifically approved in writing by the University Project Lead.

B3010 Roof Coverings**B3011 Roof Finishings****A. High Slope Roofing**

1. Roofing assemblies with a slope greater than 4:12 are steep (high) slope roofs.
2. Asphalt shingles installed over a breathable synthetic underlayment and an ice and water shield is the preferred roofing assembly for pitched roofs. Shingles shall be dimensional architectural shingle with a 30 year warranty from the shingle manufacturer. Colors with SRI greater than 29 desired but are subject to approval by University Project Lead. Asphalt shingles shall be nailed to min. 5/8" exterior grade CDX board and include a vented roof deck. The shingle roof system that is chosen shall include assembly components from the same shingle manufacturer.
3. Acceptable Asphalt shingle manufacturers include:
 1. GAF
 2. Tamko
 3. Owens Corning
 4. Additional manufacturers as recommended by the Designer and approved by the University Project Lead.

B. Low Slope Roofing

1. Low slope roofs are those roofs whose slope is between 1/4:12 and 3:12. 3:12 can be considered as pitched roof with special attention given to underlayment.
2. All low slope roofs should be a minimum of 1/4:12 with positive pitch to drains.
3. A minimum of 4'-0" by 4'-0" insulation drain sumps shall be installed at all drains, except for overflow drains.
4. When low-slope roofs are approved for use, they shall be provided with a minimum slope of 1/4" per foot and shall be a fully adhered or torch applied 2-ply SBS modified bitumen roof system. Polymethyl Methacrylate (PMMA) reinforced fluid applied flashing shall be used with modified roof systems at drains, curbs, pipe penetrations and irregular roof details. All flashing shall terminate a minimum of 8" above the finished roof surface. All seams at the cap sheet shall be heat welded. Damage to the seams during heat welding shall not be permitted.
5. Use of modified bitumen flashing as curb/wall flashing shall not be accepted with exposed termination bar and sealant unless covered with approved through-wall counterflashing.
6. Use of pitch pockets as flashing details for modified bitumen roof systems shall not be permitted.
7. Use of modified bitumen as flashing at pipe penetrations shall not be permitted.

8. Approved modified bitumen low-slope roofing manufacturers with Polymethyl Methacrylate (PMMA) fluid applied flashing include:
 1. Soprema
 2. Siplast
 3. Johns Manville
9. When low-slope roofs do not have roof-top-equipment and are pre-approved for use, they shall be provided with a minimum slope of 1/4 inch per foot and shall be fully adhered, heat welded, 60 mil. minimum thickness reinforced single ply thermoplastic membrane or polyvinyl chloride thermoplastic membrane with Kee. Fleece back membrane preferred but optional with approval of University Project Lead. Exposed termination bar and sealant shall not be considered unless covered with approved through-wall counterflashing.
10. Approved low-slope roofing manufacturers include:
 1. Fibertite
 2. GAF
 3. Firestone Building Products
 4. Johns Manville
 5. Carlisle
 6. Additional manufacturers as recommended by the Designer and approved by the University Project Lead.
 1. All Designers and/or Contractors that are requesting the use of alternate manufacturers owned by Firestone and Carlisle must be certified directly as Firestone and Carlisle system installers as well as they must meet financial requirements of certified Firestone and Carlisle manufacturer approved installers.
11. All modified bitumen low-slope roofs must carry a minimum of a 20 year, no dollar limit roof system warranty.
12. The manufacturer of the roof system must submit an assembly letter before the project begins to be included with the product data sheets.
13. New rigid insulation shall be of type and installation method required for manufacturer providing warranty. Thickness shall be determined as required to meet applicable energy codes and shall be attached to structural roof deck as required by roofing manufacturer to meet wind uplift design criteria for geographical area. Provide 1/2" cover board as required by manufacturer.
14. The manufacturer of the roofing must submit a letter to the University Project Lead certifying that the entire roofing assembly is compatible and complete as required for warranty requirements.
15. Secondary slope to roof drains shall be provided within two feet of the primary roof drain. Roof drains shall be kept protected from debris. Min. 4 foot by 4 foot insulation sump at all drains.
16. At the end of the day's work, or when precipitation is imminent, a night seal must be installed at all open edges
17. Prior to final inspection, the contractor shall conduct a flood test or electrical conductance test of the roof in the presence of the Designer and the University Project Lead to verify drainage. At final inspection, representative

of roofing materials manufacturer providing warranty to be present with Designer, University Project Lead, General Contractor, and Roofing Subcontractor where applicable.

18. Pedestrian walk pads shall be installed at all egress, access ladders and perimeters of roof top equipment. Paths with walk pads shall be considered where maintenance foot traffic exists.

B3012 Traffic Toppings & Paving Membranes

- A. When low-slope roofs are approved for use with complete overburden, such as pedestals and pavers or vegetative systems, the membrane system shall be provided with a minimum slope of 1/8" per foot to all drains and shall be a fully torch-applied, 2-ply SBS modified bitumen roof system with the top membrane a min. 154 mils. Full adhesion of the 2-ply modified bitumen membrane may be considered with solvent free adhesive. Polymethyl Methacrylate (PMMA) reinforced fluid applied flashing shall be flashed with modified roof systems at drains, curbs, pipe penetrations and irregular roof details. Flashings shall terminate a minimum of 8" above the finished roof surface. The roofing assemblage shall be covered under a single manufacturer's warranty.
- B. Acceptable fluid applied low-slope roofing manufacturers with Polymethyl Methacrylate (PMMA) fluid applied waterproofing include:
 1. Soprema
 2. Siplast
 3. Johns Manville
 4. Kemper
- C. Hot fluid applied asphalt shall not be permitted.

B3016 Gutters and Downspouts

- A. Built-in gutters and systems which bring roof water into the envelope of the building shall be avoided.

B3020 Roof Openings

B3022 Roof Hatches

- A. If the lowest point of the roof is not consistently accessible within 24 feet of the ground, a rooftop hatch or door shall be provided to facilitate access for roofing maintenance.
- B. Ladders inside closets are not acceptable for roofs with equipment that requires maintenance. Permanent stairs shall be built into the structure for roof access.
- C. Roof hatches must be no closer than 12 feet from the roof edge.
- D. Roof hatches shall not be installed in any electrical room or other room with moisture sensitive equipment such as telecom, data, security, or access control equipment rooms.
- E. Provide built in personnel tie-off points into the roof design for the purposes of construction and maintenance. Use dark bronze in color or other similar color to

blend with the roof color. Tie-off points shall be provided within and immediately outside the roof hatch.

B3023 Gravity Roof Ventilators

- A. Roof top equipment shall be located no closer than 16 feet to the roof edge. If any equipment requiring service is located within 10 feet of the roof edge, fall-protective railings shall be provided. Fiberglass railings are not permitted.

Document Revision History

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2022 Section C – Interiors

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C Interiors

C10 Interior Construction

C1010 Interior Partitions

C1011 Fixed Partitions

- A. No wood studs.
- B. Minimum thickness = 5/8" gypsum board.
- C. Provide 5/8" Type X gypsum board on minimum 3-5/8" 20-gauge metal studs, at 16" on-center, with snap-in 1 5/8" cold rolled channel stiffeners through studs at mid-span to facilitate future rewiring. Brace studs to structure for additional stiffness as needed.
- D. Where finished partitions are furred out from concrete or masonry back-up, provide minimum 7/8" furring channels and 5/8" gypsum wallboard.
- E. Designer shall indicate on the drawings or provide in the specifications for shop drawings to indicate control joints for gypsum board-finished walls greater than 30-feet in length. Control joints should be located logically and align with other elements whenever possible.
- F. Provide fire-retardant treated wood blocking to facilitate installation of grab bars, wall stops, similar accessories or other built-in work. Provide details on the drawings to accommodate built-in elements of varying weight.
- G. Gypsum board shall not touch the floor, provide 1/2" clearance.
- H. Provide fiberglass mat (moisture resistant) gypsum board in areas where water is present, such as bathrooms, kitchens, and laboratories.
- I. Extend partitions through ceiling and anchor to structure above. Do not terminate partitions at ceiling grid without prior approval. If approved, trim top edge of gypsum board partition with ceiling system "L" trim, white finish.
- J. Extend all corridor partitions and finish to structure.
- K. Provide gypsum board on steel stud partitions with approximately 12" x 12" inspection/access panel for all under stair areas (usually the lowest level). Where the design professional feels that this is not appropriate (such as lobby or monumental stairs) please request a variance from the University Project Lead.
- L. Acoustics shall be considered in appropriate areas for comfort, presentations, and privacy. Provide for sound control around offices, conference rooms, restrooms, and other sensitive areas.
- M. Provide corner guards in high traffic and utility corridors.
 - 1. Laboratory and classroom buildings
 - 1. 4' - 0" high stainless steel corner guards.
 - 2. Administrative and classroom buildings
 - 1. 4' - 0" high vinyl corner guards.
 - 3. Residence Halls
 - 1. 8' - 0" high vinyl corner guards

4. Dining Facilities
 1. 4' – 0" high stainless steel

C1017 Interior Windows & Storefronts

- A. Provide tempered or laminated safety glass.
- B. Intumescent fire-glass is preferred over wire glass for glazing in fire rated partitions

C1020 Interior Doors

C1021 Interior Doors

- A. Provide solid core wood, maple, birch, or oak veneer doors with transparent finish, except that existing adjacent door veneers shall be matched in remodeling projects.
- B. Painted doors are acceptable in Residence Hall facilities. Must be semi-gloss paint.
- C. Doors taller than eight (8) feet shall be approved by the University Project Lead.
- D. Single-leaf door openings are preferred to double-leaf door openings. If double-leaf door openings are required by the project, provide a keyed removable mullion.
- E. Aluminum storefront doors shall be wide stile only with a 12" bottom rail.
- F. All doors leading to secure areas shall be capable of real-time remote programming and or monitoring by the Auburn University Access Control Center and the Auburn University Department Campus Safety and Security.
- G. Where interior spaces require large doors for the passage of equipment (e.g. general laboratories, shared equipment laboratories, etc.), specify 3'-6" or 4'-0" single leaf doors (with appropriate adjustments in frame gauge and hardware requirements) rather than pairs of 3'-0" + 1'-0" doors

C1022 Interior Door Frames

- A. Provide welded and formed 16-gauge steel hollow metal interior door frames.
- B. Knock down or unwelded frames are not acceptable.

C1023 Interior Door Hardware

- A. Refer to Auburn University Door Hardware Standards.

C1025 Interior Door Wall Opening Elements

- A. Provide a vision lite in each door or side lite to an office, conference room, or similar space.

C1030 Fittings**C1031 Fabricated Toilet Partitions****A. Toilet and Shower Partitions**

1. Stainless steel, smooth-faced partitions floor mounted. In locations subject to high humidity, such as locker rooms or shower rooms. Phenolic or HDPE partitions may be specified with the Design Project Manager's approval.
2. Provide heavy-duty stainless-steel trim and hardware with self-closing door hinges.
3. Latches that do not depend on precision alignment of door and wall to operate are preferred.
4. Provide bumper and hooks on back of stall doors.

C1035 Identifying Devices

- A. Interior Signage shall match existing within the building or shall match this standard.
- B. Emergency Evacuation Map plans shall be installed in the following locations:
 1. each stairwell at each level
 2. each elevator landing
 3. each building entrance immediately inside the building
- C. Provide interior signage for all assigned spaces, life safety requirements, exit stair/keep door closed, inside stair landing, path to exit, exit door, public toilets, ADA compliant toilets, mechanical, service rooms and essential directional signs.
- D. Identify service rooms as Custodial, Electrical and Telecommunications where applicable.
- E. Provide identification for these specific fire protection specialty rooms with special white letters on red background:
 1. "FACP" for rooms with fire alarm control panels
 2. "SPRINKLER RISER" for rooms with fire sprinkler risers
 3. "FIRE PUMP ROOM" for rooms with fire pumps
- F. Provide signage with Grade 2 Braille, in accordance with ADAAG requirements. Maintain the required spacing of the Braille text from the raised print text.
- G. A representative sign sample must be submitted prior to the full production run to demonstrate ADAAG compliance.
- H. Signage shall be installed at the height required by ADAAG and placed 2" from the strike-side edge of the door frame. If signage is required to be installed on glazing, double-stick tape and a 1/8" aluminum backer plate on the opposing side of the glazing shall be provided. Backer plate color to complement the signage color.
- I. Standard Signage shall be equal to items listed below from
Gravograph New Hermes
2200 Northmont Parkway
Duluth, GA 30096-5895
1-800-843-7637

1. Deluxe Directory
 1. Header Plus Three Insert Lines: Part No. 34911
 2. Header Size: 2" High x 7" Wide x 1/16" Thick
 3. Insert Size: 3/4" High x 7" Wide x 1/16" Thick
 4. Overall size: 4 3/4" High x 7 5/8" Wide x 3/8" Thick
- J. Three basic colors used most on campus:
 1. Gravo-tac Silver gray (substrate) used for brail room numbers and backplate material on which to mount raised profile numbers. Material Part number 29900
 2. Gravo-tac bright white Profile material for profile numbers Part number 37042A (request with adhesive)
 3. Gravoply-I material for 3 lines Part Number 29584 Silver Gray with white core.
 4. Gravo-tac Black (substrate) Part Number 29902. *Use same bright white listed above for all profiles. Gravoply Black for 3 lines Part Number 17319.
 5. Gravoply gray (not silver gray). Use same material for substrate and 3 lines Part Number 21927.
 6. Use raster beads inserted into backplate for Braille. Part Number B9040CB. These come from Accent Signage, Minneapolis, MN 55405
- K. In addition to room identification signage, pictograms shall be installed at all restrooms. The size and layout of pictograms shall conform to all ADAAG requirements.

C1037 General Fittings and Miscellaneous

- A. Toilet and Bath Accessories
 1. All towel holders, toilet paper dispensers, and soap dispensers shall be Owner Furnished Contractor Installed (OFCI). Contract documents shall indicate the location of the toilet accessories.

C20 Stairs

C2020 Stair Finishes

C2021 Stair Tread and Landing Finishes

- A. Stair risers and treads shall be solid material.
- B. Stairs shall be finished with premium grade rubber treads
- C. Compatible sheet rubber flooring may be used on landings
- D. Risers may be painted or use an integrated rubber riser and tread
- E. Service and non-public stairs may be finished with sealed concrete in metal pan forms and shall have an aluminum nosing with integral abrasive strips.
- F. Provide a closure angle between stair stringer and adjacent wall

C30 Interior Finishes**C3010 Wall Finishes****C3012 Wall Finishes to Interior Walls****A. Gypsum Finishes**

1. Designer to provide specified finish level on design documents and in accordance with Gypsum Association's publication Recommended Levels of Gypsum Board Finish (GA-214-96).
2. Corridors and stairwells – Gypsum wallboard with a Level 4 finish and semi-gloss enamel paint.
3. Offices and conference rooms – Gypsum wallboard with a Level 4 finish and low luster or eggshell latex paint.
4. Toilet Rooms and Showers – Fiberglass mat wallboard and ceramic or other hard tile full height on wet walls. (See tile section for specific requirements regarding base and transition). Painted walls to be semi-gloss in high moisture spaces, eggshell in toilet rooms.
5. Kitchens, Foodservice Venues and Break Rooms – Fiberglass mat wallboard and porcelain or quarry tile or epoxy paint on CMU. Painted gypsum wallboard is unacceptable.
6. Mechanical Rooms, Electrical Rooms, Elevator Control/Machine Rooms, Custodial Rooms, and I/T Rooms - Epoxy paint on CMU is preferred. If gypsum wallboard is provided, a Level 4 finish and epoxy paint shall be provided.
7. Special Rooms – Some spaces are too specialized to list in the Design Standard. If a non-listed space is included within a project, the Designer shall recommend the appropriate finishes for approval by the University Project Lead.
8. Exposed metal studs without a finish are not acceptable.

B. Paint

1. Flat wall paint is unacceptable
2. Provide paint products by one of the following manufacturers:
 1. Sherwin Williams
 2. Benjamin Moore
 3. Scuffmaster
 4. Other manufacturers with similar high-quality products may be submitted to be approved by the University Project Lead during the design phase.

C. Wall Coverings

1. Type II mold and mildew resistant products with micro-perforations shall be provided.

D. Acoustical Panels

1. Class A flammability rating
2. If digital images printed on acoustical panels are specified, images shall be approved by the University Project Lead.
3. Panels shall meet or exceed NRC of 0.80.

C3020 Floor Finishes**A. General**

1. Flooring shall be durable and easy to maintain.
2. Polished concrete shall not be used for finished floor, except in back of house or service areas.

C3021 Floor Toppings**A. Tile**

1. Toilet Rooms and Showers - ceramic or other hard tile, sheet vinyl, or sealed concrete on the floor with 6" minimum cove base.
2. If Schluter Industries cove strip is specified, tile above must maintain the 6" minimum height. Cut tile should be capped using Schluter Industries or equal Jolly strip.
3. 3"x12" bullnose is not acceptable alternative to cove base.
4. Tile base shall follow wall, with minimal grout line along top of base. Must be installed via TCNA standards.
5. Kitchens, Foodservice Venues and Break Rooms - ceramic or quarry tile or sealed concrete with 6" minimum cove base.
6. Ceramic/porcelain hard tile:
 1. All specified tile must meet or exceed industry standards.
 2. Dynamic Coefficient of Friction (DCOF) Slip resistance of tile
 1. ANSI A137.1-2012 (section 6.2)
 3. Abrasion resistance data to equal:
 1. ASTM C1027-99 Class Four or Class Five
 4. Scratch hardness:
 1. Value of 7 or greater
 5. Water absorption data to equal:
 1. ASTM C373-88
 6. Breaking strength data to equal:
 1. ASTM C648-04
 7. Chemical resistance data to equal:
 1. ASTM C650-04
 8. Porcelain tile is recommended over ceramic tile for flooring application.
 9. Dark grout is preferred Grout should be thoroughly mixed per the manufacturers specifications to ensure consistent color throughout mixture and application.
 10. Epoxy mortar and grout (epoxy or equal) shall be provided.
 11. Grout joints shall be per the tile manufacturer recommendation.
 12. Grout and tile sealer shall be provided.
 13. Grout caulk shall match color of grout and be from the same manufacturer.

B. Resilient Flooring

1. Hard flooring, such as VCT, luxury vinyl flooring, ceramic or other hard tile shall meet requirements for slip resistance and durability.

2. Laboratories
 1. Heavy duty sheet seamless flooring with integral base.
 3. Closets, Storerooms and File rooms
 1. VCT with 4" resilient base.
 4. Mechanical Rooms, Electrical Rooms, Custodial Rooms and IT Rooms
 1. VCT or sealed concrete with 4" resilient base.
 5. VCT flooring shall be scrubbed to remove factory finish and then waxed with 4 coats of wax. Wax specification to be coordinated by University Project Lead.
 6. Newly waxed VCT flooring shall be burnished with a hog's hair pad by a high speed burnisher at 1500-2000 rpm.
 7. Vinyl Composition Tile:
 1. 12 in. x 12 in.
 2. 1/8 in. thick
 3. Static Load limit of 125 psi
 4. 9.4 Fire test data to equal:
 5. ASTM E 648 Critical Radiant Flux - .045 watts/cm²
 6. ASTM E 662 Smoke – 450 or less
 7. Provide a five-year warranty.
 8. Provide waterproof setting materials for flooring applied to below grade floor slabs and other assemblies as recommended by the Designer.
 8. Luxury vinyl flooring:
 1. All specified products shall meet or exceed industry standards set by ASTM F 1700 Class III Solid Vinyl Tile
 2. Product should meet the following:
 1. 20 mil wear layer
 2. Overall gauge of .120" (3mm) nominal, 5mm is also acceptable
 3. 20 Year commercial warranty
- C. Entrance Flooring
1. Building entrances shall have a built-in water walk off mat with a minimum length of 7 feet. In new construction, the walk off mat shall be recessed into the structure, or flush without transition to building flooring. Renovations may provide for a removable mat to lie on the finished floor.

C3023 Hardeners and Sealers

- A. All hard surface flooring shall be sealed in accordance with the manufacturer's written instructions.

C3025 Carpeting

- A. Carpet shall be commercial-grade, high-density with low pile height.
- B. Provide carpet flooring and resilient wall base for offices and conference rooms.
- C. Broadloom Carpet Products:
1. Rated for heavy traffic with soil, stain protection, red dye stain resistant
 2. 22-34 ounce face weight.
 3. Nylon fiber type 6 or 6-6 or equal

4. Level loop or multi-level loop
 5. When padding is used it shall be integral with carpet
 6. Solution dyed yarns
 7. Carpet shall contain pre-consumer and post-consumer recycled content. Carpets containing pre-industrial and post-industrial recycled content are preferred.
 8. Install using a direct-glue method, in accordance with manufacturer's written instructions.
- D. Carpet Tile Products:
1. Rated for heavy traffic with soil, stain protection, red dye stain resistant
 2. 22-34 ounce face weight.
 3. Nylon fiber type 6 or 6-6
 4. Solution dyed
 5. Use cushion back tiles as circumstances require, such as in an area where acoustics are important.
 6. Carpet shall contain pre-consumer and post-consumer recycled content. Carpets containing pre-industrial and post-industrial recycled content are preferred.
 7. Install using a "releasable" glue system, "peel and stick", or tackable dots, in accordance with manufacturer's written instructions. Direct-glue method is unacceptable.
 8. Installation adhesive or system shall be from same manufacturer as carpet materials.
- E. All removed carpet tiles with vinyl backing and luxury vinyl tile (LVT) flooring materials shall be palletized and returned to recycling facilities by the contractor. Coordination to facility should be incorporated into design project, with specific facility confirmed by contractor and design lead. No hazardous material or non-recyclable products may be included in recyclable pallets.

C3026 Base, Curbs, and Trim

- A. Base shall be 4" or 6" resilient, tile or wood base as appropriate to the flooring type and project design.
- B. Resilient wall base shall be continuous roll 4" or 6" cove base. Precut lengths are not acceptable.
- C. Outside and inside corners shall be formed by using the continuous roll base.
- D. Do not provide sections of base that are less than 6' in length.
- E. Resilient wall base shall have round top or flat top, shall be specified within the design documents.
- F. No toe base is acceptable at carpet floor surfaces

C3030 Ceiling Finishes**A. General**

1. Ceilings shall be accessible.
2. If hard ceilings are specified, access panels shall be required, detailed, and located on the Construction Documents to coordinate with above-ceiling systems which require accessibility and maintenance.
3. If gyp ceiling is specified, ceiling shall be painted using flat paint.

C3032 Suspended Ceilings**A. Acoustical Ceiling**

1. Suspension system shall be 2 ft. x 2 ft., or 2 ft x 4 ft 15/16" wide intermediate-duty, hot-dip galvanized with standard white finish. Suspension systems in high humidity/unconditioned spaces, kitchens, foodservice venues, or other specialized spaces shall be aluminum, unless otherwise recommended by the Designer.
2. Ceiling tile shall be 2 ft. x 2 ft., 2 ft x 4ft, 3/4" thick, white tegular-edge Armstrong Cirrus. Ceiling tile in high humidity/unconditioned spaces, kitchens, foodservice venues, or other specialized spaces shall be Armstrong Fine Fissured Ceramaguard with hold down clips, unless otherwise recommended by the Designer. In renovation projects, match the existing tile if available.
3. Suspend ceiling system from structure only.
4. Acoustical ceiling tile shall not be installed until all work above ceilings has been completed, inspected, approved by the Construction Project Manager and temperature and humidity are consistently maintained as indicated for final occupancy.

Document Revision History

Version	Section	Summary of Change	Date
1.0	C1037	ADD: Toilet/Bath Accessories Requirements	5/10/23



2022 Section D – Services

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D20	Plumbing
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D Services**D10 Conveying****D1010 Elevators and Lifts****D1011 Passenger Elevators**

- A. Warranty period and maintenance period to be one year and coincide with General Contractor's warranty.
- B. Elevators to comply with ANSI A17.1 and ADA/ADAG.
- C. Elevator certifications shall be witnessed by the University Project Lead.
- D. If there is an attic or penthouse level the elevator shall service this level.
- E. Non-public spaces shall be accessible by card reader access only.
- F. Enclosed machine rooms for hydraulic elevators shall provide supply and exhaust air to prevent oil film build-up on machinery components and reduce the potential hydraulic smell to the room.
- G. All new and renovated elevators shall have air conditioning and humidity controls in the control cabinets or equipment rooms. Shaft ways exposed to exterior environment (i.e. parking garages) shall be provided with humidity control to prevent water condensation on rails and operating mechanisms. The spaces shall maintain a temperature range between 68 to 84 degrees Fahrenheit year-round.
- H. For passenger elevators, the elevator speed shall be no less than 150 FPM. For freight elevators, the speed is to be determined according to project needs.
- I. Provide Automatic Fireman's Recall System; in general, operation shall comply with attached Elevator Recall/Shutdown Matrix for sprinklered and non-sprinklered buildings.
- J. Provide directional lanterns in the cab jambs, both sides of the entrance columns and provide the car position indicator in the main floor of egress hall station, minimum 2" in height.
- K. Elevator cab lighting shall be LED light fixtures.
- L. Provide all special diagnostic equipment, meters or monitors manuals needed to trouble shoot or repair elevators to the University. Proprietary equipment, computer hardware and software, shall not be used. Provide all user and service codes for all diagnostic equipment with instructions.
- M. Two service and repair manuals for all elevators must be submitted. Service manual must include all diagnostic information. An owner's manual must be provided to the University. One of the three sets of wiring diagrams must be laminated. All items must be turned over to the University Project Lead upon completion. After the one-year warranty period, all service records, manuals, and diagnostic equipment must be turned over to the University and signed for by the University Project Lead.
- N. Provide key locks for independent service, fire service inspection, and lighting & fan. (four keys for each lock) Fixtures shall be provided by Innovation Industries,

- Adams or GAL Manufacturing. The emergency stop switch shall be a Double D Core.
- O. Access to elevator equipment rooms shall be restricted.
 - P. Provide three copies of the “Certificate of Operation” to the University Project Lead – one to be posted in the elevator cab, one for the University Project Lead, & one for the Maintenance and Operations.
 - Q. All elevator controls shall be of a non-proprietary type. Approved control suppliers
 - 1. Elevator Control
 - 2. Motion Control Engineering
 - 3. GAL Manufacturing.
 - R. All elevator controls to be microprocessor logic type. Provide in the service manual a ladder diagram or other source code, relay wiring diagram, showing all relays, devices and switches. The drawing set shall include electrical schematic diagrams and input/output schedules.
 - S. Elevator control logic for electric traction elevators to be independent or component control logic. All elevator specs to be reviewed by Auburn’s elevator consultant.
 - T. Hydraulic elevators to be equipped with a sealed PVC cylinder sleeve.
 - U. Elevator machine and control rooms shall not be located near classrooms or sound sensitive areas.
 - V. Permit shall be paid for out of project that installs elevator.
 - W. Permits shall be applied for in advance of completion to avoid any unnecessary delays in the permitting process.
 - X. No floor drains are permitted in any elevator mechanical room.
 - Y. All elevator pits shall be sealed and watertight, with minor slope to the sump pit. Sump to be located in a rear wall corner. Sump pit must be a minimum of 2’ x 2’ x 2’ with a galvanized steel grate cover.
 - Z. Provide an oil cooler as needed.
 - AA. Elevator Sprinkler/Detector Matrix (Appendix D2)
 - BB. Elevator Recall/Shutdown Matrix (Appendix D2)

D20 Plumbing

- A. Building piping main runs shall be located above corridors unless otherwise approved by University Project Lead.
- B. Install all piping parallel or perpendicular to building lines with sufficient hangers to prevent sagging.
- C. Pipe Labels: Provide labels on all pipe systems per the following:
 - 1. In Mechanical/Electrical/Pump Rooms
 - 2. Above ALL Ceilings (lay-in and hard)
 - 3. At an interval of no more than 20 feet
 - 4. On both sides of wall and floor penetrations
 - 5. Adjacent to valves
- D. Floor Sleeves shall be cast-in-place schedule 40 steel pipe, 2” above floor, flush with bottom of slab.

- E. Isolation Valves
 - 1. Provide isolation of each floor or section of a floor.
 - 2. Provide shut-off valves for all services into bathrooms, laboratories, and mechanical rooms spaces to allow for area isolation.
 - 3. Provide isolation of each independent item of equipment and fixture
- F. All valves to be tagged. Provide as-built drawings and a tag chart noting location of valves.
- G. Lead Free Identification: All piping, fittings, valves, and fixtures of the domestic water system must be clearly labeled with permanent identification of compliance with the Safe Drinking Water Act as lead free.
- H. Water Meters:
 - 1. Provide water meter schedule to indicate each water meter required for project. Schedule the following information:
 - 1. Service: (domestic, make-up, etc.)
 - 2. Size of Meter
 - 3. Non-Return Meter: Y/N
 - 4. Minimum Design Flow (gpm)
 - 5. Maximum Design Flow (gpm)
 - 6. Location of Meter
 - 2. Water meter detail. (Appendix D2)

D2010 Plumbing Fixtures**D2011 Water Closets**

- A. Water Closet to be vitreous china, wall hung with chair carrier.
- B. Water Closet bowl shall be elongated.
- C. Water Closet passage to be a minimum diameter of 2.25" trap-way.
- D. Water Closet flush valve shall be a low flow design of 1.2 or 1.6 gallons per flush with selectable dual flush handle. Flush valves to be dual filtered bypass (minimum), ADA compliant handle.
- E. Water Closet seats to be solid plastic with stainless steel self-sustaining check hinges.
- F. Water Closet water supply connection shall be top spud type with a minimum inlet diameter of 1".

D2012 Urinals

- A. Urinals to be vitreous china, wall hung with floor mounted carrier, low flow design sensor type with 1 pint per flush.
- B. Urinal passageway shall be a minimum diameter of 2".
- C. Urinal water supply connection shall be a top spud type with a minimum inlet diameter of 3/4"

D2013 Lavatories

- A. Wall hung lavatories to be vitreous china and shall be provided with concealed arm carrier.

- B. Restroom lavatory faucets in new construction and renovations to be chrome plated with sensor.
- C. Power source for the faucet (in order of preference):
- D. Hardwired from Power Converter (Mini junction box can be used to power up to 8 faucets)
- E. 6 VDC Plug-In Power Converter (Requires receptacle under sink)
- F. Battery Powered
- G. Faucets shall not contain plastic components.

D2014 Sinks

- A. Kitchen and Breakroom Sinks
 - 1. Sinks to be 18 gauge stainless steel.
 - 2. Sink faucets to be ¼ turn ceramic disk cartridge type with 4” minimum length wrist blade handles.
 - 3. Faucets shall not contain plastic components.
 - 4. Kitchen faucets shall have a maximum flow rate of 1.8 gpm.
- B. Janitor Room Mop Sinks and Basins
 - 1. Mop service basins shall be floor/wall assemblies.
 - 2. Basin shall be a one-piece terrazzo construction.
 - 3. Basin shall be equipped with aluminum or stainless bumper guards.
 - 4. Basin shall be equipped with a mop hanger bracket.
 - 5. Basin shall be equipped with a service faucet complete with vacuum breaker, integral check valves, integral stops, an adjustable wall brace, a pail hook, and a 3/4" hose thread on spout.
 - 6. Basin shall be equipped with a hose and hose bracket.
 - 7. Basin shall be equipped with stainless steel wall guards.
 - 8. Basin and wall guards shall be sealed watertight to the wall and floor.

D2017 Showers

- A. Shower heads
 - 1. Maximum flow rate of 1.5 gpm.

D2018 Drinking Fountains and Coolers

- A. Water Cooler and Bottle Filler
 - 1. Provide a minimum of one drinking fountain with filtered water and bottle refill station on every occupied level of the building.
 - 2. Water coolers shall provide a minimum of 8 gallons per hour chilling capacity.

D2020 Domestic Water Distribution**D2021/2022 Cold/Hot Water Service**

- A. Domestic Water Piping
 1. Copper type 'L', hard drawn, with soldered joints. "ProPress" or equivalent joints may be used with prior written approval from the University Project Lead.
 2. Bracing and supports shall not allow for excessive movement.
 3. Flat support brackets are not acceptable on wall rough-in.
- B. Domestic Water Pipe Cleaning/Disinfection
 1. Clean and disinfect inside water piping prior to placing the system in operation.
 2. Purge domestic cold water, hot water, hot water circulating, and tempered water piping including heaters, pumps, tanks, and fixtures.
 3. Flush piping systems with potable water from university supply system until water runs clear.
 4. Fill system with clean water with a water/chlorine solution containing a minimum 50 ppm chlorine. Isolate the piping systems and allow to stand for 24 hrs.
 5. Flush system with clean, potable water from university supply system until the chlorine levels in the system is the same level as the supply.
 6. Submit water samples for biological examination by a lab approved by the local health authority. Samples shall be taken in the presence of the Owner.
 7. Repeat procedure and resubmit samples until biological test pass. Minimum acceptance test results shall be 0.0 colonies of coliform bacteria.
 8. Provide results of test to Owner.
 9. Materials and test methods shall comply with AWWA C651-2014.

D2023 Domestic Water Supply Equipment

- A. Plumbing Pumps
 1. Package booster pumping station to be duplex type, utilize variable speed drive pumps when applicable.
- B. Washing machine and ice maker boxes should be metal commercial grade not plastic.

D2024 Insulation and Identification

- A. Piping Insulation
 1. End joints of pipe insulation shall be sealed to pipe.
- B. Insulation shall be as listed below for service piping:
 1. Domestic Cold-Water Piping: Fiberglass
 2. Domestic Hot Water Piping: Fiberglass

C. Minimum Thicknesses:

Service	Up to 1 ¼"	≥ 1 ½"
Domestic Hot Water	1"	1.5"
Domestic Cold Water	¾"	1"

D2025 Specialties

A. Backflow Preventers

1. Domestic and Fire water:
 1. Install in mechanical room.
2. Provide a bypass with check valve and lockable ball valve if single backflow preventer is provided.
3. If reduced pressure type (RPZ), provide drain funnel and pipe to floor drain.
4. Irrigation water:
 1. Install in pit in yard with separate water meter.
5. See Section G30 for additional requirements.
6. Backflow Preventer detail. (Appendix D2)

B. Dielectric Union

1. Provide ball valves on each side of dielectric union.

C. Recirculation Pump

1. Provide ball valves on each side of recirculation pumps

D2030 Sanitary Waste

D2031 Waste Pipe

A. Piping Below grade:

1. Cast iron hub and spigot. For connections to existing piping, standard flexible couplings are preferred.
2. Do not use a shielded (no-hub) coupling below grade.
3. Document locations with GPS.

B. Piping Above grade:

1. Cast iron no-hub with four band mechanical clamps. Husky Heavy Duty or equivalent.

C. Cleanouts:

1. Wall cleanouts shall be flush with finished wall.
2. Cleanouts are to be accessible. Provide access panel in hard ceilings as required.
3. Locate to the side of the Water Closets with a minimum clearance of 6" from the rough-in of the Water Closets. Preferred location is in ADA stall to allow for additional access.
4. Wall cleanouts shall be located between 30" and 42" above finished floor.
5. Wall cleanouts shall be connected to main line with a sweep connector.

D. Lavatory P-traps

1. 17-gauge brass with integral cleanout.

- 2. Traps shall have mechanical connection (not soldered) at wall connection to allow for removal and use as a cleanout.
- E. All overhead P-traps shall have trapeze hanger with U bolt clamp for support.
- F. Indirect Drains
 - 1. Copper type 'M' for 1" and smaller, type 'DWV' for 1 1/4" and larger with sweat joints

D2032 Vent Pipe

- A. Piping below grade:
 - 1. Cast iron hub and spigot. For connections to existing piping, standard flexible couplings are preferred.
 - 2. Do not use a shielded (no-hub) coupling below grade
 - 3. Document locations with GPS.
- B. Piping above grade:
 - 1. Cast iron no-hub with four band mechanical clamps. Husky Heavy Duty or equivalent.

D2033 Floor Drains

- A. Minimum size: 3" outlet
- B. Provide floor drains in Water Closets, Shower Rooms, Kitchens, Food Service, Break Rooms, and Mechanical rooms.
- C. Provide floor drains for all emergency/drench showers.
- D. Provide trap primers for all floor drains, floor sinks and shower drains. All trap primers shall have isolation valves. Access doors shall be provided if trap primer is located behind a wall or above a ceiling.

D2034 Sanitary Waste Equipment

- A. Sewage ejectors to be used only with prior approval from University Project Lead.

D2040 Rainwater Drainage**D2041 Pipe and Fittings**

- A. Above Grade:
 - 1. Cast iron no-hub with four band mechanical clamps. Husky Heavy Duty or equivalent.
- B. Below Grade:
 - 1. Cast iron hub and spigot.
 - 2. For connections to existing infrastructure, standard flexible couplings are preferred.
 - 3. Document locations of couplings with GPS.
 - 4. Do not use a shielded (no-hub) coupling below grade.

D2090 Other Plumbing Systems**D2091 Gas Systems**

- A. Medical Gases: All medical gas pipe, fittings, and equipment shall be cleaned and capped and installed in accordance with NFPA99.
1. Oxygen
 1. Copper tubing type 'K' or 'L', less than ½" soft annealed, ½" –1.5" hard drawn.
 2. Argon
 1. Copper tubing type 'K' or 'L', less than ½" soft annealed, ½" –1.5" hard drawn.
 3. Carbon Dioxide
 1. Copper tubing type 'K' or 'L', less than ½" soft annealed, ½" –1.5" hard drawn.
 4. Helium
 1. Copper tubing type 'K' or 'L', less than ½" soft annealed, ½" –1.5" hard drawn.
 5. Nitrogen
 1. Copper tubing type 'K' or 'L', less than ½" soft annealed, ½" –1.5" hard drawn.
 6. Nitrous Oxide
 1. Copper tubing type 'K' or 'L', less than ½" soft annealed, ½" –1.5" hard drawn.
 7. Acetylene
 1. Stainless steel type 316 with Swagelok fittings.
 8. Hydrogen
 1. Stainless steel type 316 with Swagelok fittings.

D2092 Acid Waste Systems

- A. Lab Acid Waste and Vent Piping
1. Above grade
 1. Polypropylene with mechanical joints.
 2. Below grade
 1. Polypropylene with thermal fusion joints
 3. All overhead P-traps shall have trapeze hanger with U bolt clamp for support.

D2099 Other Piping Systems

- A. Compressed Air Systems
1. Air Compressors
 1. Duplex type, 100% capacity each compressor, with ASME stamped receiver.
 2. Compressed Air Piping
 1. Copper tubing type 'K' or 'L'
 1. Less than ½" soft annealed

2. ½" –1.5" hard drawn
 3. Greater than 1.5" schedule 40 black steel.
- B. Vacuum Systems
 1. Vacuum Pumps
 1. Duplex type, 100% capacity each pump.
 2. Vacuum Piping
 1. Copper tubing type 'K' or 'L'
 1. Less than ½" soft annealed
 2. ½" –1.5" hard drawn.
- C. Processed Water Systems
 1. Deionized Water Piping
 1. Polyvinylidene fluoride (pvdf) kynar resin SDR 11-21 with thermal fusion joints.
 2. Distilled Water Piping
 1. Perfluoroalkyloxy pipe (PFA) Teflon schedule 40 or 80 with thermal fusion, mechanical, or threaded joints.
 3. Reverse Osmosis Water Piping
 1. Polyvinylidene fluoride (pvdf) kynar resin SDR 11-21 with thermal fusion joints.

D30 Heating, Ventilation & Air Conditioning (HVAC)

D3010 Energy Supply

D3012 Gas Supply System

- A. Liquid Petroleum (LP) and Natural Gas Piping:
 1. Below grade:
 1. High density polyethylene (HDPE) with electro/heat fusion joints.
 2. HDPE piping shall be installed per 49CFR Part 192 by a certified installer.
 3. Install with a #12 AWG copper tracer wire.
 2. Above grade:
 1. Black steel, schedule 40
 2. Gas train to be painted battleship gray.
 3. Sediment trap required prior to all equipment.
 4. Gas Train detail. (Appendix D2)

D3020 Heat Generating Systems

D3021 Boilers

- A. Boilers and Pressure Vessels
 1. Shall be designed, constructed, installed, operated, maintained, and inspected in accordance with Alabama Boiler and Pressure Vessel Safety Act.
 2. Permits for new or relocated units, shall be included in project costs. Permits shall be obtained and maintained by contractor throughout warranty period.

3. Provide emergency shutdown button switch (mushroom type) located at mechanical room entrance for each boiler.

D3030 Cooling Generating Systems**D3032 Direct Expansion Systems**

- A. Refrigerant Piping – Copper Tubing, Type “ACR”

D3040 Distribution Systems**D3041 Air Distribution Systems****A. Air Handling Units**

1. Custom air handlers shall not be specified without prior written approval by the University Project Lead.
2. Preferred System: VAV air handling with hot water reheat
3. Units shall be double wall construction.
4. Test ports for each section shall be factory mounted.
5. Sensors and devices that are located on air handling units to be factory mounted when possible.
6. Access doors to be person sized and thermally broken. Installed between coils, at filters and fans.
7. HVAC Equipment (AHU’s, Pumps, etc.) shall be located on a housekeeping pad.
8. Fan coil units shall not be located above a ceiling.
9. All equipment shall be field inspected and tested by the manufacturer or a factory trained authorized representative for installation in compliance with the manufacturer’s installation instructions and recommendations prior to start-up. The manufacturer or a factory trained authorized representative shall do, or be present at, the start-up. Start-up documentation certifying proper installation and start-up shall be submitted to University Project Lead at that time and shall also be included in the O&M manuals.
10. HVAC systems shall not be started until cleaning, flushing and pre-treatment has been performed to the satisfaction of the University Project Lead.
11. Following start-up procedures, adjust equipment for proper operation within manufacturer’s published guidelines and tolerances. Demonstrate proper operation of equipment and systems to designated University Project Lead and the Commissioning Agent.

B. Filters

1. Type A frames required.
2. In mechanically ventilated buildings, provide regularly occupied areas of the building with air filtration media that provides a Minimum Efficiency Reporting Value (MERV) of 13 or better. Filtration should be applied to process both return and outside air that is to be delivered as supply air.
3. If permanently installed air handlers are used during construction, in addition to the specified unit filters, filtration media with a Minimum Efficiency

Reporting Value (MERV) of 8 shall be used at each return air grille, return duct inlet, outside air inlet and intake louvers. Replace all filtration media one week prior to Substantial Completion

C. Fans

1. Units over 5000 cfm to have a fan array with minimum of two fans.
2. Maximum of two VFD's per AHU.

D. Motors

1. Motors for equipment served by variable speed drives shall be Inverter-rated motors conforming to NEMA MG-1, Part 3, 1.15 service factor and class "F" insulation.
2. Maximum RPM: 1750 without prior approval.
3. Motors 5 hp or larger shall have VFD.

E. Variable Frequency Drives (VFD)

1. Mount on wall at 48" AFF in NEMA 12 enclosure.
2. Mounting on equipment only acceptable when factory installed.
3. Provide with a serial interface to allow bi-directional communication with the existing controls system.
4. At a minimum, the following points shall be made available to the controls system: Set Point, Drive Speed (RPM), Frequency (Hz), Current (A), Power (KW), Energy (KWH), Last Fault Number, OK/Faulted Status, Stop/Run Status, and Hand/Off/Auto Status.
5. No bypass required.
6. Provide a lockable service disconnect immediately upstream and adjacent to the VFD.
7. The preferred drive manufacturer shall be Danfoss or approved equal.

F. Coils

1. Chilled Water Coil Selection:
 1. Water Supply Temperature: 42°F
 2. Water Supply Delta T: 15°F
2. Units with stacked coils shall have balancing valves for each coil and coil tracks for coil removal.
3. Reheat Coil
 1. Access door/panel shall be provided upstream and downstream of re-heat coils.
 2. Provide pressure independent balancing valves at reheat coils.
4. Avoid sandwiched coils.
5. Pressure gauges and thermometers to be provided on supply and return piping.
 1. Pressure gauges to be provided with gauge valve.
 2. Thermometers to be provided with thermometer well.
6. P-T Plugs (Pete's Plugs) shall be provided adjacent to all control sensors for testing and verification.
7. Locate isolation valves outside the coil pull line to allow coil removal without disruption of hydronic service to other equipment and to keep piping disassembly to a minimum.
8. UV lights to be provided downstream of cooling coil.

- G. Drain Pans
 - 1. Internal pans to be Stainless steel construction.
 - 2. Intermediate drain pans shall be installed on multiple coil sections.
 - 3. Auxiliary drain pans with water sensor required on all units. Sensor shall be connected to the control system.
- H. Dampers
 - 1. Outside air dampers shall be stainless steel or aluminum.
- I. Gauges, meters, thermometers, etc., shall be accessible and readable from floor level.
- J. Condensate Water Piping:
 - 1. 4" and Less: Copper Type "L" or Stainless Steel
 - 2. 5" and Larger: Black Steel, Schedule 40
- K. VAV/Terminal Units
 - 1. Controllers, actuators, dampers, and valves shall be easily accessible and located in hallways or at the space entry with a minimum 2' X 2' opening.
 - 2. Provide bottom access door on all terminal units.
 - 3. Label units to reflect location and AHU.
 - 1. TU-Floor#-AHU#-Unique#
 - 4. No serviceable devices to be located above a hard ceiling unless an access door is provided.
 - 5. Provide access and required clearances (per NEC) and requirement for coordination between trades.
- L. Duct
 - 1. Fibrous Glass Duct:
 - 1. Fibrous glass duct or (ductboard) is not allowed.
 - 2. Flexible Duct:
 - 1. Runouts to diffusers shall be limited to 5 feet.
 - 2. Takeoffs for flexible ducts shall be installed at main duct branch.
 - 3. Metal Duct:
 - 1. Design and construction shall comply with SMACNA standards.
 - 2. Specialty ductwork materials (i.e., stainless steel, aluminum, etc.) or construction shall be clearly noted and hatched on the plans.
 - 4. Underground ductwork is not acceptable.
 - 5. During construction all open duct should be sealed.
 - 6. Duct sealant/mastic shall be installed at all duct joints and terminations of flexible ducts to seal leaks.
 - 7. Provide access panels in duct for all devices (Dampers, actuators, etc.)
- M. Insulation
 - 1. No internal duct liner allowed.
 - 2. Provide externally wrapped fiberglass insulation or factory fabricated double wall duct with perforated metal liner.
 - 3. All duct work with the possibility of condensation shall be insulated.
 - 4. Insulation support pins shall be welded to ductwork. Glue-on/stick-on pins are not acceptable.
- N. Outside air intake louvers should have access doors for cleaning bird screen.
- O. Diffusers/Registers/Grilles

1. Shall be of corrosion resistant construction of aluminum or stainless steel.
2. All items visible through return air grilles shall be painted flat black.

D3042 Exhaust Ventilation Systems

- A. Provide mechanical ventilation in attic spaces.
- B. Locate all maintenance parts (belts, motors, bearings, etc.) outside of contaminated air stream.
- C. Laboratory exhaust systems shall be designed in accordance with NFPA 45.
- D. Fume hood and kitchen exhaust ducts to be continuously welded, watertight.
- E. Welded longitudinal joints to be facing up.
- F. Fans shall have an upblast discharge if possible.

D3043 Steam Distribution Systems

- A. Below Grade Piping
 1. Steam Piping
 1. ASTM A106-B, Seamless, Grade B, Schedule 40 / Schedule 80
 2. Complete factory-fabricated steam and condensate piping system with carrier pipes
 3. Joints:
 1. Trenches - Butt-weld joints. Socket weld is required for pipe sizes 50 mm (2 inches) and less.
 2. Vaults - Butt weld pipe sizes 65 mm (2-1/2 inches) and greater; thread or socket weld pipe sized 50 mm (2 inches) and less. Use Schedule 80 pipe and forged steel fittings for threaded joints.
 4. Valves - 2-1/2" or greater - Gate valves, Steel body rated to 150 psig at 500 degrees F
 2. Condensate Piping
 1. ASTM A106-B, Seamless, Grade B, Schedule 80
 2. Complete factory-fabricated steam and condensate piping system with carrier pipes
 3. Joints:
 1. Trenches - Butt-weld joints. Socket weld is required for pipe sizes 50 mm (2 inches) and less.
 2. Vaults - Butt weld pipe sizes 65 mm (2-1/2 inches) and greater. Socket weld pipe sizes 25 mm (1 inch) and greater, and thread pipe sizes less than 25 mm (1 inch). Use Schedule 80 pipe and forged steel fittings for threaded joints.
 4. Valves - 2-1/2" or greater – Gate valves, Forged steel body rated to 300 psig at 420 degrees F

- B. Above Grade Piping:
 - 1. Steam – Black Steel, Schedule 40
 - 2. Steam Condensate – Black Steel, Schedule 80
 - 3. Insulation
 - 1. Fiberglass
 - 2. End joints of pipe insulation shall be sealed to pipe.
 - 3. All elbows and fittings to be fully insulated.
- C. Steam Condensate Receiver: Duplex type

D3044 Hot Water Distribution

- A. Primary Hot Water Decoupled at building
 - 1. Primary Hot Water Supply Temperature: 180° F
 - 2. Primary Hot Water Delta T: 30° F
 - 3. Primary Hot Water Excursion to 250° F
 - 4. Hot Water Heat Exchanger
 - 1. Should have capacity to install additional plates to increase 20% additional capacity.
 - 2. Pressure Drop: not to exceed 15 feet at double the design flow rate
- B. Locate main piping runs above corridors when possible
- C. Mechanically formed (pulled) T's are acceptable for ½" and ¾" piping connections to 2" or larger pipe.
- D. Minimize quantity of dielectric unions. Unions shall be in accessible locations for ease of maintenance. Provide ball valves on each side of union to allow for repair of union.
- E. System shall be cycled through heat up and cool down and checked for leaks prior to substantial completion.
- F. Piping
 - 1. Below Grade
 - 1. Pre-Insulated Pipe Conduit
 - 2. 4" and less: Black steel, Schedule 40. Use standard pipe sizes
 - 3. 5" and larger: Black Steel, Schedule 40
 - 4. Insulation: Polyurethane
 - 5. Outer Jacket: HDPE
 - 2. Above Grade
 - 1. 4" and less: Copper Type "L" or Stainless Steel
 - 2. 5" and larger: Black Steel, Schedule 40
 - 3. Insulation
 - 1. Fiberglass
 - 2. Outer Jacket: ASJ
 - 3. End joints of pipe insulation shall be sealed to pipe.
 - 4. All elbows and fittings to be fully insulated.
- G. Make-up Water Piping
 - 1. Copper Type "L"
 - 2. Provide separate water meter
 - 3. Provide RPZ back-flow preventer

- H. Valves
 1. Provide isolation of each independent item of equipment.
 2. Provide isolation at each branch takeoff.
 3. Valves located on Primary water supply and return shall be offset butterfly type with metal seats.
- I. Pumps
 1. Base mounted vertical centrifugal.
 2. Provide and install two 100% capacity pumps for redundancy.
 3. Horizontal split case pumps are acceptable for larger capacity requirements.
- J. Motors
 1. Motors for equipment served by variable speed drives shall be Inverter-rated motors conforming to NEMA MG-1, Part 3, 1.15 service factor and class "F" insulation.
 2. Maximum RPM: 1750 without prior approval.
 3. Motors 5 hp or larger shall have VFD.
- K. Variable Frequency Drives (VFD)
 1. Mount on wall at 48" AFF in NEMA 12 enclosure.
 2. Provide with a serial interface to allow bi-directional communication with the existing controls system.
 3. At a minimum, the following points shall be made available to the controls system: Set Point, Drive Speed (RPM), Frequency (Hz), Current (A), Power (KW), Energy (KWH), Last Fault Number, OK/Faulted Status, Stop/Run Status, and Hand/Off/Auto Status.
 4. No bypass required.
 5. Provide a lockable service disconnect immediately upstream and adjacent to the VFD.
 6. The preferred drive manufacturer shall be Danfoss or approved equal.
- L. Expansion Tanks
 1. Label tanks with installed pressure settings as determined by TAB

D3045 Chilled Water Distribution

- A. Locate main piping runs above corridors when possible
- B. Mechanically formed (pulled) T's are acceptable for ½" and ¾" piping connections to 2" or larger pipe.
- C. Minimize quantity of dielectric unions. Unions shall be located in accessible locations for ease of maintenance. Provide ball valves on each side of union to allow for repair of union.
- D. Piping
 1. Below Grade:
 1. Pre-Insulated Pipe Conduit
 2. 4" and less: Cement lined, Ductile Iron, Schedule 40. Use standard pipe sizes
 3. 5" and Larger: Cement lined Ductile Iron
 4. Insulation: Cellular Glass or Polyurethane
 5. Outer Jacket: HDPE

2. Above Grade:
 1. 4" and Less: Copper Type "L" or Stainless Steel
 2. 5" and Larger: Black Steel, Schedule 40
 3. Insulation: Cellular Glass
 4. Outer Jacket: ASJ
- E. Valves
 1. Provide isolation of each independent item of equipment.
 2. Provide isolation at each branch takeoff.
 3. Valves located on Primary water supply and return shall be offset butterfly type with metal seats.
- F. Pumps
 1. Base mounted vertical centrifugal.
 2. Provide and install two 100% capacity pumps for redundancy.
 3. Horizontal split case pumps are acceptable for larger capacity requirements.
- G. Expansion Tanks
 1. Label tanks with installed pressure settings as determined by TAB

D3060 Controls and Instrumentation

- A. General
 1. HVAC Design Criteria
 1. Outdoor Design Conditions

Winter	24°F DB
Summer – Cooling	93°F DB / 74°F MCWB
Summer - Evaporation	77°F DB / 87°F MCWB
Summer – Dehumidification	75°F DB / 134 HR / 81°F MCDB
Degree Days Heating	2383 (Base 65°F)
Degree Days Cooling	1859 (Base 65°F)
Climate Zone	3A

2. Indoor Design Conditions

Winter	70°F DB
Summer – Cooling	75°F DB / 50% RH
Summer - Evaporation	77°F DB / 87°F MCWB
Max Space Humidity	60% RH

D3061 Heating Generating Systems

- A. Control schemes for all building hydronic systems:
 - 1. Secondary hot water differential pressure set point reset
 - 2. Secondary hot water temperature reset
 - 3. Hot water pump rotation
 - 1. P-1 1st to 15th of the month, P-2 16th to end of month

D3062 Cooling Generating Systems

- A. Control schemes for all building hydronic systems:
 - 1. Building chilled water differential pressure set point reset.
 - 2. Secondary chilled water pump to be put to sleep when building ΔP is greater than ΔP setpoint.
 - 3. Chilled water pump rotation
 - 1. P-1 1st to 15th of the month, P-2 16th to end of month

D3063 Heating/Cooling Air Handling Units

- A. Unoccupied set points shall include reduced airflow set point and temperature set point:
 - 1. Cooling: 82°F
 - 2. Heating: 63°F
 - 3. Air Flow: Lower of 10% of max or minimum flow.
- B. The following control schemes shall be implemented for all air handling units.
 - 1. Discharge air temperature reset
 - 2. Static pressure reset
 - 3. Economizer mode
- C. Air Measurement Devices
 - 1. Provide a measurement device with an accuracy of plus or minus 15% of the design minimum outdoor air rate for mechanical systems that utilize direct measurement of outdoor air.
- D. CO2 Monitors
 - 1. Provide carbon dioxide monitors within all densely occupied spaces (greater than 25 people per 1000 sq. ft.) served by the air handling unit that measures outside air.
 - 2. Locate monitors between 3 and 6 feet above the floor.
 - 3. Monitors shall communicate with the building automation system to provide an alarm when carbon dioxide is out of range for the space.
 - 4. Provide a way to locally adjust controls in all auditoriums.
- E. Temperature sensors shall be nickel construction.
- F. Control relays shall be installed in control panels, starters, or variable speed drive.
- G. Control thermostat/sensor boxes in walls shall be sealed/ caulked to prevent airflow through the device.

D3066 Terminal Devices

- A. Integrate terminal units with room lighting occupancy sensors to enable terminal unit occupancy mode.
- B. During normal hours when occupancy is not detected by sensor setpoint control will reset to +/- 4°F.
- C. During unoccupied mode, sensor will automatically enable occupied mode for 1 hour (adjustable).

D3067 Energy Monitoring and Control

A. Setback Schedules

- 1. Should be determined after building use discussion with the building occupants.
- 2. All setback schedules are to be programmed at substantial completion.
- 3. The following standards are to be used as a starting point for setback schedules.
 - 1. Admin (offices, conference rooms, copy rooms, break rooms, etc.)
 - 1. Occupied – 6:45 am
 - 2. Unoccupied – 5:15 pm
 - 3. Unoccupied on University holidays
 - 2. Classroom (provide override ability via room thermostat or integrated room occupancy sensor)
 - 1. Occupied – 1 hour prior to start of 1st class in the building
 - 2. Unoccupied – 30 minutes after end of last class in the building
 - 3. Unoccupied on University holidays
 - 3. Computer Lab
 - 1. Same as classroom
 - 4. Teaching Laboratory
 - 1. Same as classroom
 - 5. Research Laboratory
 - 1. Equal to the greater of either admin or classroom schedules in that building
 - 2. Holidays – same as admin or classroom schedules
 - 6. Studio
 - 1. Occupied – 7:30 am
 - 2. Unoccupied – 11:00 pm
 - 3. Holidays – Unoccupied all student breaks and University Holidays

B. Control Points

- 1. Control Points shall be ordered such that set points are grouped with associated controlling points.
- 2. User views will be constructed so points are organized the same for like systems.
- 3. System/Equipment Control Points Required to be displayed on BAS. (Appendix D2)
 - 1. Typical VAV Terminal Box
 - 2. Typical Variable Volume Air Handler with Economizer

3. Typical Energy Recovery Air Handler
4. Typical Single Zone Air Handler with Economizer
5. Chilled Water Interface
6. Hot Water Interface
4. Emergency equipment Control Points
 1. Emergency generator status
 2. Automatic transfer switch, switch position
- C. Alarm Points
 1. The design engineer shall submit an alarm table summarizing the alarms to be configured for the project and their associated set points.
 2. Alarms shall be designed to communicate out to remote monitoring and notification system during the event of a power outage.
 3. Standard Alarms and Set Points for required alarms. (Appendix D2)
 4. Non-standard alarms configured during construction and commissioning are to be removed prior to turnover.

D3068 Building Automation Systems

1. Johnson Controls Inc.'s Metasys Extended Architecture is the standard interface for building management systems.

D3069 Other Controls & Instrumentation

- A. Wiring, Conduit, Power
 1. All wiring and conduit shall be installed as a complete and independent system. All control power and control wiring shall be labeled at each end and at any spliced joint.
 2. Control submittals shall include wiring diagrams for each system or piece of equipment.
 3. Control Wiring
 1. Control wiring in exposed ceilings to be in conduit
 2. Control wiring located above accessible ceilings to be plenum rated cable installed in cable trays or J-hooks run perpendicular or parallel to building lines
 4. All controls conduit, boxes, and covers shall be painted white in color.
 5. Label all junction box covers with: "HVAC CONTROLS"
 6. Power Requirements
 1. All DDC control panels shall be served by a dedicated circuit fed directly from the panel board.
 2. All network panels and DDC control panels that serve equipment on emergency power shall be provided with an uninterruptable power supply sized to provide sufficient time for transition to emergency power or equipment shutdown and alarm notification.

D3070 Systems Testing and Balancing**A. Test & Balance (T&B)**

1. Test and balance of the air and water side of an HVAC system shall be performed for any equipment replacement and/or system modifications.
2. Test and balance shall be performed by an Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB) certified T&B contractor that shall be a different company than the mechanical contractor and approved by the University Project Lead.
3. Testing and balancing of HVAC systems shall be performed, at minimum, in accordance with AABC or NEBB National Standards.
4. Final T&B report shall include design and actual readings with explanation and recommendation for remediation for readings that could not be balanced.
5. The schedule for T&B shall be incorporated in the overall project schedule such that test and balance shall be complete prior to substantial completion.

D3073 HVAC Commissioning

- A. Commissioning shall be provided for both air and water side of the HVAC System at a minimum.
- B. Commissioning Authority shall be contracted directly with owner.
- C. Agreement between Owner and Architect and Construction Contract will define roles and relationships between Architect and Contractor and the Commissioning Authority.
- D. The schedule requirements for the commissioning process shall be incorporated in the overall project schedule such that commissioning process shall be complete prior to substantial completion.
- E. The scope of commissioning services will be defined and refined as part of the project execution process during the design phase of the project.
- F. Contractors shall be responsible for the initial controls testing prior to commissioning by Auburn University. All aspects of the system shall be functionally correct prior to commissioning.
- G. Commissioning will be performed by Auburn University, Contractor(s), BAS Contractor, Construction Administration Engineer, and Commissioning Agent.

D40 Fire Protection**D4010 Sprinklers****D4011 Sprinklers Water Supply Fire Suppression**

- A. Provide fire sprinkler system in accordance with NFPA 13.
- B. Piping and hangers shall be free from direct contact with other trades.
- C. Provide an exterior weatherproof horn/strobe fire alarm device immediately adjacent to fire riser room such that it will be visible to first responders.

- D. Piping:
 - 1. Below Grade
 - 1. Cement lined ductile iron with mechanical joints.
 - 2. Wet System Above Grade
 - 1. 2" and smaller: Black steel schedule 40 with screwed joints.
 - 2. 2.5" and larger: Black steel schedule 10 with grooved mechanical joints (Victaulic).
- E. Provide hydrostatic calculation plate for each fire riser.
- F. Backflow Preventer
 - 1. Locate in fire riser room in building.
- G. Valves
 - 1. Post indicator valves shall be equipped with tamper switches and locks.
 - 2. Pad locks shall be Auburn University locks obtained from Facilities Access Control. These locks are keyed specifically for sprinkler system locks (i.e. 100E).
- H. Fire Department Connection: Provide locking caps compatible with City of Auburn Fire Division.

D4030 Fire Protection Specialties**D4031 Fire Extinguishing Devices**

- A. Before renovation, alteration, or demolition, the contractor shall contact the University Project Lead and arrange to have all existing fire extinguishers delivered to an acceptable storage facility to be reused in other University facilities.
- B. Fire Extinguishers
 - 1. All facilities shall be provided with 10 lb. ABC multi-purpose dry chemical portable fire extinguishers along with other types and sizes as required.
 - 2. Extinguishers in public areas shall be mounted in recessed or semi-recessed cabinets capable of holding the extinguisher without the use of hooks or brackets.
 - 3. Cabinet doors should be equipped with a roller ball or magnetic latch.
 - 4. All portable extinguishers shall be in visible locations and free from obstructions. Signage shall be provided to indicate the extinguisher location where visual obstructions cannot be avoided.
 - 5. All rooms, classified as laboratory by Auburn University Space Management standards, shall be provided with a minimum 5 lb. ABC multi-purpose dry chemical portable fire extinguisher.

D50 Electrical**D5010 Electrical Service and Distribution****D5012 Low Tension Service & Distribution****A. Distribution Equipment**

1. Approved secondary distribution equipment manufacturers:
 1. Square D (Schneider),
 2. General Electric (ABB)
 3. Siemens
 4. Cutler Hammer (Eaton).
2. All main breakers shall be equipped with lockout/tagout frames to allow the breaker to be locked in the open position.
3. All main distribution equipment shall be supplied with remote mounted Transient Voltage Surge Suppressor.
4. Circuit breakers shall be bolt-in type; plug-in/snap-in type not permitted.
5. "Piggy Back" style and combination circuit breakers are not permitted.
6. All distribution equipment bussing shall be copper.
7. Service entrance conductors to be copper XHHW
8. Panelboard directories shall be type-written.
9. Panelboard covers shall "door-in-door" type.
10. Floor mounted equipment shall be installed on a 3.5" high concrete housekeeping pad that extends three inches out from base of equipment on all sides.
11. Location of all exterior electrical equipment shall be approved by the University Project Lead.
12. Provide TVSS units in remote enclosures. Serve TVSS units from circuit breaker in main panels.

B. Conduit & Raceways

1. Below Grade:
 1. Schedule 80 PVC if direct buried
 2. Schedule 40 PVC if encased in or under concrete
2. The transition from PVC to Rigid conduit shall be made with a rigid 90-degree elbow and stub up. Rigid pipe shall be treated with UL Listed corrosion resistant tape to protect rigid pipe against rust.
3. Minimum depth of bury shall be three feet.
4. Minimum conduit size to be ¾".
5. Rigid Metal Conduit (RMC) to be used (indoors/outdoors) where exposed to direct physical damage. RMC to be used in parking decks.
6. Electrical Metallic Tubing (EMT) to be used (indoors only) in concealed/protected areas not subject to physical damage.
7. Liquid tight flexible metal conduit to be used for final connection to fan/pump motors or vibrating loads.

8. Conduit to be concealed in all public areas. Exposed conduit only permitted in mechanical, electrical, and telecom rooms or other locations approved by University Project Lead.
9. Chatter Clips shall be installed in all horizontal runs of metallic conduit installed in-walls and exceeding 10' in length.
10. Surface mounted steel or aluminum raceway to be used for exposed raceway mounted on walls.
11. Sleeves
 1. Indoor sleeves for low voltage wiring shall be EMT with bushings installed on each end.
 2. Underground sleeves to be PVC Schedule 80.
12. Junction Box Labeling:
 1. Exposed: provide permanent labels.
 2. Above Ceiling: provide permanent labels or permanent marker
 3. Lighting Controls box covers labeled with white stencil "LC"
13. Conduits (including couplings, fittings, boxes and covers) located above ceilings and exposed in mechanical and electrical rooms shall be colored their entire length. Sporadic spray painting of couplings and conduit is not permitted. Colors determined by Table below.

Conduit & Box Colors	
Electrical System	Conduit & Box Color
120/208V Normal Power	Silver (Unpainted)
120/240V Normal Power	Purple
277/480V Normal Power	Yellow
Emergency Power	Orange
Standby Power	Green
Fire Alarm	Red
Telecommunications	Blue
Security / Access Control / CCTV	White
Lighting Controls	Black

14. Exception: Conduit 1 1/4" and larger shall have all fittings, junction boxes and covers colored. Conduit shall be neatly identified on 5' intervals using rust resistant tape or 2" wide colored tape to match the color of the electrical system installed.
 15. Conduits located in areas with exposed ceilings may be painted to match surroundings if couplings and box covers are painted per Table.
- C. Conductors
1. Conductors/Cabling to be copper THHN, THHW, or XHHW.
 2. The use of aluminum conductors is not permitted.
 3. Minimum conductor size to be #12 AWG.
 4. Conductors sized #10AWG and #12 AWG to be solid.
 5. Conductors sized #8 AWG and larger to be stranded.
 6. Stranded conductors shall be provided for:
 1. Terminating motors or other vibrating equipment

2. Exterior lighting
3. Terminating LED lighting fixtures
7. The use of Type MC Cable is not permitted except for:
 1. Light fixture whips
 2. Fishing wire in existing walls (terminate MC cable in J-box above ceiling to minimize length of MC cable)
8. The use of Type NM (Romex) Cable is not permitted.
9. All conductors shall be in conduit.
10. All conductors/cabling shall have colored insulation their entire length. Phase tape is not permitted. Colors determined by Table below.

Conductor Insulation Color		
Phase	120/208V	277/480V
A	Black	Brown
B	Red	Orange
C	Blue	Yellow
Neutral	White Striped *	Gray Striped *
Ground	Green	Green w/ Yellow Stripe

*The neutral wire shall be striped with the color of the phase conductor. Multi-wire circuits using a common neutral are not permitted.

D5020 Lighting and Power Branch Wiring

D5021 Branch Wiring Devices

A. Receptacles

1. Approved receptacle manufacturers:
 1. Hubbell
 2. Leviton
 3. Pass & Seymour (Legrand).
2. All receptacles to be rated a minimum of 20A. The use of 15A receptacles is not permitted.
3. All receptacles to be UL listed, Federal Specification grade.
4. Receptacle cover plates shall be stainless steel unless otherwise approved by University Project Lead.
5. Receptacles on emergency power shall have cover plates engraved with "EMERGENCY" in red letters.
6. Receptacles shall be colored as follows:
 1. Normal Power – Grey
 2. Normal Power Controlled by BAS – White
 3. Emergency Power – Red
 4. Isolated Ground - Orange
7. Receptacles required to be controlled per ASHRAE 90.1 shall be fed from their own intelligent panel. No other loads shall be fed from these panels. Panels shall be integrated with the Building Automation System and shall utilize BACnet over IP/MSTP communication protocol.

B. Junction Boxes and Outlet Boxes

1. Outdoor enclosures to be NEMA 3R or NEMA 4
2. Indoor enclosures may be NEMA 1 in dry areas
3. Indoor enclosures shall be NEMA 3R in areas exposed to moisture
4. Junction boxes shall be color coded per Conduit and Box Color chart.

C. Electrical Identification

1. Junction boxes shall be permanently labeled indicating panel of origin, circuit number(s), and voltage.
2. Conductors shall be labeled with standard vinyl cloth, self-adhesive cable/conductor markers, wrap-around type; pre-numbered plastic coated to show circuit identification. Labels shall be installed within close proximity to terminations.
3. Receptacle cover plates:
 1. Shall be labeled with panel of origin and circuit number.
 2. Labels shall be self-adhesive and have clear background with 1/4" high lettering.
 3. Lettering color determined as follows:
 1. Normal Power - Black Letters
 2. Emergency Power - Red Letters
4. Electrical Panels and Equipment:
 1. Shall be labeled with engraved nameplates.
 2. Shall be 1/8" thick by 1" high melamine plastic laminate engraved with 1/4" minimum sized letters.
 3. Shall be installed with self-tapping screws.
 4. Shall be installed in visible location. Locating nameplate behind access door is not permitted.
 5. Shall be installed on electrical cabinets, major electrical equipment, safety switches, transformers, circuit breakers located in feeder style panelboards, etc.
 6. All Electrical Equipment above ceiling shall be identified on ceiling grid or access panel.
 7. Nameplate color and letter color as follows:

Electrical Panel and Equipment Identification Color Code	
Electrical System	Nameplate Color
120/208v Normal Power	White w/ Black Lettering
277/480V Normal Power	White w/ Yellow Lettering
120/208V Emergency Power	White w/ Orange Lettering
277/480V Emergency Power	Orange w/ White Lettering
120/208V Standby Power	White w/ Green Lettering
277/480V Standby Power	Green w/ White Lettering
120/240V Three Phase	White w/ Purple Lettering
240V Three Phase	Purple w/ White Lettering

D5022 Lighting Equipment

A. Equipment

1. Approved manufacturers for general lighting fixtures:
 1. Hubbell
 2. Cooper (Signify)
 3. Philips Lighting
 4. Acuity
2. T12 and T5 fluorescent lamps and incandescent lamps are not permitted.
3. Recessed Canister Lights shall have an opening $\geq 4"$ to provide access to fixture mounted driver. If smaller diameter lights are used, remote mount drivers in an accessible location.
4. Exterior lighting to be controlled by a centrally located photoelectric sensor-controlled lighting contactor with Hand-Off-Auto settings.
5. Exterior security lighting and exterior building lighting shall not be controlled by the building automation system, unless Parking Lot lighting is being dimmed when unoccupied.
6. Timers are not permitted.
7. Exterior pole lights shall be fed with a minimum of 3 circuits. Install as multi-wired branch circuits and have individual neutral conductors identified with the phase color the entire length of circuit. 10 ga conductor minimum.
8. "EXIT" signs shall be green.

B. Controls

1. Approved manufacturers for room level lighting controls
 1. nLight (Acuity)
 2. Sensor Switch (Acuity)
 3. Wattstopper (Legrand)
 4. Hubbel
 5. Greengate (Cooper/Signify)
 6. Lutron
2. Approved manufacturers for building level lighting controls
 1. nLight (Acuity)
 2. Leviton
 3. Square D (Schneider)
3. Building level lighting controls shall utilize BACnet over IP/MSTP communication protocol.
4. Building level lighting controls shall be integrated into the building automation system to allow lighting control schedules to be implemented and modified. Occupancy sensors shall integrate with HVAC terminal units to enable terminal unit occupancy mode.
5. Lighting Control Contractor shall:
 1. Provide a single line diagram located at the main lighting controller identifying all components of the lighting system.
 2. Provide software needed to trouble shoot or add/remove devices to the system.

3. Label all cables at the point of termination or connection. Labels shall identify the trunk line or control backbone and any fingers branching from the backbone. It shall also identify the device connected.
4. Cables shall be neatly terminated at each device and all cables trimmed to length.
5. Cables shall not be rolled up and zipped tied in excessive lengths.
6. Low voltage terminations shall be made inside a junction box or enclosure, this includes at devices and fixtures.
7. Power pack relays or power supplies shall be installed using (2) junction boxes (side by side). One box will be provided for the power pack and line voltage, the other for the low voltage to the sensor.
8. Provide a 20-amp rated single pole keyed switch ahead of the line voltage for service to the power packs.

D5030 Communication & Security**D5032 Intercommunication & Paging System**

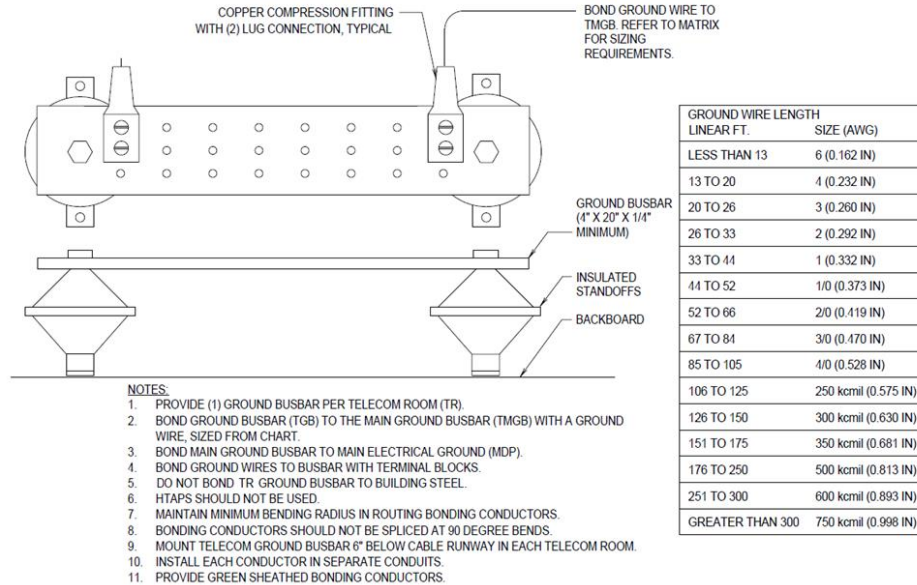
- A. Two-Way Communication Systems for Elevator Landings and Area of Refuge:
 1. Voice over Internet Protocol (VoIP) system
 2. Non-proprietary, field programmable
 3. Provide a 1" conduit homerun from the Telecom Room to the Two-Way Communication Command Unit.
 4. Locate the Command Center adjacent to the main fire alarm panel.
 5. Provide a sub-master station adjacent to a remote command fire panel or at building main entrance used for first responders.
- B. Building Elevator Phones:
 1. Equal to Viking E-1600-02A
 2. Non-proprietary, field programmable
 3. Flush mounted
 4. The phone electronics should be accessible by removing the flush-mounted phone cover, and not having to remove any other elevator control panels.
 5. Provide a 1" conduit homerun from the Telecom Room to each elevator controller box in the elevator control room with a double gang box installed no more than 12 inches from the elevator controller box.

D5034 Call Systems

- A. Follow the TIA/EIA 568B wiring standard as developed by the Telecommunications Industry Association (TIA) and the Electronic Industries Alliance (EIA).
- B. Quality Assurance:
 1. Contractor's on-site superintendent must possess Building Industry Consulting Services International (BICSI) Installer 2, Copper Certification
 2. Contractor shall provide successful Category 6 test results – See testing requirements.
- C. A Category-6 structured cabling design and installation is required.

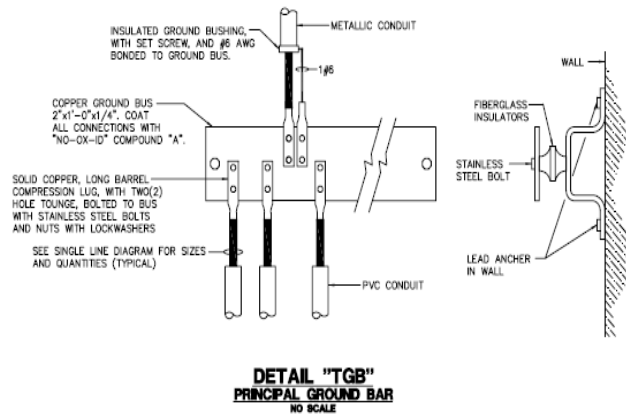
- D. Telecommunication cable pathways shall not exceed 90 meters from the telecommunication room (TR) to the outlet.
- E. Provide a Building Entrance Terminal (BET) where all copper, fiber, and coaxial outside plant cables enter the building.
- F. Larger buildings may require additional Intermediate Distribution Frames (IDF) in separate telecom rooms.
- G. Backboard:
 - 1. Constructed of $\frac{3}{4}$ -inch fire retardant AC-grade plywood painted Battleship gray on all sides.
 - 2. Mounted vertically to all walls in every telecommunications room.
- H. Conduits entering the telecom room shall terminate at the backboard edge either directly above or directly below the plywood backboard to minimize the routing of cables around the room. No telecom conduit should penetrate the ceiling or floor more than 3 inches from the wall that supports a backboard.

- I. A ground busbar shall be installed on the backboard in each telecom room. This busbar shall be connected to the Building Entrance Service Ground Busbar (BESGB), with an insulated copper conductor sized according to length from the BESGB. The busbar shall be a minimum of a ¼"x 4"x 20" copper busbar with stand-off insulators for backboard mounting and mechanical connections for ground conductors.



TYPICAL TELECOM GROUND BUSBAR

NOT TO SCALE

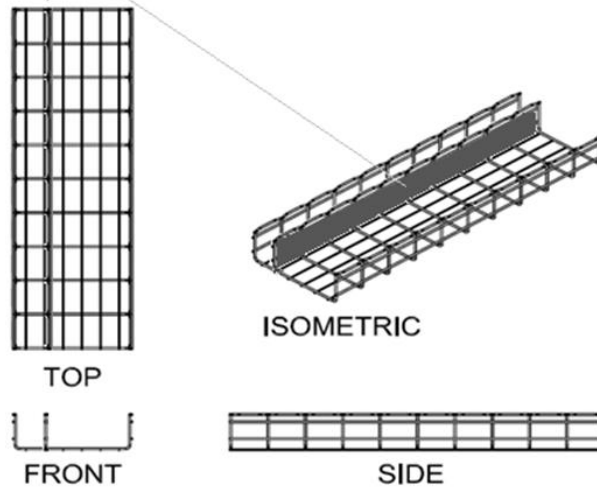


NOTE:

PRE-MANUFACTURED COPPER GROUND BARS ARE AVAILABLE FROM ENRICO.

- J. A wire basket-type cable tray shall be installed at the top of the telecom back board and shall circumnavigate the entire telecom room between 90 inches and 96 inches AFF. Any conduits that enter the room shall be connected to the cable tray

**Metallic Barrier 4-in from
one side for other non-OIT
Low Voltage cabling**

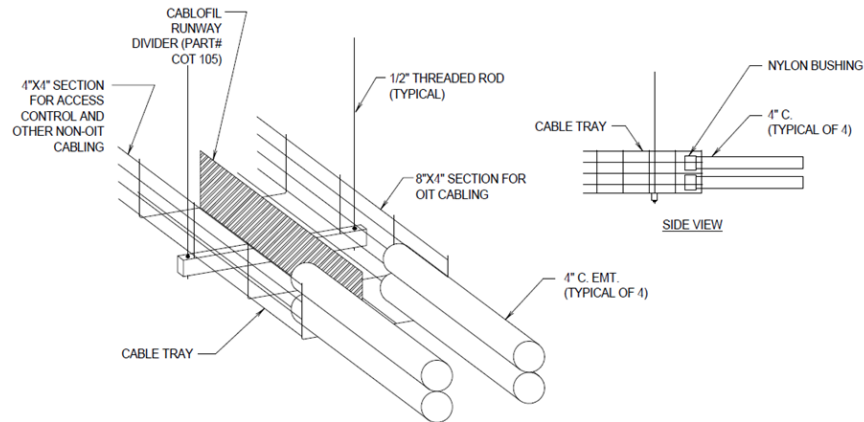


AU STANDARD SIZE WIRE BASKET CABLE TRAY 4"H x 12"W x 120"L
Trapeze or Wall bracket mounting only. Do not center-hang tray.

- by either direct mechanical connection or via a cable tray bridge. Telecom cabling is never allowed to hang in free space without support. This tray shall be a minimum 4"x12" Cablofil CF105 or exact equivalent wire basket tray in size and finish in the Telecommunications Room.
- K. Horizontal pathways shall be: homerun conduit, sleeves, cable trays, and/or support hooks or rings.
- L. Cable trays are recommended along all hallways, corridors, attics, or any other places where it is practical, and should be extended into each telecommunications room. Cable trays should be used whenever possible, especially for large projects. Cable tray sections should be sized to accommodate up to six Category-6 cables per telecom outlet box to be served by the section of cable tray under consideration. The support span for cable support systems should be determined in accordance with the manufacturer's maximum recommended load capacity for a given span. OIT should be consulted when it is necessary to use hooks or rings. Distance between hooks/rings should not exceed 36 inches. When using hooks/rings, multiple 4-inch sleeves must be installed into each telecommunication room from the above ceiling hallway for access to the hooks/rings. The Cable hooks must be rated by the manufacturer for the use of Category-6 data cabling. Ordinary cable hooks are unacceptable.
- M. Cable tray rails shall not be cut to accommodate obstructions. Cable tray supports shall be located so that connections between sections of the cable tray fall between

the support and $\frac{1}{4}$ of the span. Provide supports within 24 inches on each side of connection to a bend, tee, or cross.

- N. Cable tray or hooks are not to be installed over hard ceilings with a length greater than 72 inches.
- O. Where cable runs must cross a hard ceiling with a length greater than 72 inches, conduit transitions must be installed.



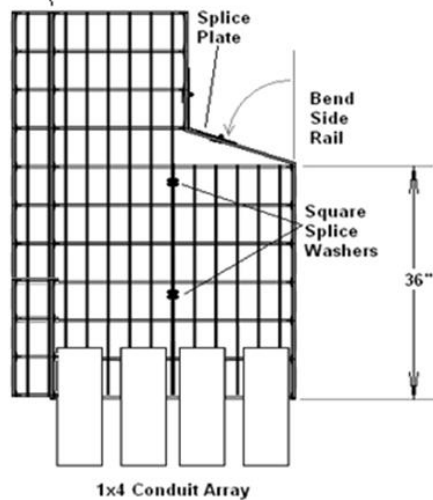
NOTES:

1. BRING CABLE TRAY TO THE BOTTOM OF THE CONDUIT. THE (2) BOTTOM CONDUITS OF THE 2x2 ARRAY SHALL BE IN CONTACT WITH THE BOTTOM OF THE CABLE TRAY.
2. ALL DISCONTINUOUS SECTIONS OF CABLE TRAY SHALL BE JUMPERED WITH A #6 AWG CONDUCTOR. RUN JUMPER ON OUTSIDE OF CONDUITS.

CABLE TRAY TO CONDUIT DETAIL

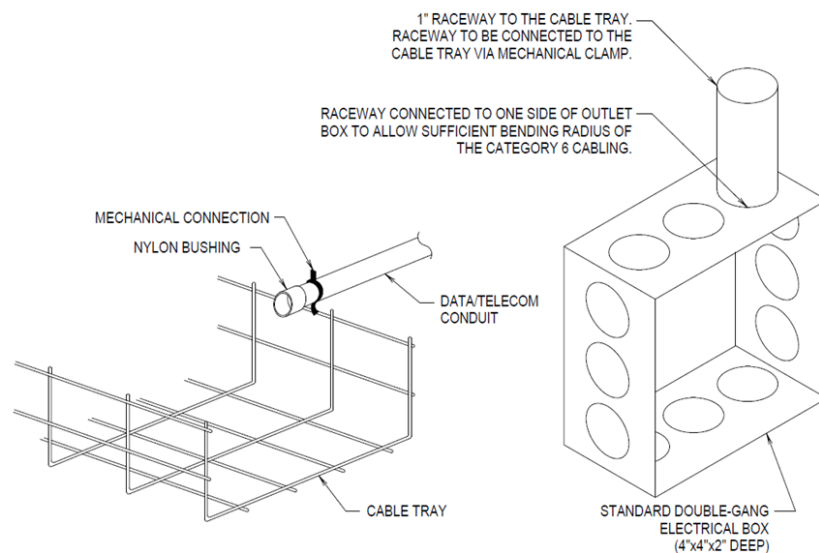
NOT TO SCALE

**Metallic Barrier
4-in from side for
other non-OIT Low
Voltage wiring**



- P. The cross-sectional area of the conduit transitions must equal the cross-sectional area of the cable tray.
- Q. Cable trays and J-Hooks are to be installed not more than 24 inches above a ceiling grid. When designing the pathway for a cable tray, Architects and Engineers are to ensure that there are 6 inches of clearance above the cable tray and to one side of the cable tray. No other trade shall install any piping or equipment within 6 inches above or to one side of the cable tray.
- R. Each telecommunications outlet box requires a 1-inch EMT conduit to be installed from the outlet box to the nearest cable tray or hooks or to the telecom room. A pull string must be installed in each conduit. Where a cable tray is used, the conduits shall make a mechanical connection to the tray at the top rail with a nylon bushing. No gaps between conduit and cable trays are permitted. Where cable hooks are used, the conduits should terminate within 6-inches of a cable hook in the above ceiling corridor. Pull boxes shall be installed for every 180 degrees of bend in a conduit and notated on drawings. Maximum continuous conduit length between pull box is 100 feet. All pull boxes shall be installed above corridors where cable trays or cable hooks are not used.
- S. In the construction of parking decks, all in-slab or in-column telecom conduits must be 1" PVC Schedule 40. Electrical Nonmetallic Tubing shall NOT be used.
- T. All cable trays shall be grounded to the telecom room busbar with an AWG #6 solid conductor as they pass by the TRs and all discontinuous sections of cable tray shall be connected with an AWG #6 solid conductor jumper wire. All conduits that are not mechanically bonded to the cable tray shall be bonded using a #6 bonding jumper from conduit to cable tray.
- U. Backbone Pathways consists of both intra-building and inter-building facilities.
- V. Intra-building backbone pathways are necessary for the installation of telecommunication riser cables between various telecommunication rooms (BET & IDF locations) within a building. Each IDF telecom room should be connected to the BET telecom room via dedicated conduit. In multi-story buildings, it is best to stack the telecommunication rooms when possible and connect the rooms with multiple 4-inch sleeves between floors. A dedicated 4-inch sleeve or conduit should be installed from the BET telecom room to each IDF. When IDFs cannot be stacked, then consult OIT for proper sizing of conduits between the BET and IDFs. A pull box is required for every 180-degrees of total bend in the conduit.
- W. Inter-building backbone pathways are facilities necessary for installation of telecommunication outside plant trunk/feeder cables between buildings. Telecommunications service entrance pathways shall be specified to support the initial and anticipated wireline and wireless telecommunications needs of the total building area served. In determining the total number of pathways required, the planner shall consider.
 - 1. Type and use of building
 - 2. Growth
 - 3. Difficulty of adding pathways in the future
 - 4. Alternate entrance
 - 5. Type and size of cables likely to be installed.

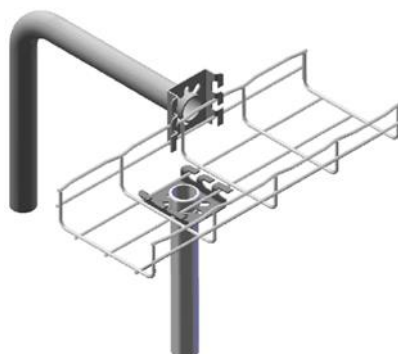
- X. Additional pathways may be specified by OIT for off-campus projects where the building may be served by both the university as well as commercial telecommunications service providers. Consult OIT for specific design needs.
- Y. Outlets:
1. Telecommunication outlet boxes shall be installed wherever telephone, computer, and/or cable television, or any audiovisual service is required. Generally, voice and data jacks in offices, classrooms, conference rooms, etc. will share the same outlet box. It is not necessary to install a separate outlet box for voice and data with the exception of wall mounted telephone locations. For known cable television outlet locations, a separate outlet box may be desired and should be installed at the location requested. Telecommunication outlet locations should be coordinated with the furniture layout.
 2. A standard double-gang electrical outlet box (4" x 4" x 2" deep) should be installed at each telecommunication outlet. All outlet boxes are to be securely fastened to the studs of the interior wall. A 1-inch conduit should be installed from the outlet box, running up the interior of the wall, out into the hallway above the ceiling, and mechanically attached to the telecom cable tray. OIT recommends use of ERICO Caddy 16P24SM flange mount conduit clip. The conduit should interface the top of the double-gang outlet box at an off-center position to allow for maximum bending radius of future cable installs. A pull-string or pull-wire should be installed in each conduit. The conduit should have no more than 180 degrees of bends between the outlet box and the above ceiling corridor space, and therefore a junction box above the ceiling over an office should not be necessary. Do Not place junction boxes above the ceilings over offices.



TELECOMMUNICATIONS OUTLET BOX DETAIL

NOT TO SCALE

3. The 1-inch conduit from each wall outlet box shall be installed to the nearest cable tray, hooks, or telecommunications room. Typical conduit to cable tray termination.



4. Where it is necessary to aggregate several of these conduits into a junction box, the conduit from the junction box to the cable tray/hooks or telecommunication room shall be sized according to the number of 1-inch conduits being aggregated in accordance with the following conduit fill capacity chart:

trade size	inside diam. inch	inside diam. mm	cable outside diameter mm (in)									
			3.3 (0.13)	4.6 (0.18)	5.6 (0.22)	6.1 (0.24)	7.4 (0.29)	7.9 (0.31)	9.4 (0.34)	13.5 (0.53)	15.8 (0.62)	17.8 (0.70)
1/2	.622	16	1	1	0	0	0	0	0	0	0	0
3/4	.824	21	6	5	4	3	2	2	1	0	0	0
1	1.049	27	8	8	7	6	3	3	2	1	0	0
1-1/4	1.380	35	16	14	12	10	6	4	3	1	1	1
1-1/2	1.610	41	20	18	16	15	7	6	4	2	1	1
2	2.067	53	30	26	22	20	14	12	7	4	3	2
2-1/2	2.469	63	45	40	36	30	17	14	12	6	3	3
3	3.068	78	70	60	50	40	20	20	17	7	6	6
3-1/2	3.548	91	MAX	MAX	MAX	MAX	MAX	MAX	22	12	7	6
4	4.026	103	MAX	MAX	MAX	MAX	MAX	MAX	30	14	12	7
typical 2-pair CAT3 cable												
typical 4-pair CAT3 cable												
typical 4-pair CAT5E cable												
typical 4-pair CAT6 (without divider) cable												
typical 4-pair CAT6 (with divider) or 4-pair SdTP cable												
typical 12-pair CAT3 unshielded cable												
typical 25-pair CAT3 unshielded cable												
typical 50-pair CAT3 unshielded cable												
typical 50-pair CAT3 shielded ARMM cable												
typical 100-pair CAT3 unshielded cable												

5. Exposed cabling should not be installed in open ceiling spaces, unless protected by a cable tray.
6. Where surface mounted raceway is installed in a room or lab, the raceway must have a metallic separation barrier between the telecom cabling and 120-VAC cabling. The cover for the raceway should be a snap-on design with

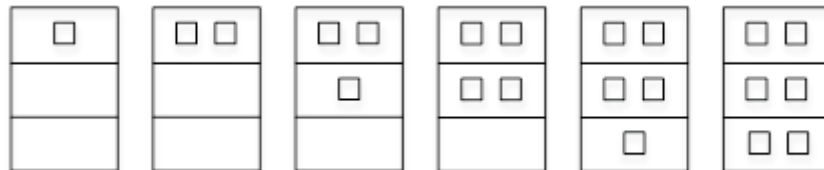
pre-punched holes for telecom jacks every 36 inches. Telecom outlet locations will be determined by OIT and the building tenants. At locations along the raceway where a power outlet is installed but no telecommunication outlet, the telecom cable channel faceplate shall be covered with a blank faceplate by the electrical contractor. Where surface mounted raceways are required within a room or lab, the raceway must be connected via a one inch conduit for every six feet of raceway, or the equivalent thereof. Each conduit must run from the raceway to the nearest cable tray or telecom room.

7. Where floor mounted telecommunication outlets are required, specify FSR FL-500P-BLP-6 floor boxes for standard applications. FSR FL-600 should be used under lecterns in auditoriums. Covers will vary with application. Wiremold RFB4-C1-1 compartment combination floor box may also be used for standard applications. The stamped steel version shall not be used in contact with grade. Only the cast steel version is rated for grade contact applications. Coordinate with OIT when specifying floor mounted outlet boxes. A telecommunication outlet will not be installed if the station cable must be exposed to a surface mounted box.
8. When the design of an office space requires the use of cubicles or other modular type office furniture, it is recommended that the furniture chosen have as part of its design an integrated raceway for installation of telecommunication cables and outlets. If the floor plan of the office space dictates the furniture to be located in the center of the room and not adjacent to any walls, the telecommunications and power access requirements may be met through closely coordinated core drills in the floor that align with the walls of the modular furniture. This is the recommended solution for modular furniture located above the ground floor of a building. For 3-inch thick cubicle walls, 2 ½ inch core drilled holes are recommended, with a 1 ½ inch EMT conduit installed from each core drilled hole to the telecom cable tray on the floor below. The conduit should stub into the telecom raceway within the wall of the modular furniture where it will be accessible for the pulling of the telecom wire. Where multiple contiguous modular offices are planned, a core drill should be made for every three offices. For example, two core drills strategically placed are needed for a configuration of six modular offices. Likewise, four core drills are needed for twelve offices. This method is preferred over the use of tele-power poles. OIT should be consulted for modular furniture that is to be located on the ground floor. Furniture layout should be planned such that telecommunication wiring will not be exposed. At no time is exposed telecommunications wiring from conduits to furniture allowed. Floor boxes have proven to be unworkable for modular furniture and therefore shall not be used. In Lecture Halls, Meeting Rooms and similar locations where power and data are to be supplied to table tops, the WIREMOLD DeQuorum flip-up module with a 20-Amp duplex power outlet and dual-data outlet shall be used where such power and data needs are required by the intended users of the room or lecture hall. Wired data in portable tables are discouraged.

9. Where tele-power poles are required, coordinate with OIT on the selection of products which accommodate both telecommunications and electrical wiring.
- Z. Provide interconnectivity between the following systems as required:
 1. Voice Communication Systems
 2. Data Communication Systems
 3. Building Automation Systems
 4. Lighting Control Systems
 5. Fire Alarm Systems
 6. Security Systems
 7. Access Control Systems
 8. Point of Sale Systems
 9. Closed Circuit Camera Systems

AA. Structured Cabling:

1. Audio-Video (AV) Cabling:
 1. For some classroom environments, Category 6A shielded cables may be required to be installed from the AV equipment rack to various AV components within the classroom, such as projectors, document cameras, podium equipment, etc. The Contractor shall NOT terminate these cables on either end (no RJ45 plug or outlet is required). After the cables are installed by the Contractor, OIT will then terminate the cables directly to the AV equipment. Consult with OIT where Category 6A shielded cabling is required.
2. Coaxial Cable TV Outlet:
 1. CATV requires installation of a coaxial station cable from the telecom backboard to the cable TV outlet location, with the cable terminated with 75-ohm F-connector at the outlet.
 2. Sometimes it is required to install a Cable TV port in addition to one or more Voice/Data ports or in addition to other cable TV ports in a single faceplate. For each additional port, installation of an additional coaxial station cable terminated on both ends is required.
3. Voice or Data Outlet:
 1. Install one 4-pair Cat-6 station cable, RJ45 Jack, and faceplate per outlet.
 2. For each additional outlet provide a 4-pair Cat-6 station cable, and RJ45 Jack installed in faceplate for up to 6 total ports. Port total will be reduced if cable TV jacks are installed in same box/faceplate.
 3. Jacks shall be installed in the following configurations (labeled IAW paragraph CC. Installation Requirements, below):



BB. Preferred Materials Listing:

1. Outlets:
 1. Category 6 ANSI TIA/EIA568B.2-1
 2. Panduit Blue - CJ688TGBU for Production Data Network Jacks
 3. Panduit Green - CJ688TGGR for Experimental Data Network Jacks
 4. Panduit Faceplate - CBEIWW
 5. Panduit Faceplate Insert - CHF2MIW-X
 6. Panduit 1/3 Blank Insert - CHB2MIW-X
 7. Panduit Blank Jack Module - CMBIW-X
 8. Panduit F Connector (Cable TV) - CMFIW
 9. Panduit Mini-Com Module – CBX1IW-A (Biscuit Jack)
2. Station Cable and Cross-Connect Cable:
 1. General Cable GenSpeed 6000 CAT-6 Plenum part #7131900
 2. Berktek Lanmark CAT-6 Plenum part #10136226
 3. RED colored cable for fire alarm network
 4. GREEN colored cable for experimental networks coordinated by OIT
 5. Plenum Cable Part Number: 10032094
 6. Non-Plenum Part Number: 10032455
 7. General Cable GenSpeed 10,000 Category 6A F/UTP (ScTP Cable), ORANGE colored cable for AV (were specified on the plans)
 8. Plenum Part Number 7131591
 9. Non-Plenum Part Number 7133591 (or AU approved equivalent)
3. Category-6 Backboard Termination Hardware:
 1. Voice:
 1. Panduit Category 5e 110-block kit with legs, Category-6, 96 pair, 100 pair footprint
 2. Part Number: P110KB1004Y
 2. Data:
 1. Panduit 24 Port Angled Patch Panel - CPPLA24WBLY (For Data Connections)
 2. Panduit 48 Port Angled Patch Panel - CPPLA48WBLY (For Data Connections)
4. Cable TV
 1. Trunk Cable between IDFs:
 1. RG-11 Belden 1523AP 75-Ohm CATV Plenum-rated coaxial cable
 2. RG-11 Belden 1523A 75-Ohm CATV non-plenum coaxial cable
 2. Jack Cable to IDF: Belden RG-6:
 1. Plenum 9116P 75-Ohm CATV coaxial cable
 2. Non-Plenum 9116 75-Ohm CATV non-plenum coaxial cable
5. Copper Riser Cabling:
 1. Superior Essex CAT3 CMP 25-pr Riser cabling Part # 18-799-46 Plenum-rated cable
 2. Superior Essex ARMM 25-pr Riser cabling Part # 02-104-03 Non-plenum cable.

6. Firestopping:
 1. Wiremold Flamestopper FS4 Thru-Wall Fitting for 4" EMT Sleeves, or Hilti 4" Speedsleeve.
 2. For all other size conduits, use 3M, STI or other UL and NFPA approved fire stopping as required to maintain penetration rating.
7. MDF to IDF Fiber
 1. Multi-Mode: Corning 006T88-31180-29 (GRAYBAR PART NUMBER: M-5-PN-6-DN-LE-AQ-CCS-CUT REEL) Multimode fiber shall terminate using fiber pigtail and LC adapters.
 2. Single-Mode: Corning 006E88-31131-29 (GRAYBAR PART NUMBER: S-PN-6-DN-YL-SIC-CUT REEL) Single Mode fiber shall terminate using fiber pigtail and angle polished LC adapters.

CC. Installation Requirements:

1. Riser Schedule: Contractor shall pull copper riser cables between the BET and each IDF and terminate and ground each cable, 25 pair cable to the patch panel.
2. The contractor shall pull AU OIT-supplied single mode and multi-mode fiber cable homerun between the BET and each IDF leaving 20 feet of slack on each backboard.
3. Contractor shall install faceplate with blank inserts on all unused telecom wall boxes.
4. Contractor shall get approval from OIT on location of equipment in the telecommunication rooms to include racks and patch panels.
5. Terminate horizontal station cables at patch panels. Terminations shall be initially organized sequentially in ascending order according to their label identification - i.e., with the lowest room/space number in the top left corner of the top patch panel, continuing left-to-right and top-to-bottom. (It is understood that later cable adds/modifications may not connect in this initial sequential order, but will be added at the bottom of the patch panels) All Wireless Access Point patch panel terminations shall be grouped together and all Classroom Tech (A/V) patch panel terminations shall be grouped together. Provide D-Rings to route station cables in orderly manner from entrance to the backboard to the panel.
6. Use Velcro ties for bundling of cables. Zip ties are not allowed.
7. All backboard terminations shall be labeled with official room number, jack number and port number.
8. CATV port – leave 8-10 inches of cable slack in the back box behind the faceplate.
9. Labeling Requirements:
 1. Each jack faceplate shall have two built-in label slots with clear plastic removable covers. Each jack will be labeled according to the room number and jack number. In rooms where more than one jack is located, sequential jack numbering is required. For example, Jack 123-1 is located in Room 123 and is the first jack in the sequence. Jack 123-4 is also located in room 123 and is fourth in the sequence of jacks. A

- computer printed label is required with bold lettering to be installed in the label slots of the faceplate. Hand-printed labels are not acceptable.
2. Each port shall be labeled on the backboard terminations. For example, if the backboard termination hardware (patch panel) label states 123-1-1, it indicates this jack and port are located in room 123, faceplate 1, port 1. A backboard termination label that states 123-4-2 indicates the jack is located in room 123, faceplate 4, port 2. Accurate labeling of jacks and backboard terminations is essential to testing, installation, and troubleshooting.
 3. Backboard terminations connected to Wireless Access Points (WAP) must be labelled similarly to faceplate and port terminal requirements. For example, if the backboard termination hardware (patch panel) label states WA123-1, it indicates this WAP is in room 123. A backboard termination label that states WA123-2 indicates the second of multiple WAP's in room 123. WA123 indicates a WAP in a hallway or public space outside room 123.
 4. AV jacks shall be labeled AVf#xxxxs#, where: 'AV' indicates it is an audio/visual connection, 'f#' indicates the room number (or floor number, if specific room is not identified) of the building, 'xxxx' indicates the category of AV connection ('data' for data, 'spk' for speaker, 'aud' for audio, 'vid' for video. And 'CTL' for control), and 's#' indicates the sequential numbering of connections on that floor. Example: AV2spk3 would be the third speaker connection on the second floor, or AV351vid2 would be the second video connection in room 351.
 5. Data jacks NOT in a wall shall have a designation before the room number indicating they are in either the floor or overhead. For example, "AV" for audio/visual connections, "WA" for wireless access points, "FB" for floor boxes.
 6. Labels shall be produced using the Ariel Bold, size 8, font.

DD. Testing Requirements:

1. DC Electrical Tests to be performed - All jacks are required to be tested after installation and before being put into service by the installation contractor using industry-accepted methods. The jacks, the four-pair data and voice cables, and the backboard termination hardware are to be tested for continuity of the tip and ring of each pair, polarity of the pair, crossed conductors between pairs, shorted pairs, and grounded pairs.
2. AC Electrical Tests to be performed - Each cable pair is to be tested end-to-end with a certified Category-6 cable tester. The contractor will verify that each cable has passed Category-6 testing with a certified tester and that all of the parameters programmed into the tester before the test are correct. Such parameters include the proper velocity propagation factor, impedance, and capacitance listed by the cable's manufacturer. All cable testing results are subject to review and to re-test verification by OIT personnel to ensure the proper testing methodology is used. The Contractor is required to ensure that every cable meets the Category-6 standard. Any cable that does not meet this standard will be rejected. The Contractor will then be required to take the

appropriate remedial measures to bring the jack, cable, and hardware circuit under test into compliance with Category-6 standards at the Contractor's expense. Testing with a Category-6 tester can accomplish the AC and DC tests provided that in addition to cable propagation and data speed testing, the continuity of the tip and ring of each pair, polarity of the pair, crossed conductors between pairs, shorted pairs, and grounded pairs are also tested with the Category-6 tester. Testing will be conducted from the voice and data jack to the corresponding terminations on the backboard termination hardware at the BET or IDF, wherever the appropriate final termination of the cable occurs, to make the station cable PERMANENT LINK COMPLIANT with ANSI TIA/EIA568B.2-1

3. Category-6 Results Submissions - The installation Contractor shall test every cable installed and shall test for all the parameters for Category-6 standards. Upon completion of cable terminations, the Contractor shall within 5 business days provide OIT with an electronic copy of the testing data of every cable contained within the job. OIT will conduct a field test audit of the total cabling to ensure that the contractor's test data correlates with the data obtained from the field audit. The tests conducted by OIT are the final determinant of whether the cable passes or fails Category-6 standards. The contractor will be required to re-test every cable in a job if the audit shows that the data of the audit substantially differs from the submitted results. Any cable not passing the audit will be required to be repaired or replaced.
4. Testing Instructions – Fiber
 1. All testing will be performed in strict accordance with the following guidelines and procedures. Any deviation from these guidelines and procedures must have prior approval from the appropriate Auburn University (Owner) representative. The Owner will reserve the right to change or alter these procedures at any time for any reason.
 2. Any test results that fail to fall within the limits of the below-referenced standards shall be deemed unacceptable by the University.
 3. Any unacceptable results will require the re-termination and re-test of the affected fiber. If subsequent attempts to re-terminate and/or re-splice are unsuccessful at obtaining desired results, it is the sole responsibility of the contractor to replace any and/or all cables, splices, and terminations at no additional cost to Owner.
4. References:
 1. ANSI/TIA/EIA-526-7, Method: Optical Power Loss Measurements of Installed Single-Mode Fiber Cable Plant, ASI/EIA/TIA-568-A
 2. Annex H: Optical Fiber Link Performance Testing.
5. Guidelines:
 1. Connect a jumper to the optical source and the optical power meter.
 2. Turn the units on.
 3. Record the reference power reading (Pref) displayed in dB.
 4. Using an adapter, insert a second jumper between the jumper used in step 1 and the optical power meter.
 5. Record this power level in dBm as Pcheck.

6. Use the following equation to ensure the attenuation added by the second jumper is not greater than 0.75dB: $P_{ref} - P_{check} < 0.75\text{Db}$.
 1. Satisfied continue to step 8.
 2. Not satisfied, clean all connectors except the optical source connection point and repeat the procedure starting with Step 4. If the result is still greater than 0.75dB, replace test jumper 2 and repeat the procedure again, starting with Step 4.
7. Leave the jumpers attached to the optical source and optical power meter. Do not reset the power meter.
8. Disconnect the two jumpers at the adapter. Do not turn off the power meter or source.
9. Attach the optical source/test jumper 1 to one end of the segment to be tested.
10. Attach the optical source/test jumper 2 to the other end of the segment.
11. Record the test power P_{test} .
12. Subtract the test power (P_{test}) from the reference power (P_{ref}) recorded in Step 3 to determine the end-to-end attenuation:

$$\text{Attenuation (dB)} = P_{ref} - P_{test}$$
5. Attenuation Acceptance Values – Fiber OSP
 1. Tested in one direction and at both wavelengths. Link attenuation is calculated as:
 1. Link attenuation = Cable attenuation + connector attenuation + splice attenuation.
 2. Cable attenuation (dB) = attenuation coefficient (dB/km) length (km).
 2. The cable attenuation coefficient is determined as follows:

Cable Type	Wavelength	Attenuation/Coefficient (dB/km)
Single Mode Outside Plant	1310	0.5
Single Mode Outside Plant	1550	0.5
Single Mode Inside Plant	1310	1.0
Single Mode Inside Plant	1550	1.0

3. Connector attenuation (dB) = Number of connector pairs (N) x splice loss (dB) = $S \times 0.3\text{ dB} = N \times 0.5\text{ dB}$.
4. Splice attenuation (dB) = Number of Splices (S) x splice loss (dB) = $S \times 0.2\text{ dB}$
5. Upon completion of the above test, Contractor will be required to submit one (1) copy of a written and one (1) electronic report detailing the test results for the Owner's review, prior to the final acceptance testing. The electronic report must be in a format agreed on by the Owner before testing begins.

6. OSP Testing and Acceptance – Copper
 1. The Contractor will provide a thorough testing program for the copper cabling. Final acceptance testing shall be performed jointly by the contractor and the owner. The Contractor will provide proposed testing procedures and test equipment to the owner prior to the commencement of the tests. The testing will include continuity, transmission loss test (dB loss) splice loss test (dB losses) and other cable system testing normally performed. All faults will be corrected and re-tested. The test will be performed with the manufacturer's recommendations.
 2. Copper testing will consist of testing for:
 3. Conductor continuity.
 4. Shield to ground (Meg. Test). Cables must meg to infinity.
 5. Cable testing will be performed on a per pair basis. Cable Meg testing will be performed on a per section basis.
 6. Acceptance Testing will be performed by the Contractor and observed by the Owner. These tests will include testing on ten percent (10%) of the cable pairs for each cable installed to verify conformance to the specifications.
 7. Complete re-testing will be performed, and any necessary corrections made, should any acceptance test fail to meet specified standards.
 8. The Contractor will furnish one (1) complete set of all test reports and records. This set will consist of an electronic copy or a hard copy or both of all test reports and drawings showing as-built and installed cable routing, termination points, copper assignments, and termination block wiring. This must include all copper pre-installation tests, splice test, and final installed test results.
 9. Owner acceptance of the system will be accomplished on the satisfactory completion of the acceptance test and receipt of all final test reports by the Owner.

D5037 Fire Alarm Systems

A. Equipment

1. Fire alarm system shall be networkable, addressable type, voice capable type and incorporate Mass Notification/Emergency Communication and shall be fully compatible with existing Johnson Controls Fire Protection campus network.
2. Visual notification devices shall incorporate dual strobes Amber marked "Alert", and clear marked "Fire".
3. Weather resistant outdoor speakers installed in a sealed weather tight back box should be installed at entrances and other gathering points near building.
4. Visual text displays shall be placed in elevator lobbies, large assembly areas, and main paths of egress.

B. Fire Alarm Control Panel (FACP) Network Connection

1. Auburn University uses Simplex Fire Alarm Systems. The Designer shall specifically spell out in the specifications and note on the drawings that the

FACP is to be connected to the nearest Telecom Room with a homerun 1 inch conduit. This is a requirement of Auburn University. A pull box is required for every 180 degrees of total bend. Provide pull string in conduit.

- C. General
 - D. Main fire alarm control panel shall be in the electrical room.
 - E. Fire alarm control panel and RCC (Remote Command Center) shall include buttons for activating pre-programmed messages locally at building.
 - F. Fire alarm system conduit, fittings, junction boxes and covers shall be painted red.
 - G. On multi-story buildings fire alarm riser shall have fire alarm terminal cabinet on each floor.
 - H. A pull station is required at the exit of every mechanical and/or electrical room.
 - I. All buildings shall have speaker layout designed to ensure intelligibility and audibility.
 - J. All Fire Alarm/Mass Notification systems must be integrated with the command center at the Auburn University Campus Safety Building.
 - K. All Fire Alarm/Mass Notification systems must have the ability to activate no less than 12 pre-programmed and manual evacuation messages as well as live public address (campus wide or building only).
 - L. No copper wire shall be used underground to interface a fire alarm control panel in one building to peripherals or remote panels/transponders in an outlying building. In these instances, connection of fire alarm equipment in the outlying building will be connected to the main control panel via multi-mode fiber.
 - M. All underground conductors to post indicator valves or sprinkler valve vaults shall be installed in PVC conduits and all outdoor sprinkler equipment shall be grounded using the manufacturer provided ground terminals. Install equipment grounding conductor in conduits to connect to PIV and interior metal conduits to properly bond the connection.
 - N. Provide single mode fiber optic interface between building and existing campus network, utilizing 6 strand single-mode with fiber pigtail and LC angled polished connectors on network end, ST or SC connector on fire panel end (contact university fire alarm contractor to verify ST or SC per job specific requirements).
 - O. A 120 volt AC electrical outlet shall be installed in close proximity to the main fire alarm control panel, for use of computers or test equipment.
 - P. A power switch shall be installed inside the fire alarm control panel when the circuit breaker, which services the panel, is not located in the same room.
 - Q. As built drawings will be turned into the University Project Lead immediately upon completion of the final inspection.
 - R. No surge suppressors will be installed above ceilings or in areas difficult to access by maintenance personnel.
 - S. All fire alarm panels and terminal cabinets shall have a disconnect switch located inside the cabinet to disconnect power source for servicing. Provide a

red label with white lettering to indicate electrical panel and circuit serving the fire alarm equipment.

- T. All fire curtains and shutters connected to automatically close upon fire alarm signal, shall automatically open (i.e. reset) once the fire alarm panel has been reset.
- U. Provide a local manual open/close switch for service of each fire curtain, shutter, or door.
- V. All fire alarm panels and cabinets shall be keyed with a AU BEST key core system – 704 fire alarm keyway.
- W. Fire Alarm Building NFPA Operations Matrix. (Appendix D2)
 - 1. Office
 - 2. Classroom
 - 3. Lab Classroom
 - 4. Dorm
 - 5. Food Venue
 - 6. Large Assembly Smoke Evacuation

X. Fire alarm wiring requirements:

Circuit Type	Conductor	Wire Type	Jacket / Wire Color
IDNET / Mapnet Power	#18 copper	FPL / FPLR, Twisted Shielded Pair	Red
RUI	#18 copper	FPL / FPLR, Twisted Shielded Pair	Gray
Speaker / Audio Riser	#18 copper	FPL / FPLR, Twisted Shielded Pair	Green
Remote Microphone	#18 copper	FPL / FPLR, Twisted Shielded Pair	Red (w / colored trace)
Addressable Signals / Visuals	#14 copper	FPL / FPLR, Twisted Pair	Yellow
Fire Fighter's Phones	#18 copper	FPL / FPLR, Twisted Shielded Pair	Blue
IDNET / Mapnet Power	#14 copper	THHN	Red & Black
Remote Microphone (push-to-talk)	#14 copper	THHN	Blue & White
Duct Detector Remote Test Switch	#14 copper	THHN	Black (x 2)
Duct Detector Remote Test LED	#14 copper	THHN	Blue & White
Door Holders	#14 copper	THHN	Yellow & Brown
Relay Circuit	#14 copper	THHN	Yellow & Brown

D5038 Security & Detection Systems

A. Electronic Access Control System (EACS)

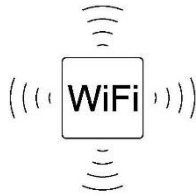
- The Standard does not provide a solution for every type of opening that may occur on the Project. The Designer shall become familiar with and interpret this section of the Design and Construction Standards in accordance with the programmatic requirements of the Project. Access Control and Security requirements for each project shall be evaluated and determined by the Project Delivery Team during the Schematic Design Phase. If variations are

recommended, these shall be reviewed and approved by the University Project Lead, prior to inclusion into the Bid Documents.

2. Access Control System and Card Access System shall be Lenel OnGuard. This is a Sole-Source system. Substitutions are not acceptable. EACS shall be able to fully communicate and provide full function with existing Lenel OnGuard system.
3. Although a Security Consultant may be retained, the scope of work shall be provided by the Designer. The EACS contractor shall include all required License Upgrade costs as a part of the project bid package. There shall be, on average, one (1) License Upgrade per ISP (Building Controller to support 64 readers). The License Upgrade shall be given to Auburn University Access Control Center and Facilities Management Information Technology Group at the onset of the project
4. Buildings shall be equipped with card access. All readers shall be wall or mullion mounted.
5. For buildings with an exterior access card reader, all exterior doors without card readers shall be monitored.
6. All doors, without card readers, into a space that is accessed with a card reader shall be monitored.
7. Exterior doors shall be provided with Electrified Panic Hardware and shall be monitored by the Access Control System. An exterior opening which is not hinged, such as a large sliding, overhead coiling or similar opening shall be monitored. All doors shall be prepped for future EACS upgrade.
8. All cable shall be in minimum 3/4" conduit from door to cable tray and from cable tray to head-end panels. Home run conduit from junction box to security panel shall be minimum 1" conduit. All conduit and cable shall be concealed.
9. All cable shall be shielded, and plenum rated.
10. General: Card readers shall be provided in the following locations:
 1. Main [ADA-compliant] entrance along the accessible route
 2. Secondary entrances
 3. Classrooms in excess of 100 seats
 4. Multimedia/Control Rooms
 5. Computer Laboratories
 6. Instructional and Research Laboratories
 7. IT/Telecommunication Closets
 8. Mechanical/Electrical Rooms
 9. Exterior openings to a single room with an interior door
 10. Other such vital infrastructure spaces
 11. Additional openings may be provided with card readers, if desired by the Project Delivery Team
11. Door Wiring Drawings
 1. See Door Hardware Standards Document

D5039 Local Area Networks

- A. Utilize the following symbol to represent WAP on documents:



- B. When a network wireless access point (WAP) is required to be on a hard ceiling or on some architectural ceiling design feature, the Architect will ensure that the design incorporates and supports wireless access point installation on the ceiling or design feature, whichever is lowest, with a telecom conduit to a double-gang box with easy access to the units for maintenance. AU Telecom WAPs do not need a power outlet as our design supplies power-over-ethernet (POE) to the WAP.
- C. WAP installation requires Contractor to install one Category-6 network station cable and the WAP equipment. The station cable is to be terminated on one end at the nearest network IDF backboard and on a biscuit jack above the ceiling at the specified location (in lift-out ceiling locations). The station cable must have an additional 15 feet of slack for future re-positioning of WAP location if necessary. The WAP equipment is to be mounted below the ceiling on the ceiling grid and connected to the above ceiling biscuit jack via a 3-foot patch cord. The station cable must be marked on both ends (IDF and biscuit jack) with WAP location as supplied by OIT. The WAP and ceiling grid mount hardware will be supplied by OIT.
- D. It is required that the contractor place each WAP at the exact location indicated on the provided drawings. The exact location is defined as an 18-inch radius of the directed location as indicated on the drawings. If installation at the location indicated is impossible due to obstructions in or above the ceiling, the contractor shall immediately contact OIT to discuss relocation of the WAP. At no time should the contractor make the determination to install the WAP outside the directed location without consultation with OIT. If the contractor is unable to contact an OIT representative immediately then installation of that particular WAP shall be delayed until such time as the consultation can take place. Installed WAP locations will be checked by OIT. If the contractor is found to have failed to adhere to the above instructions, the contractor shall relocate any and all WAP's deemed by OIT to have been improperly located at no additional charge to Auburn University.
- E. Drop Ceiling Installation: Wireless Access Points (WAP) shall be attached to the drop ceiling grid. When the ceiling grid is hidden, or otherwise unreachable, other mounting accommodations must be approved by OIT. If you are not sure of the placement or proper mounting, contact the OIT Project Manager.
- F. Open Ceiling Installation: Wireless Access Points (WAP) shall be installed using a 1-inch conduit from the nearest cable tray, hooks, or telecommunications room

turned down at a 90 degree angle to a single gang electrical box. The single gang box and the WAP should be installed facing the floor. The WAP should be at or below the lowest height in comparison to Fire Alarm strobes, area lighting units, or motion detectors.

- G. Inaccessible Ceiling Installation: Wireless Access Points (WAP) shall be installed in a manner as similar to Open Ceiling Installation as possible. The design of acceptable options must be pre-approved by OIT. Wireless Access Points (WAP) installed in inaccessible ceilings (such as locking grids, sheetrock, or watertight areas) shall utilize a 1-inch conduit to a single gang electrical box from the nearest cable tray, hooks, or telecommunications room. The design of acceptable options must be pre-approved by OIT. Wall locations are not ideal but when used the WAP should be mounted to a vendor specific, OIT approved, bracket using a 1-inch conduit from the nearest cable tray, j-hooks, or telecommunications room.
- H. All removable ceiling installations require a 15' CAT6 cable service coil to be included.
- I. Outdoor WAP Installation: Outdoor WAP installations will require separate power source and a lockable weather-proof NEMA enclosure.

D5090 Other Electrical Services

D5091 Grounding Systems

- A. Ground rods shall be 10'-0" copper clad steel rods driven to a minimum depth of 2'-0" below grade.
- B. Underground grounding connections shall have exothermically welded connections. Mechanical connections are not permitted underground.
- C. Provide inspection well for buried grounding connections. Locate inspection wells as close to main electrical service equipment as possible.
- D. Ground rods shall not be installed under sidewalks, parking areas, or other areas where it cannot be inspected.
- E. GPS Locate and document location of all ground rods, conductors, and inspection wells.

D5092 Emergency Lighting and Power

- A. Approved manufacturers for emergency generators
 - 1. Caterpillar
 - 2. Cummins/Onan
 - 3. Kohler
 - 4. MTU On-Site Energy
 - 5. Generac.
- B. Provide generator docking station. Docking station to have the following:
 - 1. Manual failsafe operation to separate permanent generator from portable generator.
 - 2. Female camlock connections for load bank testing.
 - 3. Male camlock connections for portable generator hookup.

4. Auxiliary contacts for control wiring. Control wiring to be provided between docking station and ATS.
5. Locate docking station in an accessible area so portable generator can be connected within 50 feet of the building.
- C. Approved fuel types:
 1. Diesel fuel
 2. Natural gas.
- D. When using diesel fuel:
 1. Provide belly tank sufficient to supply any fire pump start/operation for 2.0 hours plus all other rated/connected loads for 48 hours.
 2. Provide fuel consumption calculations.
 3. Underground fuel tanks are not permitted.
- E. Automatic transfer switches shall be equipped with isolation maintenance bypass.
- F. Remote Generator annunciator shall be provided.
- G. Provide generator connections to BAS to provide status monitoring and alarms for generator functions.
- H. Provide ATS contacts to BAS for monitoring switch position.

D5094 Other Special Systems and Devices

- A. Lightning Protection
 1. Lightning protection systems shall be passive.
 2. Specifications shall be included that comply with NFPA 780, UL96, and UL96A.
 3. Lightning protection system shall be installed by a qualified UL or LPI installer.
 4. Upon completion, a UL Master Label or LPI System certificate shall be provided to Auburn University.

Appendix D1 – Water Treatment Requirements

A. Primary & Secondary Building Water Systems – New Construction

1. Materials

1. Temporary Building Strainer Screens shall be fine mesh (3/64-inch maximum).
2. Cleaning and Sterilization Chemicals shall be:
3. Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products. Use Suez WTS Ferroquest FQ7103 at 3% of system volume.
4. Non-oxidizing biocide which has halogen like effects such as 2,2-dibromo-3-nitrilopropionamide, also known as DBNPA. Use Suez WTS Spectrus NX1102 or equivalent for chilled water systems only.
5. Water Treatment Chemical shall be Suez WTS Corrshield MD4100 or equivalent.

2. Equipment

1. Chemical Pot Feeder: Five gallon carbon steel filter housing, as shown on the drawings, quick opening cap for working pressure of 175 psig. Construct of materials which are impervious to the products being dispersed.
2. Install isolating and drain valves, and necessary piping. Install around supply and return of system pump unless otherwise specified.
3. A 3/4" nipple and locking stainless steel ball valve should be installed on the suction side of the system pump prior to system being cleaned. This will allow easy addition of Ferroquest cleaning chemical to the loop if the by-pass feeder is not large enough.
4. If there is more than one circulation pump in the closed loop, install the chemical pot feeder across the common supply and return so that it may be utilized regardless of which pump is in service.
5. Install isolation valves on the chemical pot feeder as close to the pot feeder as possible for safety reasons associated with the use of the feeder.
6. Introduce closed system treatment through bypass feeder when required or indicated by test.
7. Water Meter:
8. Meter to be selected and supplied by University Utility Services.
9. Meter should be installed in the make-up water line no higher than forty eight inches (48") above the floor level in the horizontal position.
10. No by-pass shall be installed around this water meter.

3. Preparation

1. Contractor shall provide a minimum notice of fourteen (14) days to the water treatment vendor to allow for delivery of chemicals.

2. Contractor will notify the University Project Lead fourteen (14) days prior to filling and cleaning of new water pipes. The new piping system shall not be connected/operated until the chemical clean-up is performed.
 3. Cleaning of primary building water systems cannot be performed until all piping in the building, or zone to be cleaned, is installed, leak tested and adequate re-circulation loops are installed to ensure adequate flow is obtained throughout the system.
 4. All heat exchangers and air handler coils must be installed prior to the cleaning sequence beginning.
 5. A temporary chemical by-pass feeder must be installed prior to the start of the cleaning sequence if the system is not cleaned in conjunction with distribution piping connecting to the building.
 6. The system must be flushed (prior to startup cleaning) until water runs clear to remove existing dirt and debris.
 7. The cleaning process continues for a minimum of twenty four (24) hours after the introduction of the cleaning agents and must be planned for in advance with the Auburn University Plant Operations Department.
 8. The system pump must be fully operational to maintain steady output at 75 – 100% of design capacity throughout the cleaning process.
 9. During the cleaning, at no time shall the circulation pump be shut off except in the event of an emergency. If for some reason the system pump cannot be used for circulation purposes, the mechanical contractor must provide a temporary pump that has similar flow and pressure capacities to that of the system pump.
4. Cleaning Sequence
1. When possible, cleaning shall be accomplished in conjunction with the distribution piping connecting the building. Under no circumstance shall the pipe remain untreated for more than one week after initial filling.
 2. All water shall be metered into the pipe and amounts shall be tabulated and given to University Project Lead to indicate the volume of water inside the building. Pipe quantities and sizes shall also be tabulated to verify piping is filled completely.
 3. Install temporary building strainers on supply piping entering the building to prevent damage to building isolation valve seats and discs.
 4. Force all automatic valves and ball valves into the open position at all air handlers, system heat exchangers and expansion tanks. Ensure the system is filled with water and vented of air and initiate system pumps at 75 – 100% of flow capacity.
 5. Monitor pressure drop across the temporary strainer screen and clean as necessary to maintain the recommended pipe velocity as directed by the University Project Lead.
 6. Two twelve (12) ounce bottles of the system water shall be taken for laboratory analysis prior to the start of the addition of cleaning chemical or flushing. University Project Lead will be responsible for providing the sample bottles to the mechanical contractor.

7. Cleaner and biocide, when required, shall be added to piping at concentration as recommended by Owners representative following the hydro test. A water volume equal to the calculated amount of cleaner to be added shall be drained from the pipe to allow for addition of cleaner.
8. Two twelve (12) ounce bottles of the system water shall be taken for laboratory analysis three hours after chemical addition.
9. Two twelve (12) ounce bottles of the system water shall be taken for laboratory analysis twelve hours after chemical addition.
10. Circulate the solution for 24 hours or as recommended by the University Project Lead, whichever is less. Cleaner shall be circulated at 75 – 100% of system pump capacity.
11. Twenty four (24) hours following the start of the cleaning process, two twelve (12) ounce bottles of system water shall be gathered for laboratory analysis.
12. Following cleaning, drain systems as quickly as possible. This should be done by means of draining water to a nearby floor drain and adding clean domestic water through a make-up system or by hosepipe. The draining water should not exceed the amount being made up. The system pump remains on during this time and all valves remain in the forced open position.
13. Two twelve (12) ounce bottles of system water shall be gathered for laboratory analysis following city water flushing.
14. Following cleaning remove all temporary bypasses and screens, and install all instruments and controls as required.
5. Water Treatment
 1. Within twenty four (24) hours following the completion of the cleaning sequence, the water treatment chemicals will be added and circulated as recommended by the University Project Lead or system water from the primary distribution system will be introduced to the building system.
 2. After addition of water treatment chemicals or distribution water, the system pump will remain on line for an additional eight (8) hours, or less if deemed acceptable by the University Project Lead to ensure a good blend of corrosion inhibitor throughout the entire system. During this time, it is imperative that the air handler coils, and all valves which have been previously forced to the open position remain this way.
 3. Following eight (8) hours or less of circulation, two additional twelve (12) ounce samples will be taken for laboratory analysis. At this point, the system pumps can be shut down.
 4. If for any reason water is drained from the loop after the water treatment chemical is added, the University Project Lead will be notified immediately so that action can be taken to prevent corrosion in the system.
- B. Primary & Secondary Building Water Systems – Existing Construction
 1. General
 1. The following specifications are meant only for piping systems that are pre-existing where it has been deemed necessary by Auburn University

- Utilities and Operations Groups, as well as University Project Lead that an entire building clean-up is necessary to remove excess iron and corrosion by-products which are impeding heat transfer or causing re-circulation issues in the building.
2. It must be noted that this cleaning process will remove all iron scale (rust) that it comes into contact with. If the existing system contain high amounts of internal corrosion, then pipe failure is likely to occur during this process.
 3. It is recommended that adequate measures be taken to prevent catastrophic failure of key building systems such as electrical equipment, experimental processes, etc. This would include the addition of contractor supplied “roaming guards” throughout the process and the placement of water barriers such as plastic sheeting in critical areas of the building.
 4. The cleaning rate is dependent on a number of factors including temperature and velocities. A typical cleaning at 140 oF may require only a couple of days to clean a system where a cleaning closer to 60 oF may require several weeks to clean. Cleanings taking place at higher temperatures may require more frequent testing versus cleanings operating at cooler temperatures, so adequate planning with the University Project Lead must be made in advance.
2. Materials
 1. Temporary Building Strainer Screens: Fine mesh (3/64-inch maximum).
 2. Cleaning Chemicals
 3. Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products. Use Suez WTS Ferroquest FQ7101 at 10% of system volume and FQ7102 to maintain pH (this is typically 10% of the required amount of FQ7101).
 4. Water Treatment Chemical: Suez WTS Corrshield MD4100 or equivalent.
 3. Equipment
 1. Chemical Pot Feeder: Five gallon carbon steel filter housing, as shown on the drawings, quick opening cap for working pressure of 175 psig. Construct of materials which are impervious to the products being dispersed.
 2. Install isolating and drain valves, and necessary piping. Install around supply and return of system pump unless otherwise specified.
 3. If there is more than one circulation pump in the closed loop, install the chemical pot feeder across the common supply and return so that it may utilized regardless of which pump is in service.
 4. Install isolation valves on the chemical pot feeder as close to the pot feeder as possible for safety reasons associated with the use of the feeder.
 5. Introduce closed system treatment through bypass feeder when required or indicated by test.

6. A 3/4" nipple and locking stainless steel ball valve should be installed on the suction side of the system pump prior to system being cleaned. This will allow easy addition of Ferroquest cleaning chemical to the loop if the by-pass feeder is not large enough.
7. Water Meter:
 1. Meter to be selected and supplied by University Utility Services.
 2. Meter should be installed in the make-up water line no higher than forty eight inches (48") above the floor level in the horizontal position.
 3. No by-pass shall be installed around this water meter.
4. Preparation
 1. Contractor shall provide a minimum notice of fourteen (14) days to the water treatment vendor to allow for delivery of chemicals.
 2. Contractor will notify the University Project Lead fourteen (14) days prior to the start of cleaning process.
 3. Contractor shall provide adequate personnel to monitor the cleaning process throughout the entire procedure. This may include, but not be limited to, inside the mechanical rooms, classrooms, hallways, etc. of the entire building.
 4. Cleaning of existing primary building water systems cannot be performed until all new piping in the building, or zone to be cleaned, is installed, leak tested and adequate re-circulation loops are installed to ensure adequate flow is obtained throughout the system.
 5. All new heat exchangers and air handler coils must be installed prior to the cleaning sequence beginning.
 6. A temporary chemical by-pass feeder must be installed prior to the start of the cleaning sequence if the system is not cleaned in conjunction with distribution piping connecting to the building.
 7. The cleaning process continues for a minimum of twenty four (24) hours after the introduction of the cleaning agents and must be planned for in advance with the Auburn University Plant Operations Department.
 8. The system pump must be fully operational to maintain steady output at 75 – 100% of design capacity throughout the cleaning process.
5. Cleaning Sequence
 1. Photographic documentation both before and after cleaning, shall be taken by Auburn University Plant Operations Department to verify the effectiveness of the cleaning process. This should coincide with the installation and removal of temporary strainers.
 2. Install temporary building strainers on supply piping entering the building to prevent damage to building isolation valve seats and discs.
 3. Force all automatic valves and ball valves into the open position at all air handlers, system heat exchangers and expansion tanks. The mechanical contractor will be responsible for ensuring this is accomplished via communication with Johnson Control and the building mechanics.
 4. Ensure the system is filled with water and vented of air and initiate system pumps at 75 – 100% of flow capacity.

5. During the cleaning, at no time shall the circulation pump be shut off except in the event of an emergency. If for some reason the system pump cannot be used for circulation purposes, the mechanical contractor must provide a temporary pump that has similar flow and pressure capacities to that of the system pump, with a minimum flow rate of three (3) feet per second.
6. Monitor pressure drop across the temporary strainer screen and clean as necessary to maintain the recommended pipe velocity as directed by the University Project Lead.
7. Two twelve (12) ounce bottles of the system water shall be taken for laboratory analysis prior to the start of the addition of cleaning chemical or flushing. University Project Lead will be responsible for providing the sample bottles to the mechanical contractor.
8. Cleaner shall be added to piping at concentration of 10% of the total volume of the system to be cleaned. In order to do this, the city make-up should be turned off and 10% of the total volume be drained from the system while the system pump continues to circulate. Close attention should be paid to the pump during this time to ensure cavitation does not occur.
9. The conductivity of the water should increase by about 10,000 micromohs above the starting point conductivity, which will indicate 10% volume has been reached in the system.
10. Once the Ferroquest cleaning solution is added to the loop, if it is lost due to leaks in the system, it is the responsibility of the University's mechanics to locate, isolate and repair the leaks. Once complete, it is the responsibility of the University to supply additional Ferroquest chemical to re-charge the system and complete the cleaning.
11. pH and Iron tests should be conducted on a regular basis throughout the cleaning process, at least once every four hours. These tests will be conducted by the Auburn University Plant Operations Department.
12. pH should be maintained throughout the cleaning process at 6.5 to 7.2 by the addition of Ferroquest FQ7102. Iron levels should not be allowed to exceed 8,000 ppm any time during the cleaning. If they exceed this level, the system should be dumped immediately and replenished with fresh water.
13. Twenty four (24) hours, forty eight (48), seventy two (72), etc. following the start of the cleaning process, two twelve (12) ounce bottles of system water shall be gathered for laboratory analysis.
14. When iron levels are no longer increasing and pH levels remain steady, drain systems using a blowdown and flush method (this may take longer than 72 hours). This should be done by means of draining water to a nearby floor drain and adding clean domestic water through a make-up system or by hosepipe. The draining water should not exceed the amount being made up. The system pump remains on during this time and all valves remain in the forced open position.

15. Two twelve (12) ounce bottles of system water shall be gathered for laboratory analysis following city water flushing.
16. Following cleaning remove all temporary bypasses and screens.
6. Water Treatment
 1. Within twenty four (24) hours following the completion of the cleaning sequence, the water treatment chemicals will be added and circulated as recommended by the University Project Lead or system water from the primary distribution system will be introduced to the building system.
 2. After addition of water treatment chemicals or distribution water, the system pump will remain online for an additional eight (8) hours, or less if deemed acceptable by the University Project Lead to ensure a good blend of corrosion inhibitor throughout the entire system. During this time, it is imperative that the air handler coils, and all valves which have been previously forced to the open position remain this way.
 3. Following eight (8) hours or less of circulation, two additional twelve (12) ounce samples will be taken for laboratory analysis. At this point, the system pumps can be shut down.
 4. If for any reason water is drained from the loop after the water treatment chemical is added, the University Project Lead will be notified immediately so that action can be taken to prevent corrosion in the system.
- C. Boiler Treatment General Guidelines
 1. Summary- This Section includes the following HVAC water-treatment systems
 1. HVAC water treatment performance requirements.
 2. Chemical treatment test equipment.
 3. HVAC water-treatment chemicals.
 4. Makeup water softeners.
 5. Alkaline boil-out procedure for steam or hot water boilers.
 2. Definitions
 1. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.
 2. Total Dissolved Solids (TDS): A measure of the combined content of all inorganic and organic substances contained in a liquid in: molecular, ionized or micro-granular suspended form.
 3. PPM: Part Per Million.
 3. Performance Requirements
 4. Water quality for HVAC systems shall minimize corrosion, scale buildup, and biological growth for optimum efficiency of HVAC equipment without creating a hazard to operating personnel or the environment.
 5. Base HVAC water treatment on quality of water available at Project site, HVAC system equipment material characteristics and functional performance characteristics, operating personnel capabilities, and requirements and guidelines of authorities having jurisdiction.

6. Provide all equipment, accessories, instrumentation, controllers, automated valves, and electrical connections as required to maintain specified performance requirements stated herein.
7. Feed water, Condensate and Steam Boiler Water
 1. Feed water
 1. pH: Maintain a value between 8.3 to 10.5.
 2. Dissolved Oxygen: Maintain a value < 0.007 ppm.
 3. Total Hardness: Maintain a value <0.25 ppm.
 2. Boiler Water
 1. pH: Maintain a value within 8.5 to 10.5.
 2. Total Alkalinity: Maintain a value 300 to 800 ppm
 3. Total Solids: Maintain a value < 3,000 ppm.
 4. Sulfite: Maintain a value within 30 to 50 ppm.
 5. Polymer as necessary to prevent deposition in the boiler.
 3. Condensate Return
 1. pH: Maintain a value within 8.8 to 10.5 blended and maintain furthest point above 8.8.
 4. Hot Water Boiler System
 1. System Water
 1. Nitrite: Maintain a value between 700 to 900 ppm
 2. Copper protection agent: minimum 2 ppm
8. Submittals
 1. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for the following products
 1. Inhibitor injection timers.
 2. TDS controllers.
 3. Chemical solution tanks.
 4. Injection pumps.
 5. Chemical test equipment.
 6. Chemical material safety data sheets.
 7. Water softeners (per current vendor).
 2. Shop Drawings: Pretreatment and chemical treatment equipment showing tanks, maintenance space required, and piping connections to HVAC systems. Include plans, elevations, sections, details, and attachments to other work.
 3. Wiring Diagrams: Power and control wiring.
 4. Field quality-control test reports.
 5. Operation and Maintenance Data: For sensors, injection pumps, water softeners, and controllers to include in emergency, operation, and maintenance manuals.
 6. Other Informational Submittals
 1. Water-Treatment Program: Written sequence of operation on an annual basis for the application equipment required to achieve water quality defined in the "Performance Requirements" Article above.
 2. Water Analysis: Illustrate water quality available at Project site.

3. Safety Data Sheets (SDS) and product fact sheet for all chemicals to be used for the clean-up and long term treatment of the boiler system.
9. Quality Assurance
 1. Retain the resources of the chemical water treatment contractor who is already under contract with the client.
 2. The water treatment chemical and service supplier shall be a recognized specialist, active in the field of industrial water treatment for at least five years, whose major business is in the field of water treatment, and who has full time service personnel within the area of the job site. Laboratory facilities shall be available. Service personnel shall be degreed specialists in the fields of mechanical or chemical engineering or chemistry.
 3. Furnish and install all equipment and material on this project in accordance with the requirements of the authority having jurisdiction, suitable for its intended use on this project, approved by the U.S. Environmental Protection Agency (EPA), and local Department of Environmental Protection, and so certified by the manufacturer.
 4. If not already known, analyze the water from the local water supplier to be used on the project, before establishing treatment procedures.
 5. The cleaning sequence will not be deemed completed until fully signed off and agreed upon by the Auburn University Plant Operations Department, as well as the Plant Operations or Mechanical Shop Groups.
10. Safety
 1. All chemical and analytical reagents supplied by the vendor shall meet all applicable government regulations. The bidders shall submit an SDS for all proposed products with the initial technical proposal. The vendor shall be responsible for providing up to date SDS for all chemicals supplied including reagents.
 2. The mechanical contractor shall be responsible for the safe cleanup of any chemical spills relating to products supplied by the vendor and caused by failure or malfunction of the chemical feed equipment or due to the actions of the field service personnel. Cleanup shall be performed in accordance with all current government regulations and good safety practices. Vendor shall maintain a 24 hour hot line for emergency situations. Bidder shall provide the phone number and procedure to access the hot line including estimated response time in the event of an emergency.
11. Technical Services
 1. Mechanical contractor shall be responsible for handling of all water treatment chemicals.
 2. All chemical deliveries shall be made to the point of use by the vendor. The contractor shall remove, following local, state and federal governances all chemical containment systems as instructed by the vendor.

D. Boiler Treatment – Products

1. Manufacturers: Subject to compliance with requirements, provide products by the contracted Auburn University water treatment provider, Suez WTS.
 1. TDS Controller - Microprocessor-based controller, one percent (1%) accuracy in a range from zero (0) to five thousand (5000) micromohs. Incorporate solid-state integrated circuits and digital LCD display in NEMA 250, Type 12 enclosure with gasketed and lockable door.
 2. Digital display and touch pad for input.
 3. Sensor probe adaptable to sample stream manifold.
 4. High, low, and normal conductance indication.
 5. High or low conductance alarm light, trip points field adjustable; with silence switch.
 6. Hand-off-auto switch for solenoid bleed-off valve.
 7. Bleed-off valve activated indication.
 8. Internal adjustable hysteresis or dead band.
 9. Bleed Valves - Steam Boilers: Motorized ball valve, steel body, with seats and seals rated for pressure and temperature of boiler water.
2. Chemical Solution Tanks
 1. Chemical-resistant reservoirs fabricated from high-density opaque polyethylene with minimum 110 percent containment vessel.
 2. Molded cover with recess for mounting pump.
 3. Capacity: as required for four week storage.
3. Chemical Solution Injection Pumps
 1. Self-priming, positive displacement; rated for intended chemical with minimum 25 percent safety factor for design pressure and temperature.
 2. Adjustable flow rate.
 3. Metal and thermoplastic construction.
 4. Built-in relief valve.
4. Chemical Solution Tubing
 1. Polyethylene tubing with compression fittings and joints except ASTM A 269, Type 316, stainless steel for steam boiler injection assemblies.
5. Injection Assembly
 1. Quill: Minimum NPS 1/2 with insertion length sufficient to discharge into at least 25 percent of pipe diameter.
 2. Ball Valve: Two-piece, stainless steel as described in "Stainless-Steel Pipes and Fittings" Article below; and selected to fit quill.
 3. Packing Gland: Mechanical seal on quill of sufficient length to allow quill removal during system operation.
 4. Assembly Pressure/Temperature Rating: Minimum 600 psig at 200 °F
6. Stainless-Steel Pipes and Fittings
 1. Stainless-Steel Tubing: Comply with ASTM A 269, Type 316.
 2. Stainless-Steel Fittings: Complying with ASTM A 815/A 815M, Type 316, Grade WP-S.
 3. Two-Piece, Full-Port, Stainless-Steel Ball Valves: ASTM A 351, Type 316 stainless-steel body; ASTM A 276, Type 316 stainless-steel stem

and vented ball, threaded body design with adjustable stem packing, threaded ends, and 250-psig SWP and 600-psig CWP ratings.

7. Chemical Treatment Test Equipment
 1. Test Kit: Should be recommended and sourced by current chemical vendor. Should include a wall mounted cabinet and materials for testing pH, TDS, inhibitor, chloride, alkalinity, and hardness, sulfite and testable polymer for high pressure boilers.
 2. Sample Cooler
 1. Tube: Sample.
 1. Size: NPS 1/4 tubing.
 2. Material: ASTM A 666, Type 316 stainless steel.
 3. Pressure Rating: Minimum 2000 psig.
 4. Temperature Rating: Minimum 850 0F.
 2. Shell: Cooling water.
 1. Material: ASTM A 666, Type 304 stainless steel.
 2. Pressure Rating: Minimum 250 psig.
 3. Temperature Rating: Minimum 450 0F.
 3. Capacities and Characteristics
 1. Tube: Sample.
 2. Flow Rate: 0.25 gallon per minute.
 3. Entering Temperature: 400 0F.
 4. Leaving Temperature: 88 0F.
 5. Pressure Loss: 6.5 psig.
 4. Shell: Cooling water.
 1. Flow Rate: 3 gallon per minute.
 2. Entering Temperature: 70 0F.
 3. Pressure Loss: 1.0 psig.
8. Chemicals
 1. Chemicals shall be as recommended by water-treatment system vendor that are compatible with piping system components and connected equipment, and that can attain water quality specified in Part 1 "Performance Requirements" Article.
 2. Water Softener Chemicals
 1. Mineral: High-capacity, sulfonated-polystyrene ion-exchange resin that is stable over entire pH range with good resistance to bead fracture from attrition or shock. Resin exchange capacity minimum 30,000 grains/cu. ft. of calcium carbonate of resin when regenerated with 15 pounds (lbs) of salt.
 2. Salt for Brine Tanks: High-purity sodium chloride, free of dirt and foreign material. Rock and granulated forms are not acceptable.
 3. Boil Out Chemicals
 1. Suez WTS Optisperse ADJ0350 or equivalent.
 4. Operational Chemicals for Steam Boilers
 1. Suez WTS Solus AP24 or equivalent.
 2. Suez WTS Cortrol IS105 or equivalent.
 3. Suez WTS Optiguard ADJ560 or equivalent.

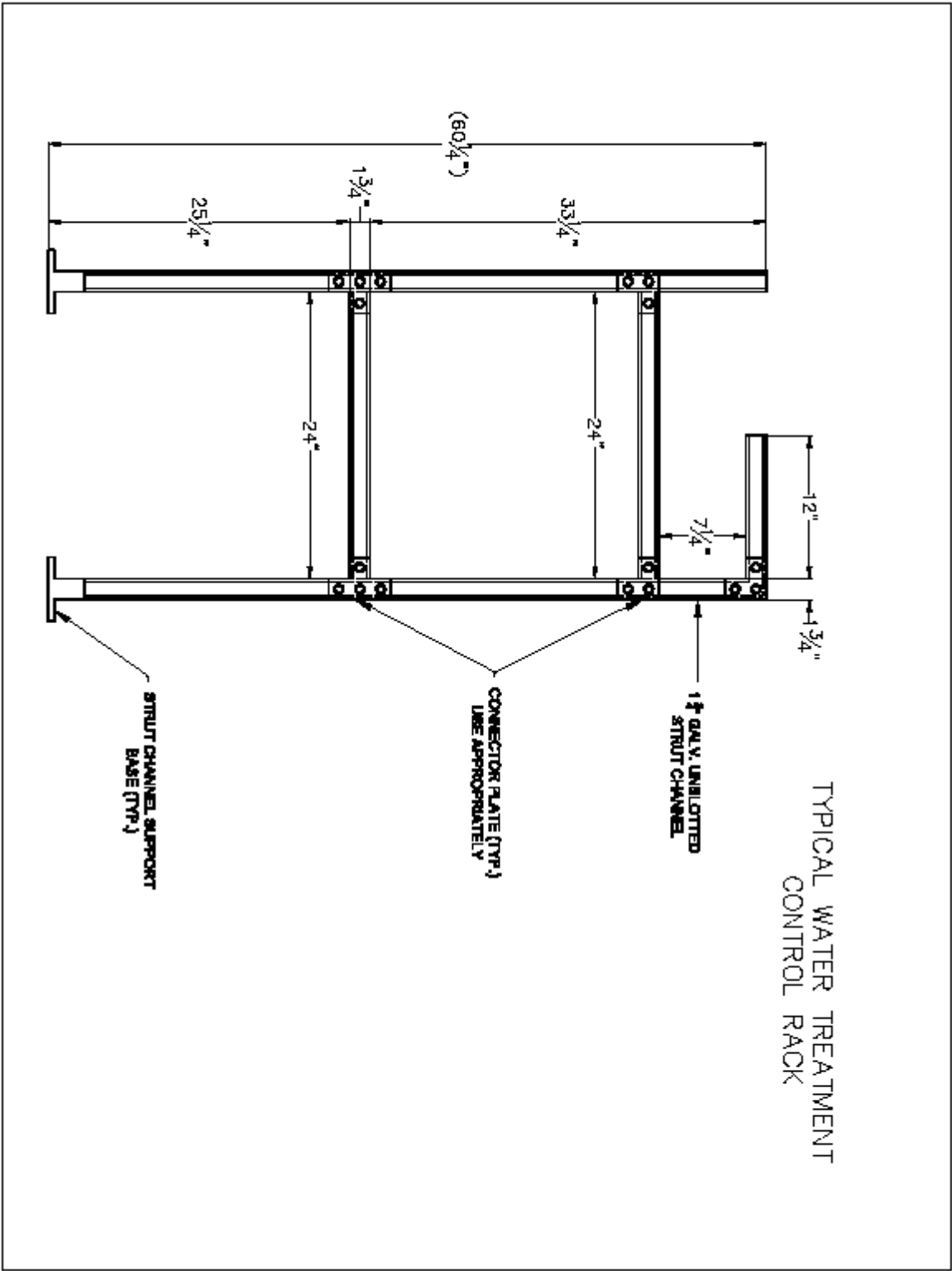
4. Suez WTS Steamate NA700 or NA702 or equivalent.
 5. Suez WTS Solus MCA42 or equivalent.
5. Operational Chemicals for Hot Water Boilers
 1. Suez WTS Corrshield NT4207 or equivalent.
9. HVAC Makeup Water Softener
 1. Description: Twin mineral tanks and one brine tank, factory mounted on skid.
 2. Mineral Tanks
 1. Fabricate and label FRP filter tanks to comply with ASME Boiler and Pressure Vessel Code: Section X, if indicated.
 2. Pressure Rating: 125 psig minimum.
 3. Wetted Components: Suitable for water temperatures from 40 to at least 100 OF.
 4. Freeboard: 50 percent, minimum, for backwash expansion above the normal resin bed level.
 5. Support Legs or Skirt: Constructed of structural steel, welded or bonded to tank before testing and labeling.
 6. Upper Distribution System: Single-point type, fabricated from galvanized-steel pipe and fittings.
 7. Lower Distribution System: Hub and radial-arm or header-lateral type; fabricated from PVC pipe and fittings with individual, fine-slotted, non-clogging PE strainers; arranged for even-flow distribution through resin bed.
 3. Controls: Automatic; factory mounted on mineral tanks and factory wired.
 1. Adjustable duration of regeneration steps.
 2. Push-button start and complete manual operation override.
 3. Pointer on pilot-control valve shall indicate cycle of operation.
 4. Means of manual operation of pilot-control valve if power fails.
 5. Main Operating Valves: Industrial, automatic, multiport, diaphragm type with the following features:
 1. Slow opening and closing, non-slam operation.
 2. Diaphragm guiding on full perimeter from fully open to fully closed.
 3. Isolated dissimilar metals within valve.
 4. Self-adjusting, internal, automatic brine injector that draws brine and rinses at constant rate independent of pressure.
 5. Float-operated brine valve to automatically measure the correct amount of brine to the softener and refill with fresh water.
 6. Sampling cocks for soft water.
 6. Flow Control: Automatic control of backwash and flush rates over variations in operating pressures that do not require field adjustments. Equip mineral tanks with automatic-reset-head water meter that electrically activates cycle controller to initiate regeneration at preset total in gallons, and automatically resets after

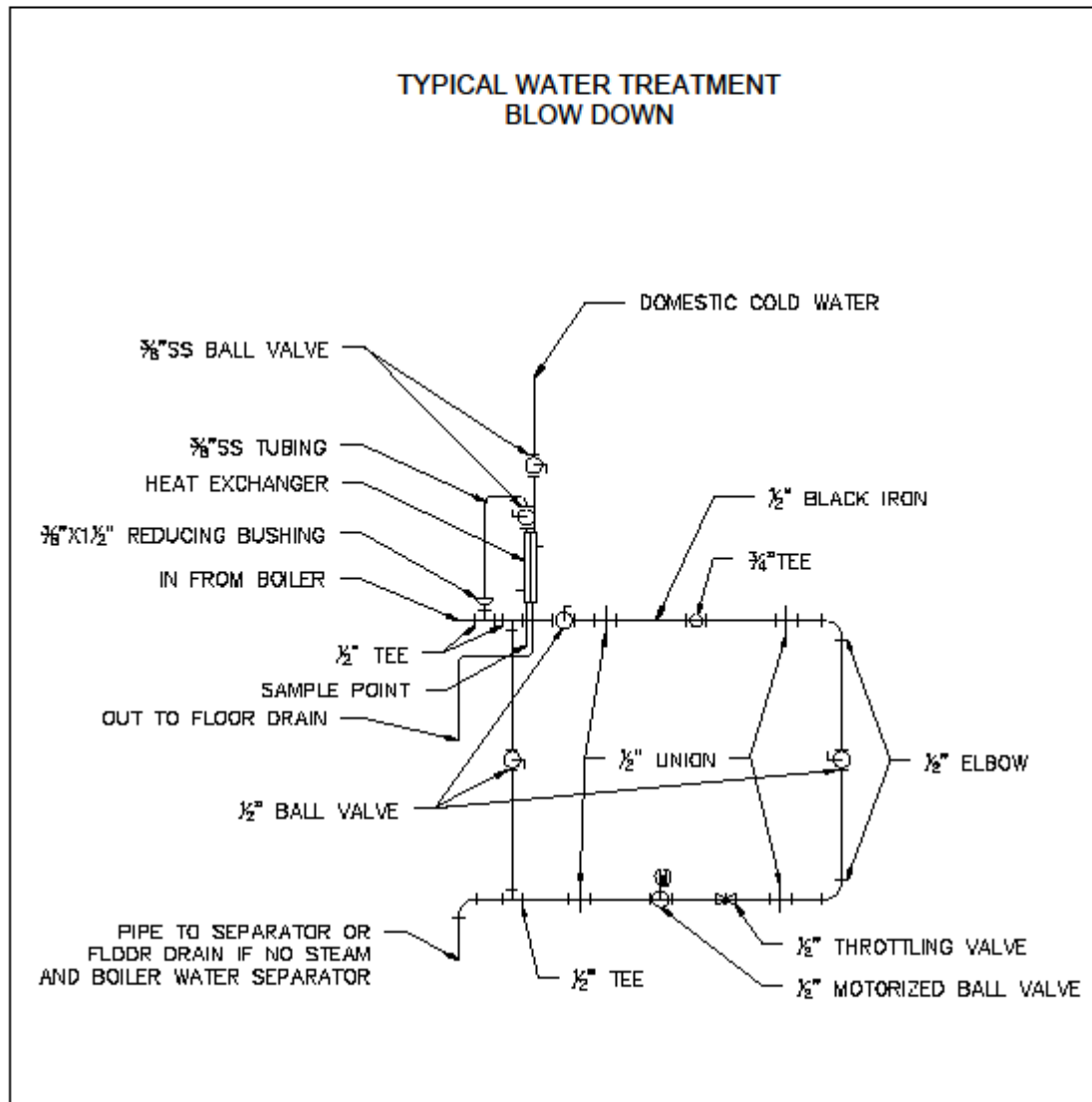
regeneration to preset total in gallons for next service run. Include alternator to regenerate one mineral tank with the other in service.

4. Brine Tank: Combination measuring and wet salt storing system.
 1. Tank and Cover Material: Fiberglass a minimum of 3/16 inch thick; or molded PE a minimum of 3/8 inch thick.
 2. Brine Valve: Float operated, and plastic fitted for automatic control of brine withdrawn and freshwater refill.
 3. Size: Large enough for at least four regenerations at full salting.
 5. Factory-Installed Accessories
 1. Piping, valves, tubing, and drains.
 2. Sampling cocks.
 3. Main-operating-valve position indicators.
 4. Water meters.
 6. Water Test Kit: Include water test kit in wall-mounting enclosure for water softener.
- E. Boiler Treatment – Execution
1. Preparation for Boil Out of Boiler Internals
 1. Contractor shall provide a minimum notice of fourteen (14) days to the water treatment vendor to allow for delivery of chemicals.
 2. Contractor will notify the University Project Lead a minimum of three (3) working days prior to filling for pressure testing and cleaning of new boilers. The new boiler system shall not be connected/operated until the chemical clean-up is performed.
 3. Feed Point
 1. OptiSpense ADJ0350 should be fed via a chemical feed line to the feed water. Following the boil-out procedures, ensure that this chemical feed-line is adequately rinsed.
 2. Optisperse ADJ0350 can be fed via man way or vent using a positive displacement pump. If this method is employed, the mechanical contractor should take special care to cover the boiler shell with plastic to prevent splashing of Optisperse ADJ0350 onto painted surfaces.
 4. Feed rate
 1. OptiSpense ADJ0350 should be applied at ten (10) pounds per one thousand (1000) pounds water in the boiler.
 5. Dilution
 1. The product may be fed neat or diluted with condensate, softened water, demineralized water, or feed water to any convenient strength.
 6. Equipment
 1. A steel transfer pump is recommended for adding the product to the selected feed point.
2. Boil Out Procedure
 1. After the addition of OptiSpense ADJ0350, close all man ways and fill boiler to the top of the gauge glass with the vents open. Fire the boiler in accordance with the standard procedure. When steam is flowing freely

- from the vents, close those not specified by the boiler manufacturer for super heater protection. Unless contrary to the manufacturer's recommendations, raise the pressure to one-half the normal pressure and maintain this pressure for 24 to 48 hours.
2. The boiler should be blown down in the amount of one-half of a gauge glass every eight hours through the bottom blowdown line. In case there is more than one blowdown line, alternate valves. After each blow-down, refill to maximum height in the gauge glass.
 3. At the end of the boil-out period, allow the unit to cool gradually. Cool to 200°F (93°C), open all drains and blowdown lines to drain the unit completely. Wash all water-side surfaces as thoroughly as possible with a high pressure hose. If inspection shows oil or scum remaining, the boil-out procedure should be repeated.
 4. These procedures are meant to supplement, not replace those of the boiler manufacturer.
3. Preparation for Installation of Boiler Water Treatment Equipment
 1. Existing Boiler Plants Being Retrofitted with New Boilers
 1. Mechanical contractor and current chemical vendor to discuss existing water treatment equipment with prior to demolition of any boiler room equipment. When equipment can be salvaged and re-used, they will make this recommendation to the mechanical contractor who will request a change order when necessary.
 2. New and Existing Boiler Plants
 1. The mechanical contractor and current chemical vendor will engage the early in the construction phase to determine placement of the following
 2. Chemical Tanks and Spill Basins
 3. Chemical Pumps and Supply Tubing
 4. Blowdown control equipment to include blowdown controller, motorized blowdown valve, back pressure valves, blowdown equipment rack, blowdown waste line, etc.
 5. Sample coolers
 6. Chemical injection quills
 7. Water softener and brine tank
 8. The mechanical contractor will ensure, with the help of the boiler manufacturer, that a complete surface blowdown skim kit is factory installed in the boiler. This will include, at a minimum, a sub-surface blowdown syphon tube connecting to a flange passing through the boiler's outer shell.
 9. The surface blowdown point cannot, under any circumstances, originate from the water column on the boiler. It must come from the recommended surface blowdown port as designed by the boiler manufacturer.
 10. Copper pipe and copper fitting are not allowed for any blowdown line, surface or bottom.

4. Perform an analysis of supply water to determine quality of water available at Project site.
5. Installation
 1. Install chemical application equipment on concrete bases, level and plumb. Maintain manufacturer's recommended clearances. Arrange units so controls and devices that require servicing are accessible. Anchor chemical tanks and floor-mounting accessories to substrate.
 2. Install water testing equipment on wall near water chemical application equipment.
 3. Install interconnecting control wiring for chemical treatment controls and sensors.
 4. Mount sensors and injectors in piping circuits.
 5. Install automatic chemical-feed equipment as recommended by the current chemical vendor for steam boiler and steam condensate systems and include the following
 1. Install makeup water softener.
 2. Install water meter in makeup water supply.
 3. Install inhibitor injection pumps and solution tanks with injection timer sensing contacts in water meter.
 4. Pumps shall operate for timed interval when contacts close at water meter in makeup water supply connection.
 5. Injection pump shall discharge into boiler feed water tank or feed water supply connection at boiler.
 6. Install test equipment and furnish test-kit to Owner.
 7. Install TDS controller with sensor and bleed valves. Bleed valves shall cycle to maintain maximum TDS concentration.
 6. Install blowdown control piping and valves on field erected stand if adequate wall space is not available. The control valves and sensors must be located well below the boiler water level and cannot be tied into the bottom blowdown lines. They must have their own dedicated blowdown line all the way to the blowdown flash tank. The blowdown system should be arranged in the following array:





7. Install sample cooling stations on the following:
 1. Each individual boiler
 2. Feed Water
 3. Combined condensate return
6. Water Softener Installation
 1. Install water softener equipment on concrete bases, level and plumb. Maintain manufacturer's recommended clearances. Arrange units so controls and devices that require servicing are accessible. Anchor mineral and brine tanks and floor-mounting accessories to substrate.
 2. Install brine lines and fittings furnished by equipment manufacturer but not factory installed. Install sample point for water treatment testing purposes on the leaving side of the water softener.
 3. Prepare mineral-tank distribution system and under-bed for minerals and place specified minerals into mineral tanks.
 4. Install water-testing sets on wall adjacent to water softeners.
7. Connections
 1. Piping installation requirements are specified in other Sections.
 2. Drawings indicate general arrangement of piping, fittings, and specialties.
 3. Install piping adjacent to equipment to allow service and maintenance.
 4. Make piping connections between HVAC water-treatment equipment and dissimilar-metal piping with dielectric fittings. Dielectric fittings are specified in "Basic Mechanical Materials and Methods."
 5. Install shutoff valves on HVAC water-treatment equipment inlet and outlet. Metal general-duty valves are specified in "Valves."
 6. Refer to "Domestic Water Piping Specialties" for backflow preventers required in makeup water connections to potable-water systems.
 7. Confirm applicable electrical requirements in Sections for connecting electrical equipment.
 8. Ground equipment according to "Grounding and Bonding."
 9. Connect wiring according to "Conductors and Cables."
8. Field Quality Control
 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.
 2. Tests and Inspections:
 1. Inspect field-assembled components and equipment installation, including piping and electrical connections.
 2. Inspect piping and equipment to determine that systems and equipment have been cleaned, flushed, and filled with water, and are fully operational before introducing chemicals for water-treatment system.
 3. Place HVAC water-treatment system into operation and calibrate controls during the preliminary phase of HVAC systems' startup procedures.

4. Do not enclose, cover, or put piping into operation until it is tested and satisfactory test results are achieved.
5. Test for leaks and defects. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
6. Leave uncovered and unconcealed new, altered, extended, and replaced water piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.
7. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow test pressure to stand for four hours. Leaks and loss in test pressure constitute defects.
8. Repair leaks and defects with new materials and retest piping until no leaks exist.
3. Remove and replace malfunctioning units and retest as specified above.
4. Sample boiler water at one-week intervals after boiler startup for a period of five weeks and prepare test report advising Owner of changes necessary to adhere to Part 1 "Performance Requirements" Article for each required characteristic. Sample boiler water at four-week intervals following the testing noted above to show that automatic chemical-feed systems are maintaining water quality within performance requirements specified in this Section.
5. Comply with ASTM D 3370 and with the following standards
 1. Silica: ASTM D 859.
 2. Steam System: ASTM D 1066.
 3. Acidity and Alkalinity: ASTM D 1067.
 4. Iron: ASTM D 1068.
 5. Water Hardness: ASTM D 1126
9. Demonstration
 1. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC water-treatment systems and equipment. Refer to Division 1 Section "Demonstration and Training."
 2. Training: Provide a "how-to-use" self-contained breathing apparatus video that details exact operating procedures of equipment.
- F. Evaporative Cooling Water Systems – General
 1. Submittals
 1. Shop Drawings
 1. Schematic piping and chemical equipment layout.
 2. Identify connection points to condenser/cooling tower water piping system.
 3. Provide product data for all chemical treatment materials, chemicals and equipment. Product data shall include chemical explanation, SDS, layouts of feeding equipment and equipment detail sheets.
 4. Detailed cleaning and passivation procedures.

2. Quality Assurance
 1. Retain the resources of the chemical water treatment contractor who is already under contract with the client.
 2. The water treatment chemical and service supplier shall be a recognized specialist, active in the field of industrial water treatment for at least five years, whose major business is in the field of water treatment, and who has full time service personnel within the area of the job site. Laboratory facilities shall be available. Service personnel shall be degreed specialists in the fields of mechanical or chemical engineering or chemistry.
 3. Furnish and install all equipment and material on this project in accordance with the requirements of the authority having jurisdiction, suitable for its intended use on this project, approved by the U.S. Environmental Protection Agency (EPA), and local Department of Environmental Protection, and so certified by the manufacturer.
 4. If not already known, analyze the water from the local water supplier to be used on the project, before establishing treatment procedures.
 5. The pre-cleaning sequence will not be deemed completed until fully signed off.
3. Safety
 1. All chemical and analytical reagents supplied by the vendor shall meet all applicable government regulations. The bidders shall submit an SDS for all proposed products with the initial technical proposal. The vendor shall be responsible for providing up to date SDS for all chemicals supplied including reagents.
 2. The mechanical contractor shall be responsible for the safe cleanup of any chemical spills relating to products supplied by the vendor and caused by failure or malfunction of the chemical feed equipment or due to the actions of the field service personnel. Cleanup shall be performed in accordance with all current government regulations and good safety practices. Vendor shall maintain a 24 hour hot line for emergency situations. Bidder shall provide the phone number and procedure to access the hot line including estimated response time in the event of an emergency.
4. Technical Services
 1. Mechanical contractor shall be responsible for handling of all water treatment chemicals.
 2. All chemical deliveries shall be made to the point of use by the vendor or an ahead of time agreed upon location such as the mechanical contractors lay down yard. The contractor shall remove, following local, state and federal governances all chemical containment systems as instructed by the vendor.
- G. Evaporative Cooling Water Systems – Products
 1. General: Use standard chemical feed controllers and pumps as recommended by the current chemical vendor.

2. Cooling Tower Treatment System
 1. Cooling Tower Water Treatment System - Prefabricated, integrated electronic control system for cooling tower water circuit to monitor and control total dissolved solids, corrosion inhibitors, and biocides.
 2. Controller: Microprocessor based type for use in recirculating cooling tower water systems.
 1. Accurately control level of total dissolved solids (TDS) in terms of electrolytic conductivity.
 2. Provide a programmable twenty-eight (28) day biocide timer for accurate addition of algicide.
 3. Provide for proportional feed of inhibitor, and/or dispersant chemicals based upon make-up water as measured by a contacting head water meter.
3. Main Control Panel and Accessories
 1. Housed in a NEMA Type 4X enclosure.
 1. Hinged key Jock door with viewing window.
 2. 2440 mm8 FT, 3-wire power cord with molded plug.
 3. Provide minimum of three (3) 115V, Single Phase, 60 Hz receptacles located on enclosure for electrical connection and control of chemical pumps.
 4. Prewired for ease of installation.
 2. Provide an external combination mounted flow switch
 1. Disable control outputs upon loss of water flow to prevent chemical feeding.
 2. Provide complete with 3/4 IN connections and combination conductivity and temperature electrode.
 3. Keypad or remote control: Access all measurements and set points through chemical resistant keypad or remote.
 4. Security code to prevent unauthorized access.
 5. Utilize microprocessor technology.
 6. Menu driver programs.
 7. Liquid crystal display (LCD).
 8. Provide temperature corrected measurements (Range: 0-100 0C with an adjustable high alarm) by reading water temperature and adjusting conductivity values according to known temperature curve.
 9. Provide real-time clock.
 10. Conductivity /monitor.
 11. Provide linear measurements of full range.
 12. Provide two scales for selection of high and low in field to assure accurate measurements.
 13. Provide increments of one (1) micromohs with adjustable hysteresis.
 14. Provide bleed-off control in following manner
 15. Standard operation-controller actuates a bleed off solenoid valve when dissolved solids level is exceeded by trip point.

16. Provide an adjustable bleed limit timer to prevent excessive bleed off.
17. An alarm contact shall close when timer has timed out.
18. Biocide operation
19. Provide a secondary bleed off timer to lower conductivity in system prior to biocide feed.
20. Lock out cooling water bleed-off during biocide feed period.
21. Chemical feed control: Provide two biocide timers and one inhibitor control algorithm capable of operating in the following field programmable mode.
22. Counter-timer-chemical feed proportioned to make-up water rate.
23. Controller shall send and / or receive low voltage signal to a contacting head water meter.
24. Low voltage signal will ensure long contact life.
25. Water meter shall read in gallons.
26. Provide alarm LEDs with silence button for high and low conductivity, ten (10) to sixty (60) minute bleed-off, chemical feed limit timers and chemical drum level. Provide remote output relay to indicate alarm condition to Building Management and Control System (BMCS).
27. Controller operating data history
28. Retain in memory all operating data for following parameters:
29. Standard memory shall allow acquisition and storage of all analog inputs for a one-week period.
30. A three (3) hour minimum, maximum average of all conditions shall be stored for a one-week period.
31. A minute-by-minute account of operating conditions shall be available for latest three-hour period.
32. Electrode: Combination temperature and conductivity type.
33. Quick disconnect.
34. Supplied in flow switch assembly.
35. pH monitor
36. Sensor for monitoring purposes only.
37. Acid shall not be used to control pH.
38. Water meters
39. Meters provided by owner, installed by contractor.
40. Provide meters at cooling tower make up and bleed lines.
41. Single phase, variable frequency drive chemical pumps shall be provided.
4. Positive Displacement Type Pump
 1. Provide with anti-siphon/pressure relief valve installed on pump head which provides anti-siphon protection and aids in priming under pressure.
 2. Capacity: As determined by Water Treatment Vendor.
 3. Complete with discharge check valves, foot valves, polyethylene suction, and discharge tubing.

4. Provide a non-metallic shelf to mount chemical pumps.
5. Discharge tubing shall be routed from the chemical storage area to the tower return line or to the tower basin for adequate mixing
6. Quantity: Two (2) to four (4) based on chemicals chosen by Water Treatment Vendor.
5. Bleed-off piping assembly.
 1. Inlet shut-off valve.
 2. Wye strainer.
 3. Strainer blowdown valve.
 4. Throttling valve.
 5. Brass solenoid valve compatible with main control panel.
 6. Assembly shall be sized by Water Treatment Vendor.
6. Chemical storage containers with secondary containment
 1. Material: Polyethylene.
 2. Container capacity: Sixty (60) gallon each (minimum).
 3. Provide each secondary containment pallet with grating and drain plug. Size shall be Sufficient to accommodate all three containers and have sufficient volume to contain the contents of one container.
 4. Provide one portable loading ramp.
 5. Container quantity: Two (2) to Four (4) Determined by Water Treatment Vendor.
7. Provide liquid level switch assemblies to mount directly into chemical drums.
 1. Interface with main control panel.
 2. Quantity: Two (2) to Four (4) Determined by Water Treatment Vendor.
8. Corrosion monitor rack
 1. Materials: Corrosion resistant.
 2. Construction: ASME specifications.
 3. Number of coupons: Four (4).
 4. Coupon holders: Quick disconnect type.
9. Provide two (2) to four (4) CPVC corporation stop injection nozzles if chemical are to be injected into tower supply header. Water Treatment Vendor to determine total number required.
10. Provide test kits for monitoring inhibitor levels, total dissolved solids, chlorides, alkalinity and closed system inhibitors.
11. Provide one (1) year's supply of chemical treatment including quantity of chemicals necessary to chemically treat system to control scale, corrosion, and biological fouling.
12. Provide water treatment products that perform the following:
 1. Inhibitor to protect against corrosion and scale formation.
 2. Two liquid biocides for prevention of slime, bacteria, and algae.
 3. Chromate based chemical are unacceptable.
 4. Water treatment chemicals to remain stable throughout operating temperature range.
 5. Are compatible with pump seals and other elements in the systems.

6. Provide pre-cleaning chemicals to remove system dirt, debris, and cutting oils from system for all condenser piping. Pre-cleaning materials to be non-acid in composition and not harmful to system metallurgy.
 7. All chemicals to be acceptable for discharge to sanitary sewer.
- H. Pre-Cleaning and Passivation of Cooling Towers
1. Pre-cleaning of closed-circuit cooling tower shall include removal of all accumulated debris and cleaning/flushing of spray section and open water basin.
 2. Passivation of closed-circuit cooling tower shall include chemical treatment to provide a protective film coating of the spray section and open water basin.
- I. Pre-Cleaning Of Condensers and Evaporators
1. Pre-cleaning of the condensers may occur simultaneously with the cleaning of the cooling towers, provided system metallurgy allows for this approach, (i.e no galvanized metals present). The final judgment will be made by the Auburn University Plant Operations Department, the Auburn University Plant Operations Group and the Water Treatment Vendor.
 2. If simultaneous cleaning of the condenser and tower cannot occur, then the mechanical contractor is responsible for ensuring adequate chemical cleaning of the condenser following Auburn University's standard closed loop pre-cleaning practices.
 3. Pre-cleaning of the evaporator is to be performed by the mechanical contractor following Auburn University's standard closed loop pre-cleaning practices.
- J. Cooling Tower Connection
1. Installation
 1. Install all systems and components in accordance with manufacturer's instructions and recommendations.
 2. Provide all piping and wiring for a complete functional system.
 3. All wiring shall be in metallic conduit complying with Electrical Specification Divisions.
 4. Locate chemical feed pumps, chemical drums, and other components as field dictated based on available wall, floor space and proximity to re-circulating lines and floor drains.
 5. Install impulse water meter at the following locations
 1. Cooling tower make up piping.
 2. Cooling tower blowdown line, upstream of blowdown solenoid valve.
 6. Provide a by-pass line around water meters and bleed off piping assembly. Provide ball valves to allow for bypassing, isolation, and servicing of components.
 7. Bleed off water piping with bleed off piping assembly shall be piped from pressure side of circulating water piping to a convenient drain. Bleed off connection to main circulating water piping shall be upstream of chemical injection nozzles.

8. Provide DN 251 IN Schedule 80 PVC piping for the flow assembly piping to the main control panel and accessories.
 1. The inlet piping shall connect to the discharge side of the circulating water pump.
 2. The outlet piping shall connect to the water piping serving the cooling tower downstream of the heat source.
 3. Provide inlet PVC wye strainer and PVC ball valves to isolate and service main control panel and accessories.
9. Install PVC injection nozzles with corporation stops in the water piping serving the cooling tower downstream of the heat source.
10. Schedule 80 PVC piping for corrosion monitor rack per manufacturer's installation instructions. Provide PVC ball valves to isolate and service rack.
11. Provide installation supervision, start-up, and operating instruction by manufacturer's technical representative.
12. Provide minimum of four hours instruction of Owner's personnel.
- K. Pre-Cleaning and Passivation of Cooling Towers and/or Condensers
 1. Contractor shall provide a minimum notice of fourteen (14) days to the water treatment vendor to allow for delivery of chemicals.
 2. Contractor will notify the fourteen (14) days prior to filling and cleaning of new water pipes. The new piping system shall not be connected/operated until the chemical clean-up is performed.
 3. Cleaning of condenser water systems cannot be performed until all piping is installed, leak tested and adequate re-circulation loops are installed to ensure adequate flow is obtained throughout the system.
 4. Make sure all chemicals are on-site and that pH control is available. If possible the tower should be exposed to atmosphere for 4 to 6 weeks prior to start-up.
 5. Pre-cleaning and passivation procedures shall not damage galvanized and stainless steel panels, structural components, fasteners, and all other elements of the cooling tower.
 6. Pre-cleaning procedure shall include
 1. Products Required
 1. HPS-1 dispersant product to achieve 25 to 100 ppm active polymer.
 2. HRA to achieve 8 to 20 ppm active HRA.
 3. Non-oxidizing biocide to achieve 50 to 75 ppm as product. Do not exceed registered maximum as indicated on product label.
 4. Surfactant at approximately 20 to 50 ppm as product — should provide oil/grease dispersancy as well as general surfactant properties.
 5. Antifoam as needed.
 6. If an oxidizing biocide is used at this point, keep levels at or below 1.0 ppm free residual chlorine.
 7. Sulfuric acid may be required for pH control.

2. Procedure
 1. Make sure that tower is full with fresh make-up water. Begin to circulate water through spray system.
 2. Control pH in the 7.0 to 8.0 range.
 3. Add chemicals to tower basin near pump screens shot wise to achieve desired concentrations. Add products in order as given above or minimally, add HPS-1 dispersant and HRA azole first.
 4. Circulate for 24 hours.
 5. Flush all traces of chemicals and any dispersed oils, etc. at this point.
 6. Immediately institute passivation/pre-filming procedure and avoid keeping pre-cleaning solution in system for long periods of time.
7. Passivation/Pre-filming
 1. For the first thirty (30) to sixty (60) days of system operation, control the system pH in the 7.0 to 8.0 range.
 2. If an oxidizing biocide is used (chlorine or bromide based) keep free residual as chlorine below 1.0 ppm.
 3. It is best to maintain standard high ortho phosphate, low phosphonate cooling water treatment programs during this time. Excessive phosphonate levels are detrimental to zinc coated surfaces.
 4. Moderate calcium hardness levels of 100 to 300 ppm as CaCO₃ and alkalinity levels of 50 to 150 ppm as CaCO₃ are ideal during the 30 to 60 day passivation period.
 5. Once the 60-day passivation period is complete, desired treatment technology can begin including programs that include higher cycles to achieve higher alkalinity and hardness levels.
- L. Pre-Cleaning of Condensers and/or Evaporators Following Auburn University's Standard Closed Loop Pre-Cleaning Practices
 1. Materials
 1. Temporary Loop Strainer Screens: Fine mesh (3/64-inch maximum).
 2. Cleaning and Sterilization Chemicals
 3. Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products. Use Suez WTS Ferroquest FQ7103 at 3% of system volume.
 4. Non-oxidizing biocide which has halogen like effects such as 2,2-dibromo-3-nitrilopropionamide, also known as DBNPA. Use Suez WTS Spectrus NX1102 or equivalent for chilled water systems only.
 5. Condenser Water Treatment Chemical: Suez WTS Genguard GN8118 or equivalent.
 6. Evaporator Water Treatment Chemical: Suez WTS Corrshield MD4100 or equivalent.
 2. Preparation
 1. Contractor shall provide a minimum notice of fourteen (14) days to the water treatment vendor to allow for delivery of chemicals.
 2. Contractor will notify the Auburn University Plant Operations Department fourteen (14) days prior to filling and cleaning of new water

- pipes. The new piping system shall not be connected/ operated until the chemical clean-up is performed.
3. Cleaning of condenser/evaporator water systems cannot be performed until all piping to be cleaned is installed, leak tested and adequate re-circulation loops are installed to ensure adequate flow is obtained throughout the system.
 4. A temporary chemical by-pass feeder must be installed prior to the start of the cleaning sequence if the system is not cleaned in conjunction with distribution piping connecting to the building.
 5. The cleaning process continues for a minimum of twenty four (24) hours after the introduction of the cleaning agents and must be planned for in advance with the Auburn University Plant Operations Department.
 6. The system pump must be fully operational to maintain steady output at 75 – 100% of design capacity throughout the cleaning process.
 7. If the system pumps are not operational, the mechanical contractor must provide a pump capable of producing similar flows to that of the system or the table as outline below.

MINIMUM CLEANING WATER	
<i>Pipe Size (in)</i>	<i>Flow (gpm)</i>
2	45
4	100
6	250
10	500
14	960
15 thru 30	1,250

3. Cleaning Sequence
 1. Under no circumstance shall the condenser/evaporator remain untreated for more than one week after initial filling.
 2. All water shall be metered into the pipe and amounts shall be tabulated and given to Owner's representative to indicate the volume of water inside the building. Pipe quantities and sizes shall also be tabulated to verify piping is filled completely.
 3. Install temporary building strainers on supply piping entering the building to prevent damage to building isolation valve seats and discs.
 4. Force all automatic valves and ball valves into the open position at all air handlers, system heat exchangers and expansion tanks. Ensure the system is filled with water and vented of air and initiate system pumps at 75 – 100% of flow capacity.
 5. During the cleaning, at no time shall the circulation pump be shut off except in the event of an emergency. If for some reason the system pump cannot be used for circulation purposes, the mechanical contractor

- must provide a temporary pump that has similar flow and pressure capacities to that of the system pump.
6. Monitor pressure drop across the temporary strainer screen and clean as necessary to maintain the recommended pipe velocity as directed by the Owner's Representative.
 7. Two twelve (12) ounce bottles of the system water shall be taken for laboratory analysis prior to the start of the addition of cleaning chemical or flushing. Auburn University Plant Operations Department will be responsible for providing the sample bottles to the mechanical contractor.
 8. Cleaner and biocide, when required, shall be added to piping at concentration as recommended by Owners representative following the hydro test. A water volume equal to the calculated amount of cleaner to be added shall be drained from the pipe to allow for addition of cleaner.
 9. Circulate the solution for 24 hours or as recommended by the Owner's representative, whichever is less. Cleaner shall be circulated at 75 – 100% of system pump capacity.
 10. Twenty four (24) hours following the start of the cleaning process, two twelve (12) ounce bottles of system water shall be gathered for laboratory analysis.
 11. Following cleaning, drain systems as quickly as possible. This should be done by means of draining water to a nearby floor drain and adding clean domestic water through a make-up system or by hosepipe. The draining water should not exceed the amount being made up. The system pump remains on during this time and all valves remain in the forced open position.
 12. Two twelve (12) ounce bottles of system water shall be gathered for laboratory analysis following city water flushing.
 13. Following cleaning remove all temporary bypasses and screens, and install all instruments and controls as required.
4. Water Treatment
1. Within twenty four (24) hours following the completion of the cleaning sequence, the water treatment chemicals will be added and circulated as recommended by the Owner's Representative or system water from the primary distribution system will be introduced to the building system.
 2. After addition of water treatment chemicals or distribution water, the system pump will remain online for an additional eight (8) hours, or less if deemed acceptable by the Owner's Representative to ensure a good blend of corrosion inhibitor throughout the entire system. During this time, it is imperative that all valves which have been previously forced to the open position remain this way.
 3. Following eight (8) hours or less of circulation, two additional twelve (12) ounce samples will be taken for laboratory analysis. At this point, the system pumps can be shut down.
 4. If for any reason water is drained from the loop after the water treatment chemical is added, Auburn University Plant Operations Department

and/or the Owner's Representative will be notified immediately so that action can be taken to prevent corrosion in the system.

Appendix D2: Standard Details

D1010 Elevators and Lifts

Elevator Fire Protection Matrix

Location \ Device	Elevator Type								
	Machine Roomless (MRL)			Hydraulic			Overhead Traction		
	Sprinkler	Smoke Detector	Heat Detector	Sprinkler	Smoke Detector	Heat Detector	Sprinkler	Smoke Detector	Heat Detector
Top of Shaft	O	R	R ¹	O	R ¹	R ¹	O	R ¹	R ¹
Bottom of Shaft	O	R ²	R ²	R	R ²	R ²	O	R ²	R ²
Machine Room & Control Closet	R ³	R	R ³	R ³	R	R ³	R ³	R	R ³

Legend:

O = Optional

R = Required

R¹ = Required if sprinkler head is installed in top of shaft, optional otherwise

R² = Required if Sprinkler head is installed greater than 24" above bottom of shaft, optional otherwise

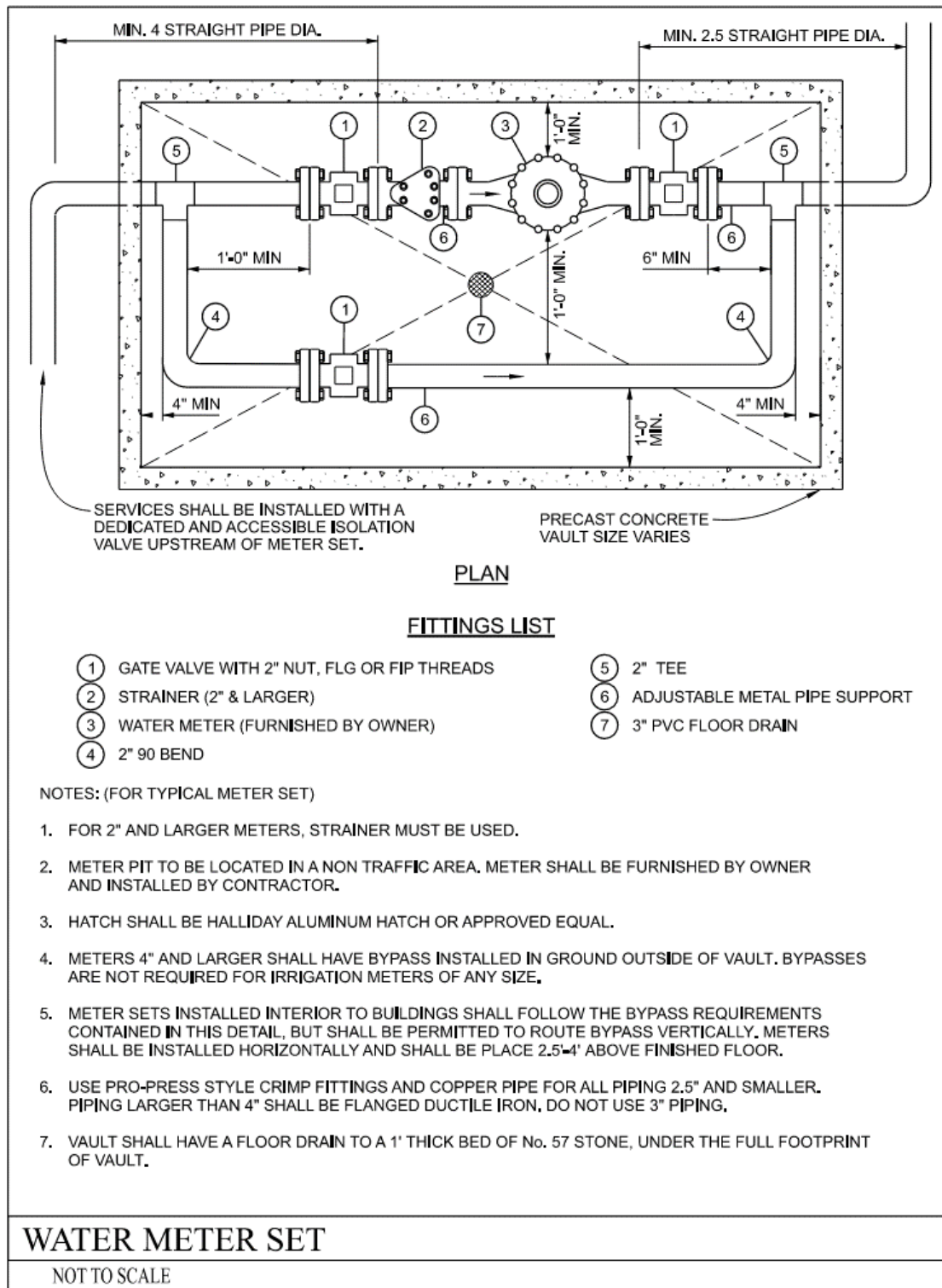
R³ = Required if building is protected with sprinklers

Elevator Recall/Shutdown Matrix

ELEVATOR RECALL/SHUTDOWN MATRIX						
Building Sprinklered						
Building Location	Location Sprinklered	Recall Detection	Elevator Recall	Elevator Fireman's Hat	Shutdown Detection	Elevator Shutdown
Basement Lobby	Yes	Smoke Detector	primary (1st floor)	On	None	N/A
1st Floor Lobby	Yes	Smoke Detector	alternate*	On	None	N/A
2nd Floor Lobby	Yes	Smoke Detector	primary (1st floor)	On	None	N/A
3rd Floor Lobby	Yes	Smoke Detector	primary (1st floor)	On	None	N/A
Machine Room	Yes	Smoke Detector	primary (1st floor)*	Flash	Heat Detector	Yes**
Hoistway Pit	Yes***	Pit Heat Detector	higher of primary/alternate	Flash	None	N/A
Hoistway Ceiling	No	None	N/A	N/A	None	N/A
Hoistway Ceiling	No	Smoke Detector****	higher of primary/alternate	Flash	None	N/A
Building Not Sprinklered						
Building Location	Location Sprinklered	Recall Detection	Elevator Recall	Elevator Fireman's Hat	Shutdown Detection	Elevator Shutdown
Basement Lobby	No	Smoke Detector	primary (1st floor)	On	None	N/A
1st Floor Lobby	No	Smoke Detector	alternate*	On	None	N/A
2nd Floor Lobby	No	Smoke Detector	primary (1st floor)	On	None	N/A
3rd Floor Lobby	No	Smoke Detector	primary (1st floor)	On	None	N/A
Machine Room	No	Smoke Detector	primary (1st floor)*	Flash	None	N/A
Hoistway Pit	No	None	N/A	N/A	None	N/A
Hoistway Ceiling	No	None	N/A	N/A	None	N/A
Hoistway Ceiling	No	Smoke Detector****	higher of primary/alternate	Flash	None	N/A
*Normally, primary is 1st floor and alternate is basement or 2nd floor; machine room recall to alternate floor if machine room on primary floor						
**Heat detectors in machine room to shunt trip electric power prior to sprinkler operation in machine room						
***Separate pit heat detector not required by code because of pit sprinkler head within 2 ft of pit floor						
****By code, ceiling smoke detector permitted in unsprinklered hoistway only if required for smoke relief/exhaust						

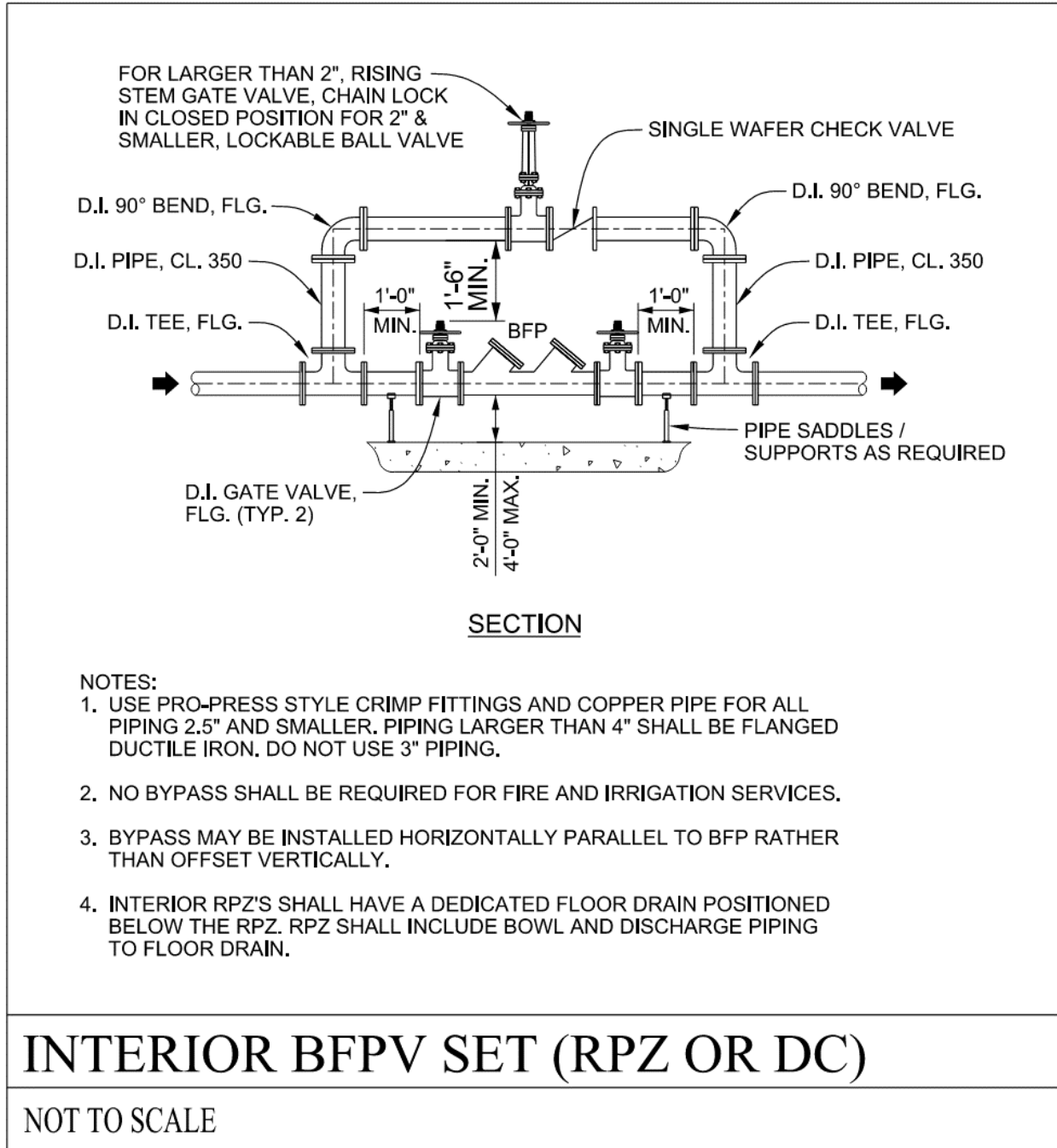
D20 – Water Meter Set Installation

1. Typ for outside and in-building systems



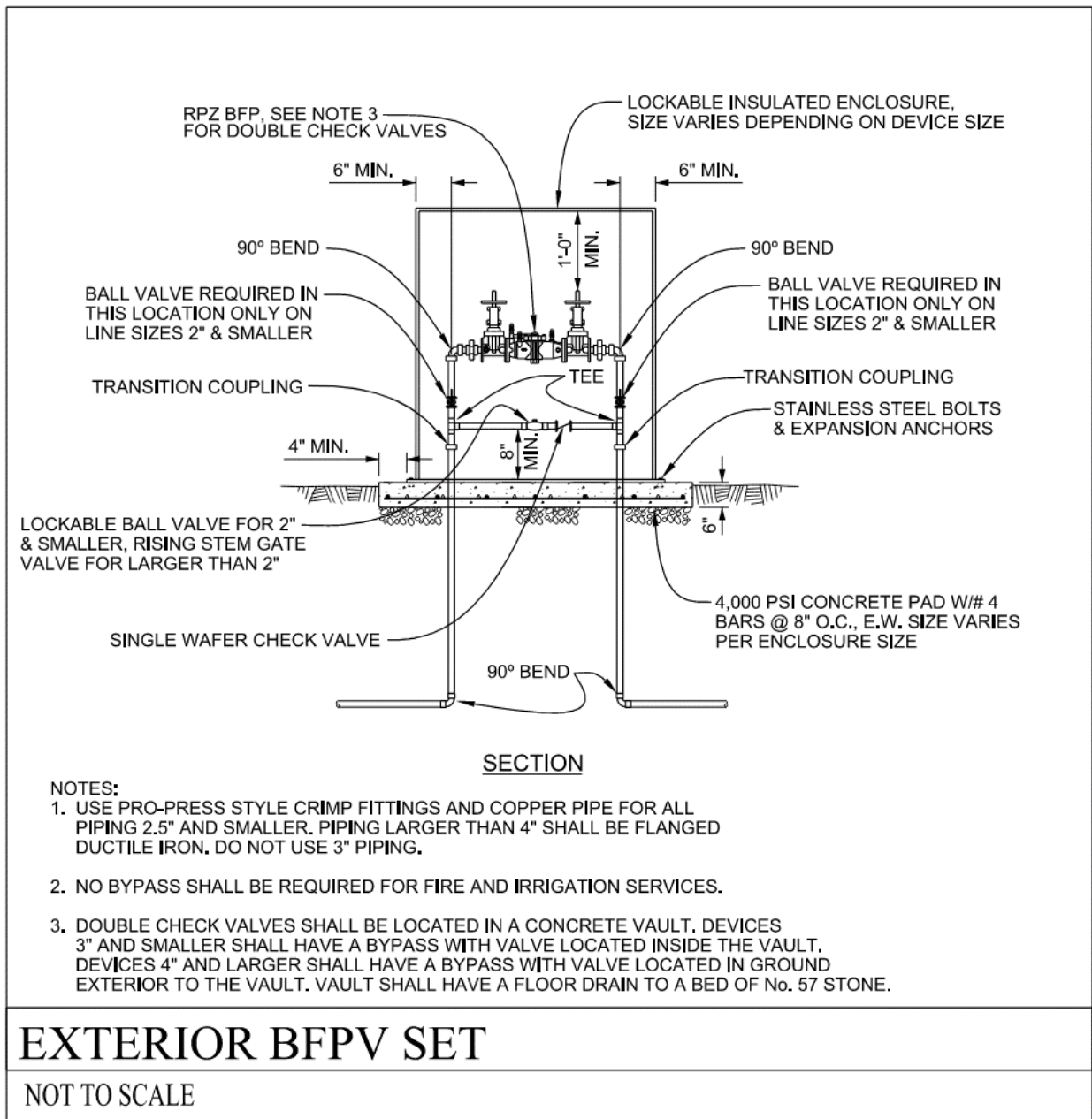
D2025 Interior Backflow Preventer Installation

1. Typ for building and any makeup systems



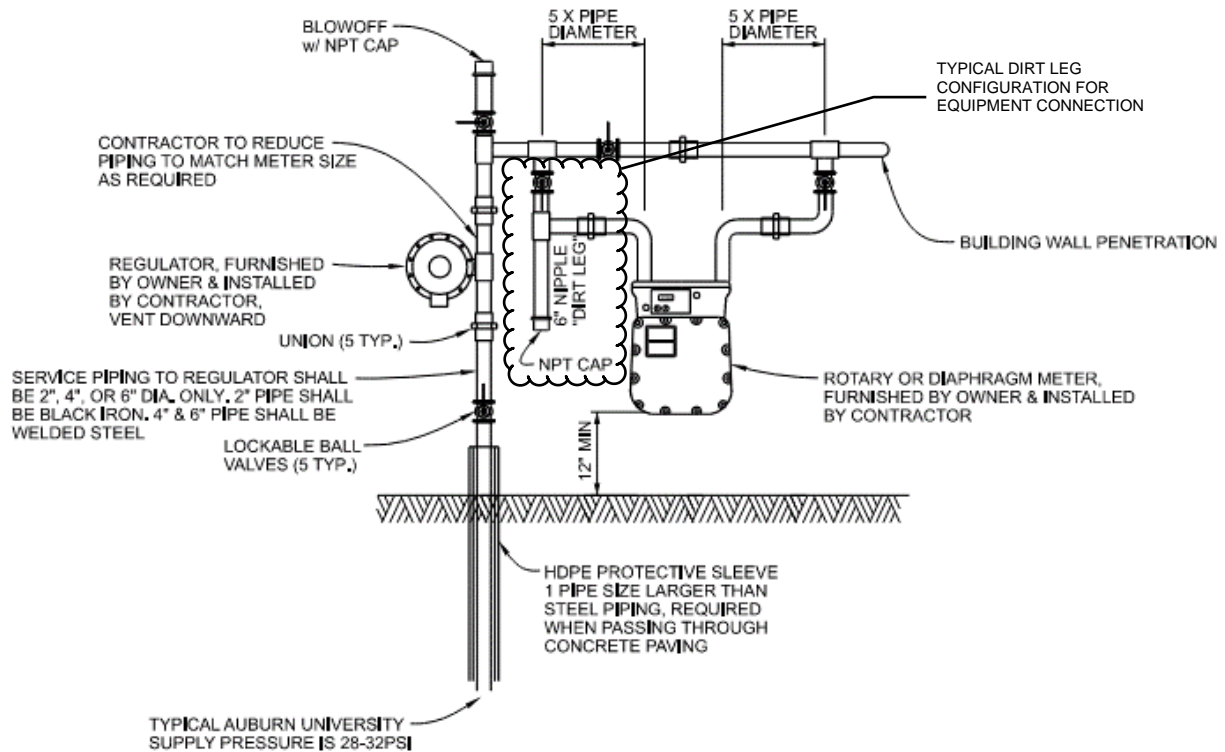
D2025 Exterior Backflow Preventer Installation

1. Typ for building and irrigation systems



D3012 Gas Supply System

1. Gas Train detail



NOTES:

1. METER SET SHALL TYPICALLY BE LOCATED 2' CLEAR OF BUILDING AND ORIENTED PARALLEL TO BUILDING WITH APPROPRIATE FITTINGS.
2. PAINT METER SET PIPING AND VALVES TO MATCH METER. (AMERICAN GRAY, TYP)
3. TURBINE METERS REQUIRE CUSTOM DESIGNED METER SET.
4. METER SET PIPE TO BE SIZED BASED ON BUILDING DEMAND.
5. REGULATOR/METER SET SHALL NOT INCLUDE LOW PRESSURE SHUTOFF UNLESS OTHERWISE REQUIRED BY CODE.
6. ENGINEER SHALL CONSIDER METER PLACEMENT AND BOLLARD USE IN VEHICLE ACCESSIBLE AREAS.
7. ALL VALVES IN THE METER SET SHALL BE LOCKABLE.
8. METER AND REGULATOR SHALL NOT BE LOCATED WITHIN 5' OF AIR INTAKES OR WINDOWS.

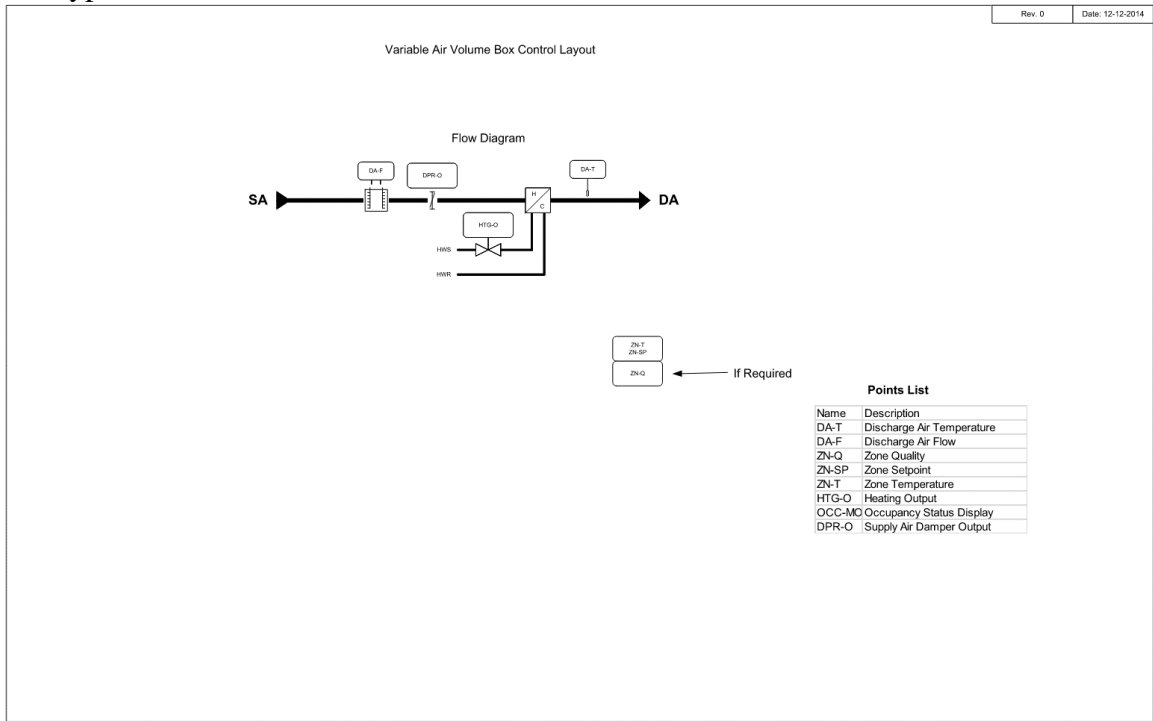
NATURAL GAS METER SET

NOT TO SCALE

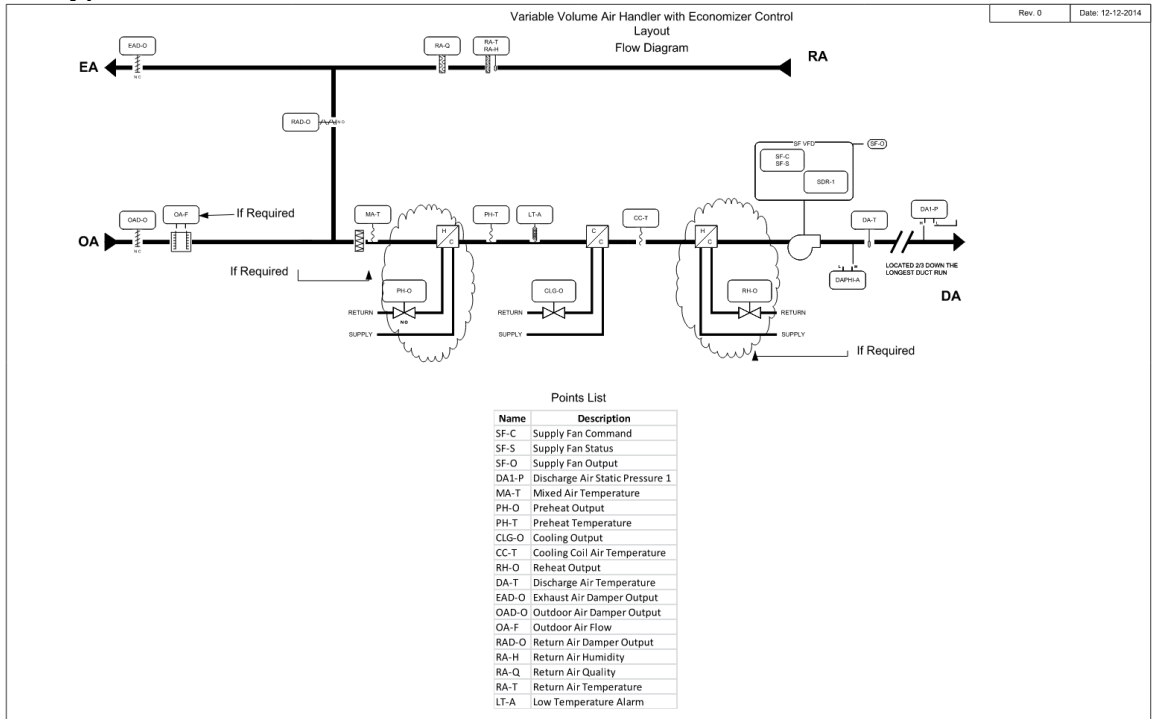
D3060 Controls and Instrumentation

D3067 Energy Monitoring and Control

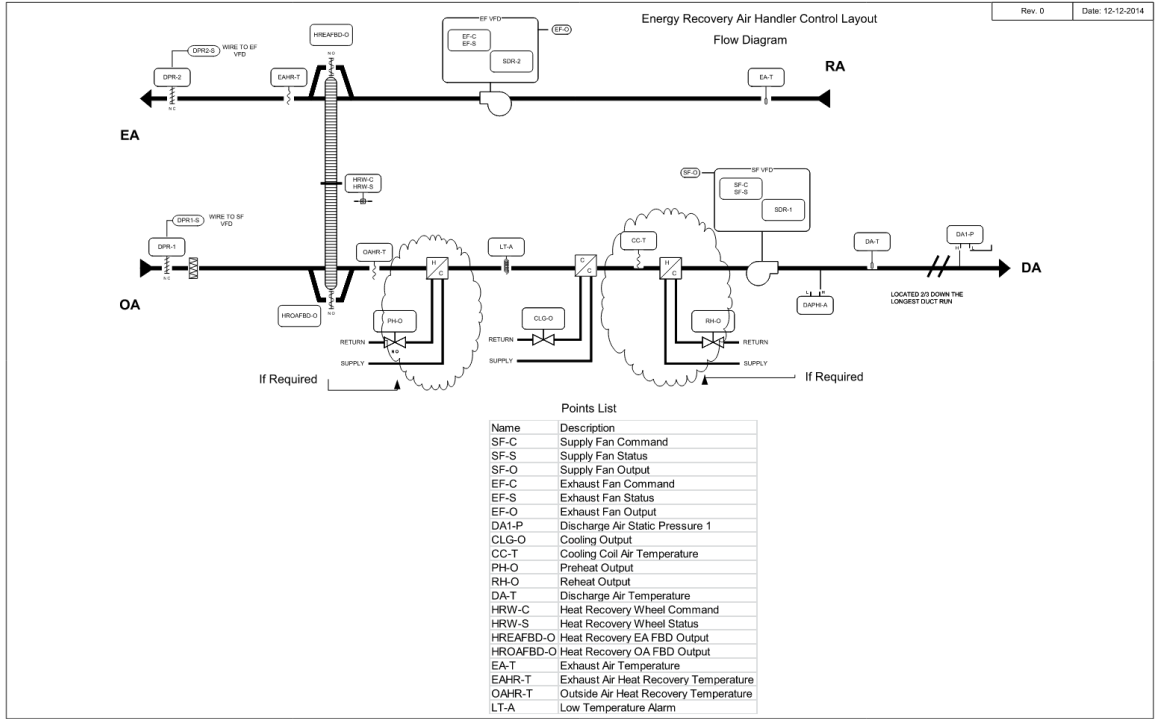
1. Typical VAV Terminal Box



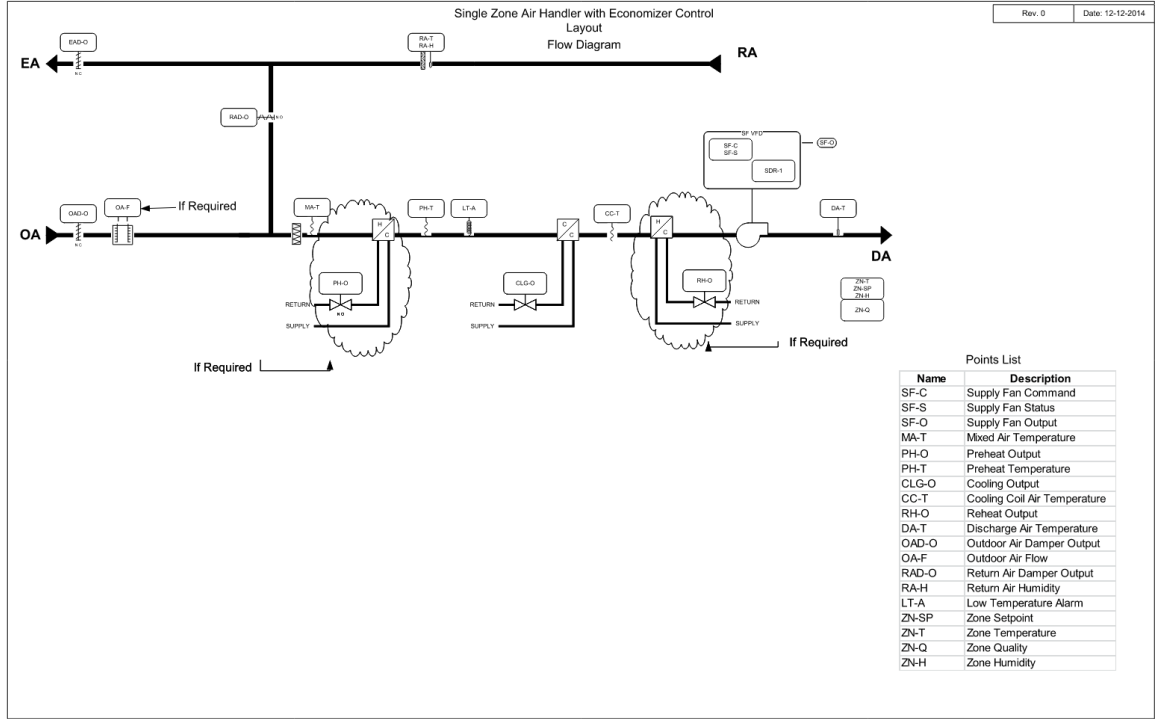
2. Typical Variable Volume Air Handler with Economizer



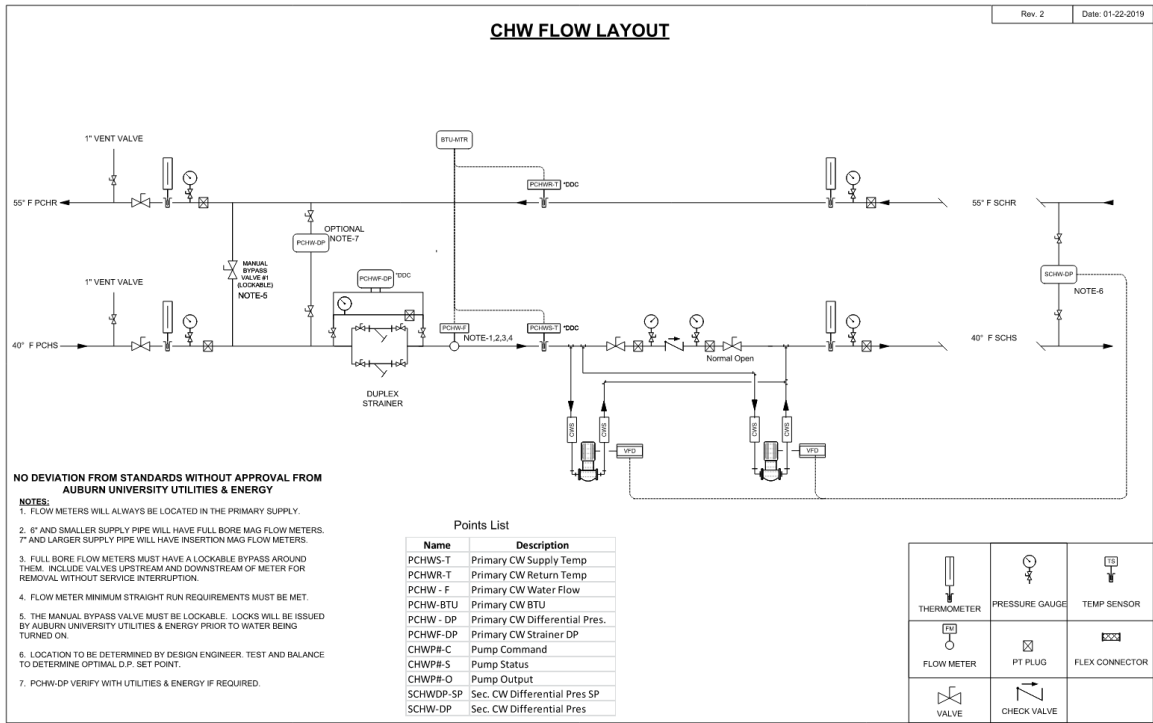
3. Typical Energy Recovery Air Handler



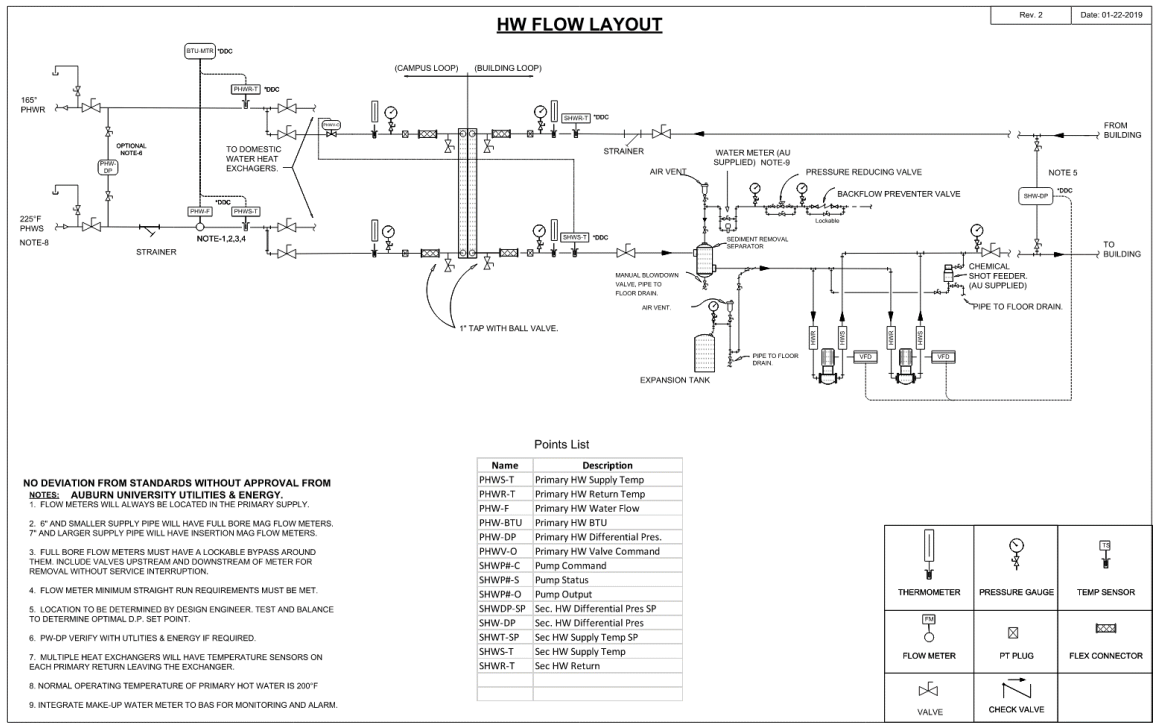
4. Typical Single Zone Air Handler with Economizer



5. Chilled Water Interface



6. Hot Water Interface



7. Standard Alarm Points

Revised: 6/17/2022														
Standard Alarms														
#	System	Type	Reference	Alarm Generated By	Upper Limit	Lower Limit	High Warning Offset	Low Warning Offset	Alarm & Warning Differential	Reference Delay Time	Report Delay	Comments	Alarm Priority	Who Gets the Alarm?
1	Zone Temperature	Zone Control	Zone Setpoint	Exceeding Differentials	85	66	N/A	N/A	2°F	70 sec.	600 sec.		Zone 1-81 Zone 2-86 Zone 3M-89 Zone 3V-94 Zone 4-74	Zone Supervisors Zone Assistant Supervisors
2	Zone CO ₂ Levels	Zone Control	Zone Setpoint	Exceeding Limits	1000 ppm	100 ppm	N/A	N/A	100 ppm	70 sec.	600 sec.		32	Energy Engineers
3	Humidity	AHU	Zone Setpoint	Exceeding Limits	65	N/A	N/A	N/A	2	70 sec.	600 sec.	Should only be put in for buildings that have humidity controls.	Zone 1-81 Zone 2-86 Zone 3M-89 Zone 3V-94 Zone 4-74	Zone Supervisors Zone Assistant Supervisors
4	Fan Status	AHU	Status vs. Command	Status ≠ Command	N/A	N/A	N/A	N/A	N/A	600 sec.	600 sec.		Zone 1-80 Zone 2-85 Zone 3M-91 Zone 3V-92 Zone 4-77	Zone Supervisors, Assistant Supervisors, Roving Mechanic
5	Low Temp Alarm (TLL)	AHU	Point Units	When point units = Alarm	N/A	N/A	N/A	N/A	N/A	70 sec.	600 sec.	Unit Safety.	Zone 1-80 Zone 2-85 Zone 3M-91 Zone 3V-92 Zone 4-77 Managers - 8 (All AHUs)	Zone Supervisors, Assistant Supervisors, Roving Mechanic
6	Fire Alarm Relay	AHU	Point Units	When point units = Alarm	N/A	N/A	N/A	N/A	N/A	70 sec.	60 sec.	Unit Safety. Supplies system notifies fire department to respond.	N/A	No one
7	Pressure High / Low Limits	AHU	Point Units	When point units = Alarm	N/A	N/A	N/A	N/A	N/A	600 sec.	600 sec.	Unit Safety.	Zone 1-80 Zone 2-85 Zone 3M-91 Zone 3V-92 Zone 4-77	Zone Supervisors, Assistant Supervisors, Roving Mechanic
8	Pan Float Switches	AHU	Point Units	When point units = Alarm	N/A	N/A	N/A	N/A	N/A	70 sec.	60 sec.	Unit Safety.	Zone 1-80 Zone 2-85 Zone 3M-91 Zone 3V-92 Zone 4-77	All exchangers in particular zones, Zone Supervisors, Assistant Supervisors, Roving Mechanic
9	Preheat Pumps	AHU	Status vs. Command	Status ≠ Command	N/A	N/A	N/A	N/A	N/A	600 sec.	600 sec.		Zone 1-80 Zone 2-85 Zone 3M-91 Zone 3V-92 Zone 4-77	Zone Supervisors, Assistant Supervisors, Roving Mechanic
10	Pumps	Water	Status vs. Reference	Status ≠ Reference	N/A	N/A	N/A	N/A	N/A	600 sec.	600 sec.	On 2-pipe systems when the mechanical stop puts the building into a neutral state, the pump <u>MUST</u> be commanded off to avoid alarms.	Zone 1-80 Zone 2-85 Zone 3M-91 Zone 3V-92 Zone 4-77	Zone Supervisors, Assistant Supervisors, Roving Mechanic
11	Hot Water Supply Temp	Water	Point Value	>200°F (different requirements per engineer)	200°F	120°F	N/A	N/A	5°F	70 sec.	600 sec.		Zone 1-81 Zone 2-86 Zone 3M-89 Zone 3V-94 Zone 4-74	Zone Supervisors Zone Assistant Supervisors
12	Building Secondary Differential Pressure	Water	Point Value	Low Limit	N/A	3 psi	N/A	3 psi	1 psi	70 sec.	600 sec.	Reason for alarm: Coupling could break, status of pump could be ok, and yet the pump is <u>not</u> flowing water.	Zone 1-81 Zone 2-86 Zone 3M-89 Zone 3V-94 Zone 4-74	Zone Supervisors Zone Assistant Supervisors
13	Domestic Water Monitoring	Water	Point Value	Currently determined by project documents	Various	Various	N/A	N/A	Various	70 sec.	600 sec.	To notify mechanics when there is a domestic water problem (low domestic hot water temperature, or domestic pumping package failure).	Zone 1-81 Zone 2-86 Zone 3M-89 Zone 3V-94 Zone 4-74	Zone Supervisors Zone Assistant Supervisors
14	Domestic Water Temperature	Water	Water Temp	High Limit Low Limit	150°F 100°F	N/A	N/A	N/A	5°F	70 sec.	600 sec.		Zone 1-81 Zone 2-86 Zone 3M-89 Zone 3V-94 Zone 4-74	Zone Supervisors Zone Assistant Supervisors
15	VFD Hot Sink Temperature	VFD	Point Value	High Limit	55°C	N/A	N/A	N/A	2°F	70 sec.	600 sec.		Zone 1-81 Zone 2-86 Zone 3M-89 Zone 3V-94 Zone 4-74	Zone Supervisors Zone Assistant Supervisors
16	Wireless Thermostat Batteries	Zone Control	Point Units	When point units = Alarm	N/A	N/A	N/A	N/A	N/A	70 sec.	600 sec.		Zone 1-81 Zone 2-86 Zone 3M-89 Zone 3V-94 Zone 4-74	Zone Supervisors Zone Assistant Supervisors
17	Generator	Generator	Status	Alarm - Start Alarm - Stop	N/A	N/A	N/A	N/A	N/A	70 sec.	300 sec.	Alarm when generator starts. Alarm when generator returns to normal steps. Email only to Manager Mech Trades	TBD	Zone Supervisors Zone Assistant Supervisors Manager Mech Trades
18	Primary Chilled Water Building Temperature	Water	Point Value	When Temp = Alarm Limit	70	N/A	N/A	N/A	N/A	600 sec.	600 sec.	Alarms on primary supply and return temperature sensors at each building to alarm sensor failure.	32	Energy Engineers
19	Primary Hot Water Building Temperature	Water	Point Value	When Temp = Alarm Limit	240	N/A	N/A	N/A	N/A	600 sec.	600 sec.	Alarms on primary supply and return temperature sensors at each building to alarm sensor failure.	32	Energy Engineers
20	SCM, NIE & NAE Office Alarms	Device Alarm	Status	Status = Offline	N/A	N/A	N/A	N/A	N/A	70 sec.	600 sec.			JCI Service Techs.
21	Hot Water Plant Supply Temp	Water	Point Value	When Temp = Alarm Limit	240°F	175°F	N/A	N/A	5°F	0 sec.	30 sec.		15,17,18	Superintendent, Supervisor, Mechanics assigned to Plant
22	Hot Water Plant Differential Pressure (does not include Plant 2)	Pump	Point Value	When DP = Alarm Limit	10 psi	7 psi	N/A	N/A	1 psi	0 sec.	300 sec.		15,18	Superintendent, Supervisor, Mechanics assigned to Plant
23	Hot Water Plant 2 Differential Pressure	Pump	Point Value	When DP = Alarm Limit	10 psi	4.5 psi	N/A	N/A	1 psi	0 sec.	300 sec.		17	Superintendent, Supervisor, Mechanics assigned to Plant
24	Sanitary Steam Pressure	Steam	Point Value	When PSI = Alarm Limit	100 psi	55 psi	N/A	N/A	3 psi	0 sec.	60 sec.		10	Superintendent, Supervisor, Mechanics assigned to Plant
25	Coldwater Steam Pressure	Steam	Point Value	When PSI = Alarm Limit	40 psi	15 psi	N/A	N/A	3 psi	0 sec.	60 sec.		11	Superintendent, Supervisor, Mechanics assigned to Plant
26	Chilled Water Plant Supply Temp	Water	Point Value	When Temp = Alarm Limit	48°F	36°F	N/A	N/A	1°F	0 sec.	600 sec.		20,21,22,23	Superintendent, Supervisor, Mechanics assigned to Plant
27	Chilled Water Plant 1 Differential Pressure	Pump	Point Value	When DP = Alarm Limit	10 psi	6 psi	N/A	N/A	1 psi	0 sec.	300 sec.		20	Superintendent, Supervisor, Mechanics assigned to Plant
28	Chilled Water Plant Differential Pressure (does not include Plant 1)	Pump	Point Value	When DP = Alarm Limit	10 psi	7 psi	N/A	N/A	1 psi	0 sec.	300 sec.		21,22,23	Superintendent, Supervisor, Mechanics assigned to Plant
29	Furniture Growth Chamber	Pump	Point Value	When DP = Alarm Limit	65 psi	40 psi	N/A	N/A	1 psi	0 sec.	60 sec.			Superintendent, Supervisor, Mechanics assigned to Plant

D5037 Fire Alarm Systems

1. Fire Alarm Building NFPA Operations Matrix

Office

[illegible]

Notes: Coordinate AHU shutdown with areas served by AHU. Can vary by building.

Lab Classroom

[illegible]

Notes: Coordinate AHU shutdown with areas served by AHU. Can vary by building.

Provide Switch in fire alarm panel for smoke removal

- General Alarm release
- Override duct detectors off for AHUs and ERUs
- Open outside air 100% on all AHUs and ERUs
- Open Exhaust/return dampers on ERUs to 100%
- On AHU close return dampers
- Fan speeds set for each building after testing. Speeds should pressurize building to push smoke out.
- Strobes should continue to operate during this mode

N.F.P.A. OPERATIONS MATRIX

Classroom

SYSTEM OUTPUTS

Control Unit Annunciation																Required Fire Safety Control														Supplementary													
ACTUATE COMMON ALARM SIGNAL INDICATOR																TURN ON ELEVATOR CAR SPEAKERS (High Rise Only)																											
ACTUATE AUDIBLE ALARM SIGNAL																TRANSMIT SUPERVISORY SIGNAL TO SUPERVISING STATION																											
ACTUATE COMMON SUPERVISORY SIGNAL INDICATOR																TRANSMIT TROUBLE SIGNAL TO SUPERVISING STATION																											
ACTUATE AUDIBLE SUPERVISORY SIGNAL																RELEASE MAGNETICALLY HELD SMOKE DOORS																											
ACTUATE COMMON TROUBLE SIGNAL INDICATOR																RECALL ELEVATORS TO PRIMARY RECALL FLOOR																											
ACTUATE TROUBLE AUDIBLE INDICATOR																RECALL ELEVATORS TO ALTERNATE RECALL FLOOR																											
ACTUATE LOCAL PRIORITY 2 ALARM INDICATOR																CLOSE ASSOCIATED DAMPER ON FLOOR OF ALARM																											
TRANSMITS ALARM SIGNAL TO SUPERVISING STATION																START ELEVATOR AND STAIR PRESSURIZATION FANS (High Rise Only)																											
DISPLAY PRINT CHANGE OF STATUS																SHUNT TRIP MAIN ELEVATOR BREAKER																											
ACTIVATE STAIRWELL SPEAKERS																ELEVATOR HAT FLASH																											
TURN ON ELEVATOR CAR SPEAKERS (High Rise Only)																WATER FLOW BELL																											
TRANSMIT SUPERVISORY SIGNAL TO SUPERVISING STATION																SHUT DOWN ASSOCIATED AHU (See Note)																											
TRANSMIT TROUBLE SIGNAL TO SUPERVISING STATION																																											
RELEASE MAGNETICALLY HELD SMOKE DOORS																																											
RECALL ELEVATORS TO PRIMARY RECALL FLOOR																																											
RECALL ELEVATORS TO ALTERNATE RECALL FLOOR																																											
CLOSE ASSOCIATED DAMPER ON FLOOR OF ALARM																																											
START ELEVATOR AND STAIR PRESSURIZATION FANS (High Rise Only)																																											
SHUNT TRIP MAIN ELEVATOR BREAKER																																											

Notes: Coordinate AHU shutdown with areas served by AHU. Can vary by building.

Provide Switch in fire alarm panel for smoke removal

- General Alarm release
- Override duct detectors off for AHUs and ERUs
- Open outside air 100% on all AHUs and ERUs
- Open Exhaust/return dampers on ERUs to 100%
- On AHU close return dampers
- Fan speeds set for each building after testing. Speeds should pressurize building to push smoke out.
- Strobes should continue to operate during this mode

N.F.P.A. OPERATIONS MATRIX

Dorm

SYSTEM OUTPUTS

Control Unit Annunciation

Required Fire Safety Control

Supplementary

	A	B	C	D	E	F	G	H	I	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	BB	CC	DD	EE	FF	GG
1	ACTUATE COMMON ALARM SIGNAL INDICATOR																															
2	ACTUATE AUDIBLE ALARM SIGNAL																															
3	ACTUATE COMMON SUPERVISORY SIGNAL INDICATOR																															
4	ACTUATE AUDIBLE SUPERVISORY SIGNAL																															
5	ACTUATE COMMON TROUBLE SIGNAL INDICATOR																															
6	ACTUATE TROUBLE AUDIBLE INDICATOR																															
7	ACTUATE LOCAL PRIORITY 2 ALARM INDICATOR																															
8	TRANSMITS ALARM SIGNAL TO SUPERVISING STATION																															
9	DISPLAY PRINT CHANGE OF STATUS																															
10	ACTIVATE STAIRWELL SPEAKERS																															
11	TURN OFF SINGLE STATION AUDIBLES																															
12	TURN ON ELEVATOR CAR SPEAKERS (High Rise Only)																															
13	TURN OFF SINGLE STATION VISUALS																															
14	TRANSMIT SUPERVISORY SIGNAL TO SUPERVISING STATION																															
15	TRANSMIT TROUBLE SIGNAL TO SUPERVISING STATION																															
16	RELEASE MAGNETICALLY HELD SMOKE DOORS																															
17	RECALL ELEVATORS TO PRIMARY RECALL FLOOR																															
18	RECALL ELEVATORS TO ALTERNATE RECALL FLOOR																															
19	CLOSE ASSOCIATED DAMPER ON FLOOR OF ALARM																															
20	START ELEVATOR AND STAIR PRESSURIZATION FANS (High Rise Only)																															
21	SHUNT TRIP MAIN ELEVATOR BREAKER																															
22	ELEVATOR HAT FLASH																															
23	WATER FLOW BELL																															
24	SHUT DOWN ASSOCIATED AHU (See Note)																															
25	Range Exhaust to Minimum																															
26	Associated Range Supply Air AHU to Economizer Mode (BAS)																															

SYSTEM INPUTS

1	Unit Smoke Detector with Sounder base		X	X					X	X	X	X	X	X			X			X	X											1	
2	Common Area Smoke Detectors		X	X					X	X	X	X	X	X			X			X	X											2	
3	Thermal Detectors		X	X					X	X	X	X	X	X			X			X	X											3	
4	AHU Duct Detectors		X	X	X	X																										4	
5	Range Hood Detectors		X	X					X	X	X	X	X	X			X			X	X				X	X	X					5	
6	More than 1 unit with detector in alarm on a floor		X	X					X	X	X	X	X	X			X			X	X											6	
7	Pull Stations		X	X					X	X	X	X	X	X			X			X	X											7	
8	Main floor elevator lobby smoke detector		X	X					X	X	X	X	X	X			X		X	X	X											8	
9	Elevator lobby smoke detector excluding main floor		X	X					X	X	X	X	X	X			X	X		X	X											9	
10	Elevator shaft smoke detector		X	X					X	X	X	X	X	X			X	X		X	X											10	
11	Elevator shaft heat detector		X	X					X	X	X	X	X	X			X			X	X			X								11	
12	Elevator mechanical room smoke detector		X	X					X	X	X	X	X	X			X			X	X			X								12	
13	Elevator mechanical room heat detector		X	X					X	X	X	X	X	X			X			X	X			X	X							13	
14	Sprinkler Water Flow		X	X					X	X	X	X	X	X			X			X	X											14	
15	Sprinkler Tamper Switches				X	X				X	X																						15
16	Damper Duct Smoke Detectors				X	X				X	X																						16
17	Fire Pump Run				X	X				X	X																						17
18	Fire Pump Fault				X	X				X	X																						18
19	Loop Open / Short Circuit						X	X		X	X						X																19
20	Loop Ground fault						X	X		X	X						X																20
21	Loop Failure						X	X		X	X						X																21
22	Nac Open/Short Circuit						X	X		X	X						X																22
23	Nac Ground Fault						X	X		X	X						X																23
24	Nac Failure						X	X		X	X						X																24
25	Loss of AC power						X	X		X	X																						25
26	Loss of AC Power (>8 hours)						X	X		X	X						X																26
27	Battery Charger Failure						X	X		X	X						X																27
28	Low Battery						X	X		X	X						X																28

Notes: Coordinate AHU shutdown with areas served by AHU. Can vary by building.

Provide Switch in fire alarm panel for smoke removal

- General Alarm release
- Override duct detectors off for AHUs and ERUs
- Open outside air 100% on all AHUs and ERUs
- Open Exhaust/return dampers on ERUs to 100%
- On AHU close return dampers
- Fan speeds set for each building after testing. Speeds should pressurize building to push smoke out.
- Strobes should continue to operate during this mode

Food Venue

Food Venue

SYSTEM INPUTS

	A	B	C	D	E	F	G	H	I	K	M	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	BB	CC	DD	EE	FF	GG	
1 Common Area Smoke Detectors	X	X						X	X	X	X			X			X	X													1
2 Thermal Detectors	X	X						X	X	X	X			X			X	X													2
3 AHU Duct Detectors			X	X								X										X									3
4 Range Hood Detectors	X	X							X	X	X						X	X					X	X							4
5 Pull Stations	X	X						X	X	X	X						X	X													5
6 Main floor elevator lobby smoke detector	X	X						X	X	X	X					X	X	X													6
7 Elevator lobby smoke detector excluding main floor	X	X						X	X	X	X				X		X	X													7
8 Elevator shaft smoke detector	X	X						X	X	X	X						X	X													8
9 Elevator shaft heat detector	X	X						X	X	X	X						X	X			X										9
10 Elevator mechanical room smoke detector	X	X						X	X	X	X				X	X	X	X			X										10
11 Elevator mechanical room heat detector	X	X						X	X	X	X				X	X	X	X													11
12 Sprinkler Water Flow	X	X						X	X	X	X			X			X	X			X										12
13 Sprinkler Tangle Switches			X	X								X																			13
14 Damper Duct Smoke Detectors			X	X				X	X			X					X					X									14
15 Fire Pump Run			X	X								X																			15
16 Fire Pump Fault			X	X								X																			16
17 Loop Open / Short Circuit					X	X				X			X																		17
18 Loop Ground fault					X	X				X			X																		18
19 Loop Failure					X	X				X			X																		19
20 Nac Open/Short Circuit					X	X				X			X																		20
21 Nac Ground Fault					X	X				X			X																		21
22 Nac Failure					X	X				X			X																		22
23 Loss of AC power					X	X				X			X																		23
24 Loss of AC Power (>8 hours)					X	X				X			X																		24
25 Battery Charger Failure					X	X				X			X																		25
26 Low Battery					X	X				X			X																		26

SYSTEM OUTPUTS

Control Unit Annunciation	Required Fire Safety Control	Supplementary
ACTUATE COMMON ALARM SIGNAL INDICATOR	START ELEVATOR AND STAIR PRESSURIZATION FANS (High Rise Only)	
ACTUATE AUDIBLE ALARM SIGNAL	SHUNT TRIP MAIN ELEVATOR BREAKER	
ACTUATE COMMON SUPERVISORY SIGNAL INDICATOR	ELEVATOR HAT FLASH	
ACTUATE AUDIBLE SUPERVISORY SIGNAL	WATER FLOW BELL	
ACTUATE COMMON TROUBLE SIGNAL INDICATOR	SHUT DOWN ASSOCIATED AHU (See Note)	
ACTUATE TROUBLE AUDIBLE INDICATOR	Range Exhaust to Minimum	
ACTUATE LOCAL PRIORITY 2 ALARM INDICATOR	Associated Range Supply Air AHU to Economizer Mode (BAS)	
TRANSMITS ALARM SIGNAL TO SUPERVISING STATION		
DISPLAY PRINT CHANGE OF STATUS		
ACTIVATE STAIRWELL SPEAKERS		
TURN ON ELEVATOR CAR SPEAKERS (High Rise Only)		
TRANSMIT SUPERVISORY SIGNAL TO SUPERVISING STATION		
TRANSMIT TROUBLE SIGNAL TO SUPERVISING STATION		
RELEASE MAGNETICALLY HELD SMOKE DOORS		
RECALL ELEVATORS TO PRIMARY RECALL FLOOR		
RECALL ELEVATORS TO ALTERNATE RECALL FLOOR		
CLOSE ASSOCIATED DAMPER ON FLOOR OF ALARM		
	</	

Notes: Coordinate AHU shutdown with areas served by AHU. Can vary by building.

Provide Switch in fire alarm panel for smoke removal
-General Alarm release
-Override duct detectors off for AHUs and ERUs
-Open outside air 100% on all AHUs and ERUs
-Open Exhaust/return dampers on ERUs to 100%
-On AHU close return dampers
-Fan speeds set for each building after testing. Speeds should pressurize building to push smoke out.
-Strobes should continue to operate during this mode

N.F.P.A. OPERATIONS MATRIX

Large Assembly Smoke Evacuation

		SYSTEM OUTPUTS																Required Fire Safety Control																							
		Control Unit Annunciation																																							
		ACTUATE COMMON ALARM SIGNAL INDICATOR	ACTUATE AUDIBLE ALARM SIGNAL	ACTUATE COMMON SUPERVISORY SIGNAL INDICATOR	ACTUATE AUDIBLE SUPERVISORY SIGNAL	ACTUATE COMMON TROUBLE SIGNAL INDICATOR	ACTUATE TROUBLE AUDIBLE INDICATOR	ACTUATE LOCAL PRIORITY 2 ALARM INDICATOR	TRANSMITS ALARM SIGNAL TO SUPERVISING STATION	DISPLAY PRINT CHANGE OF STATUS	ACTIVATE STAIRWELL SPEAKERS	TURN ON ELEVATOR CAR SPEAKERS (High Rise Only)	TRANSMIT SUPERVISORY SIGNAL TO SUPERVISING STATION	TRANSMIT TROUBLE SIGNAL TO SUPERVISING STATION	RELEASE MAGNETICALLY HELD SMOKE DOORS	RECALL ELEVATORS TO PRIMARY RECALL FLOOR	RECALL ELEVATORS TO ALTERNATE RECALL FLOOR	CLOSE ASSOCIATED DAMPER ON FLOOR OF ALARM	START ELEVATOR AND STAIR PRESSURIZATION FANS (High Rise Only)	SHUNT TRIP MAIN ELEVATOR BREAKER	ELEVATOR HAT FLASH	WATER FLOW BELL	SHUT DOWN ASSOCIATED AHU (See Note)	ACTUATE SMOKE EVAC SEQUENCE PER MECHANICAL SEQUENCE OF OPERATION																	
		A	B	C	D	E	F	G	H	I	K	M	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	BB	CC	DD	EE	FF	GG										

SYSTEM INPUTS		A	B	C	D	E	F	G	H	I	K	M	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	BB	CC	DD	EE	FF	GG											
1	Common Area Smoke Detectors	X	X						X	X	X	X			X			X	X																							1
2	Thermal Detectors	X	X						X	X	X	X			X			X	X																						2	
3	Pull Stations	X	X						X	X	X	X	X		X			X	X																						3	
4	AHU Duct Detectors	X	X	X	X																		X																		4	
5	Main floor elevator lobby smoke detector	X	X						X	X	X	X			X			X	X																						5	
6	Elevator lobby smoke detector excluding main floor	X	X						X	X	X	X			X	X		X	X																						6	
7	Elevator shaft smoke detector	X	X						X	X	X	X			X	X		X	X																						7	
8	Elevator shaft heat detector	X	X						X	X	X	X			X	X		X	X																						8	
9	Elevator mechanical room smoke detector	X	X						X	X	X	X			X	X		X	X																						9	
10	Elevator mechanical room heat detector	X	X						X	X	X	X			X	X		X	X																						10	
11	Sprinkler Water Flow	X	X						X	X	X	X			X			X	X			X																			11	
12	Sprinkler Tamper Switches			X	X				X				X					X																							12	
13	Damper Duct Smoke Detectors			X	X				X	X			X					X																							13	
14	Smoke Evac Zone Detectors (Beam, Smoke, Etc.)	X	X						X	X	X	X			X			X					X	X																	14	
15	Fire Pump Run			X	X								X																												15	
16	Fire Pump Fault			X	X								X																												16	
17	Loop Open/Short Circuit					X	X				X			X																												17
18	Loop Ground fault					X	X				X			X																												18
19	Loop Failure					X	X				X			X																												19
20	Nac Open/Short Circuit					X	X				X			X																												20
21	Nac Ground Fault					X	X				X			X																												21
22	Nac Failure					X	X				X			X																												22
23	Loss of AC power					X	X				X			X																												23
24	Loss of AC Power (>8 hours)					X	X				X			X																												24
25	Battery Charger Failure					X	X				X			X																												25
26	Low Battery					X	X				X			X																												26

Notes: Coordinate AHU shutdown with areas served by AHU. Can vary by building.

Document Revision History

Version	Section	Summary of Change	Date
1.0	D3012.A.3	Add: Sediment leg required prior to all equipment connections	2/14/23
1.0	D3041.D	Remove: Harmonic filtering required for motors > 40hp	2/14/23
1.0	D5022.B.1-4	Update: Approved Manufacturers for Lighting Controls	3/25/23



2022 Section E – Equipment and Furnishings

INDEX

E10	Equipment
E20	Furnishings
Document Revision History	

E Equipment and Furnishings

E10 Equipment

E1010 Commercial Equipment

E1017 Vending Equipment

- A. University Project Lead will coordinate vending area requirements to be included in the design.
- B. Connection requirements of equipment (power, water, etc.) shall be provided to the designer and included in the design.
- C. Equipment shall be provided by the University or vending companies having contracts with the University.
- D. Drink and snack machines each require a 20 amp duplex receptacle.
- E. All water and electrical outlets around vending equipment shall be 18 inches above finished floor level.
- F. Floor finishes around vending equipment shall be hard surface (ceramic tile, etc.).
- G. If vending machines contain condensate drains, a floor drain should be provided.
- H. Place vending machines in a convenient location to serve the building occupants such as an alcove, break room, vending room or other area as deemed appropriate by the building's user requirements.

E1020 Institutional Equipment

E1027 Laboratory Equipment

- A. Fume hoods and casework shall be selected based on:
 - 1. The needs and use of laboratory personnel and the department(s) associated with the laboratory.
 - 2. The chemicals and processes to be used which may dictate specific type of hood such as: perchloric acid, acid digestion, etc.
- B. Fume hood low airflow safety alarm consoles shall be factory and field-tested and furnished with each fume hood. Airflow measuring devices shall be capable of indicating design flow rates within +/- 20% of design flow rates.
- C. Reuse of fume hoods from existing laboratory locations shall be evaluated through University Project Lead.
- D. Fume hoods shall be equipped with zone presence sensors and automatic sash closers.
- E. Fume Hood Layout and Installation
 - 1. Fume hoods shall be located away from doorways and other traffic areas or where airflow may be negatively impacted.
 - 2. Fume hoods should be labeled with engraved plastic tag to indicate which fan or ventilation system they are connected to.
 - 3. Fume hood controls and plumbing shall be located on the exterior of the fume hood.

4. Fume hoods shall be ASHRAE 110 tested after installation. Prior to ASHRAE 110 test, the HVAC system, fume hoods, snorkels, etc shall be tested and balanced. The ASHRAE 110 must not come before test and balance of systems.
 5. If a high performance (less than 100 fpm, sash open 18 inches) fume hood is to be considered for use in laboratories, it shall be approved through the University Project Lead.
 6. Future laboratory needs should be taken into consideration when making a fume hood selection.
- F. Provide a system test and balance report of proper function of the HVAC system and fume hood(s). This report shall be reviewed and approved by University Project Lead prior to substantial completion of the project.
- G. Local exhaust ventilation (snorkels, grossing stations, etc.) shall be compliant with ACGIH standards.
- H. Biological Safety Cabinets (BSCs) shall be certified following installation. Existing BSCs shall be decontaminated prior to moving. Certification shall be coordinated through University Project Lead.
- I. Flammable Material Refrigerators/Freezers shall be provided if flammable chemicals need to be refrigerated.
- J. Countertops shall be chemical and heat/flame resistant.
- K. Each laboratory shall have an emergency eyewash. Emergency eyewash shall be compliant with ANSI Z358.1.
- L. Each laboratory shall have an emergency shower near the main entrance. Emergency shower shall be compliant with ANSI Z358.1, including the requirement for tepid water. All emergency shower units shall be equipped with a floor drain.

E20 Furnishings

- A. All furnishings shall be grade A and meet BIFMA (Business and Institutional Furniture Manufacturers Association) and ANSI (American National Standards Institute) standards as determined by the University Project Lead.
- B. All furnishings shall have a minimum warranty of 10 years for single shift use.
- C. Provide installation drawings color coded to indicate furniture dealer.
- D. If furnishings are selected by consultant design firm, AU Interior Designers will review prior to approval for purchase.

E2010 Fixed Furnishings

E2012 Fixed Casework

- A. Casegoods
1. Horizontal Surfaces shall be high pressure laminate (HPL). Surfaces shall be medium density fiber board (MDF), particle board, or wheat board and must have a minimum density of 45 lb. per cubic ft. All horizontal surfaces shall be constructed to be dimensionally stable and shall be a minimum 1 1/16" thick.

1. In Residence Halls – MDF construction is not acceptable. All components shall be minimum plywood board construction.
2. Vertical exposed veneer surfaces shall be select grade hardwood veneer, selected, and matched to assure proper balance and consistency.
3. Joints and chassis must be fastened by screws, glue, and heavy-duty metal fasteners. All fasteners shall be concealed.
4. All drawer fronts must be a minimum three-ply construction. Drawer Slides must be full extension with steel ball bearing file drawer suspension.
5. Box drawers shall hold a minimum of 50 lbs. File drawers shall hold a minimum of 100 lbs. for 24-30" deep drawers, and 130 lbs for 36" deep drawers.
6. All desks must have the option to include grommets for wire management.
7. All desks must have $\frac{3}{4}$ or full modesty panels.
8. Glides shall be countersunk into hardwood edge at bottom of desk panel and consist of countersunk threaded metal sleeve and adjustable threaded metal glide.
9. Coordination Storage:
 1. Storage cabinets and lateral files shall have capability of being keyed-alike.
 2. Master keys shall be provided.
 3. Vertical filing cabinets shall not be used.
 4. Lateral Files
 1. Width shall be 30", 36" or 42"
 2. Depths shall be 18", 20" or 24"
 3. Maximum height shall be 4 drawers.
 4. Dual sided metal locking system that shall lock all drawers simultaneously.
 5. Drawer slides shall be of steel construction with carburized steel ball-bearings.
10. Approved Manufacturers (or equals):
 1. Kimball
 2. National
 3. Indiana
 4. OFS
 5. Gunlocke
 6. DarRan

E2013 Blinds & Other Window Treatment

- A. All exterior windows shall have window treatments limited to horizontal metal blinds or specialty shades.
- B. Horizontal metal blinds approved manufacturers:
 1. Hunter Douglas
 2. Levelor
 3. Bali
- C. Specialty shades approved manufacturers:
 1. Mecho

2. Draper
3. Hunter Douglas

E2015 Fixed Multiple Seating

A. Fixed Seating

1. Seats shall be minimum 20" wide.
2. Seats shall be numbered as specified by University Project Lead.
3. Foam seat shall be minimum 3" thick.
4. Chairs must be constructed with polypropylene backs and shell. The inside of the back and seats must be foam covered in fabric or vinyl.
5. The minimum requirements for tablet arms are as follows:
 1. Must adequately fit a 13"-16" laptop computer.
 2. Must be available right and left-handed.
 3. HPL or vinyl clad top
 4. Vinyl edge

E2020 Moveable Furnishings

E2022 Furniture & Accessories

A. System Furniture Panels

1. The connection system shall be metal-to-metal.
2. All panel connections shall be such that light passage and electrical wiring are concealed.
3. The system must feature replaceable exterior surface skins or tiles that can be replaced in the field.
4. Individual workstation changes shall be capable of being made without disruption to adjoining workstations.
5. The system shall allow for selective placement of surface finish options.
6. Fabric surface panels shall be tackable.
7. The system shall have wood veneer trim or painted metal top caps and end caps
8. Panels shall have the ability to stack up and/or down in the field.

B. System Furniture Electrical and Lighting

1. A licensed electrician shall wire system furniture system base feed to building power system.
2. A minimum of three-circuit, eight-wire power system shall be provided.
3. Separate data and telecommunication raceways shall be provided.
4. Raceway covers shall be securely hinged.
5. Panel system shall be capable of adding or removing baseline or beltline power in the field without dismantling the system.
6. Task lights shall be LED.
7. Task lights shall have a minimum 6-foot cord and an on/off rocker switch.

C. System Furniture Work Surface

1. Maximum unsupported length of work surface shall be 5'

2. A 7/8"-1" gap at the back of the freestanding or wall supported work surface or provide grommets or cutouts to allow electrical cords to drop through to cable management components.
3. Panel mounted surfaces shall have a capacity of 31.5 psf
4. Access to work surface wire management should run the entire length of the back edge of all work surfaces regardless if it is panel mounted, wall mounted, or freestanding
- D. System Furniture Pedestals; refer to Steel Storage
- E. System Furniture Overhead Furniture
 1. Shall attach to either the panels or the walls (using wall track system)
 2. Minimum 22 gauge steel construction
 3. Provide an anti-dislodgment mechanism on all overhead units.
 4. The overhead doors shall open up and over.
 5. The load limit for any overhead storage unit or shelf shall be 150 pounds.
 6. Shall be lockable and have the ability to be keyed alike.
 7. All overheads shall be capable of incorporating a task light with enclosed vertical cord manager.
 8. Approved Manufacturers (or equals):
 1. Steelcase
 2. Allsteel
 3. Haworth
 4. Herman Miller
 5. Kimball
 6. Knoll
- F. System Furniture Keyboard Trays
 1. Fully articulating with palm rest
 2. Shall include reversible mouse support and include wrist support.
 3. Approved Manufacturers (or equals):
 1. Humanscale
 2. Herman Miller
 3. Steelcase
 4. ESI
 5. Knoll
- G. Lounge Furniture
 1. Lounge seating fabric covering shall be Crypton or Nanotex finish or approved equal. Minimum 75,000 double rubs using Wyzenbeek method.
 2. Approved Manufacturers (or equals):
 1. KI
 2. Integra
 3. Arcadia
 4. National
 5. Coalesse
 6. Carolina
 7. Herman Miller
 8. Allsteel
 9. OFS Brands

3. If lounge chairs are specified with integral tablet arms, the tablet arm shall have a minimum weight capacity of 300 pounds – solid surface is preferred for student facing spaces.
 4. Occasional tables shall be matched to the lounge furniture.
- H. Lounge Side Chairs
1. Wood or steel frame.
 2. Shall have option for padded seat and/or back.
 3. Shall have minimum 300 pound capacity
 4. Chair glides shall be specified according to type of floor.
 5. Approved Manufacturers (or equals)
 1. Indiana
 2. Steelcase
 3. National
 4. Highmark
 5. SitOnIt
 6. Haworth
 7. Allsteel
 8. OFS Brands
- I. Stacking or Nesting Chairs
1. High density stackers or flip/nest.
 2. Weight capacity minimum of 300 lbs.
 3. Any high-density stacking chairs must have polypropylene back and seat and tubular steel frame.
 4. Training room fabric chair coverings shall be Crypton or Nanotex finish or approved equal. Minimum 75,000 double rubs using Wyzenbeek method.
 5. Chair glides shall be specified according to the type of floor.
 6. Approved Manufacturers (or equals):
 1. KI
 2. SitOnIt
 3. Highmark
 4. Herman Miller
 5. Haworth
 6. Knoll
- J. Classroom Furnishings Tables and Desks
1. Horizontal Surfaces shall be high pressure laminate (HPL). Surface substrate shall be medium density fiber board (MDF), particle board, or wheat board and must have a minimum density of 45 lb. per cubic ft. All horizontal surfaces shall be constructed to be dimensionally stable and shall be a minimum 1 1/4" thick.
 2. Flat PVC or vinyl edge. Knife edge or self-edge is unacceptable.
 3. Minimum 18" deep, maximum 30" deep
 4. Height shall be 29-30"
 5. For 60" wide tables, maximum seating capacity is 2; for 84" wide tables, maximum seating capacity is 3.
 6. Steel base
 7. Glides or locking casters.

8. Approved Manufacturers (or equals):
 1. KI
 2. Coalesse
 3. Berco
 4. Haworth
 5. Versteel
- K. Classroom Seating
 1. High density stackers, sled base, four-legged, flip/nest, task seating
 2. Weight capacity minimum of 300 lbs
 3. No arms
 4. Classroom chair coverings shall be Crypton or Nanotex finish or approved equal. Minimum 75,000 double rubs using Wyzenbeek method.
 5. Casters shall be specified according to type of floor.
 6. Approved Manufacturers (or equals):
 1. SitOnIt
 2. Global
 3. Highmark
- L. Classroom Tablet Armchairs
 1. Must adequately fit a 13"-16" laptop computer.
 2. Must be available right and left-handed.
 3. HPL or vinyl clad top
 4. Vinyl edge
- M. Computer Furnishings
 1. Horizontal Surfaces shall be high pressure laminate (HPL). Surface substrate shall be medium density fiber board (MDF), particle board, or wheat board and must have a minimum density of 45 lb. per cubic ft. All horizontal surfaces shall be constructed to be dimensionally stable and shall be a minimum 1 1/4" thick.
 2. Flat PVC or vinyl edge
 3. Minimum 18" deep, maximum 30" deep
 4. Height shall be 29-30"
 5. For 60" wide tables, maximum seating capacity is 2; for 84" wide tables, maximum seating capacity is 3
 6. Steel base
 7. Power infeed shall be capable of either hardwire or single circuit plug-in.
 8. Two duplex receptacles per table for widths over 36".
 9. Electrical components (receptacles, lighting, etc.) shall be serviceable and allow for the replacement of individual components.
 10. Table to table power connectors available for a variety of table widths
 11. Power wireway shall provide for separation of electrical and data channels.
 12. Pop-up receptacle modules should be provided as an option.
 13. Grommets and wire managers shall be available as an option.
 14. CPU holders and keyboard trays should be provided as an option.
 15. Approved Manufacturers (or equals)
 1. KI
 2. Haworth

3. Coalesse
4. Versteel
- N. Computer Lab Seating
 1. Sled base, four-legged, flip/nest, task seating
 2. Weight capacity minimum of 300 lbs
 3. With or without arms
 4. Computer lab chair coverings shall be Crypton or Nanotex finish or approved equal. Minimum 75,000 double rubs using Wyzenbeek method.
 5. Approved Manufacturers (or equals)
 1. SitOnIt
 2. Steelcase
 3. Versteel
 4. Haworth
 5. Highmark
- O. Conference Tables
 1. Veneer or HPL tops, solid surface or stone equal may be approved where appropriate.
 2. Wood, flat PVC or vinyl edge, minimum 1.5" overall thickness
 3. Height shall be 29-30"
 4. Power/data capabilities shall be an option with grommets and wire managers.
 5. Approved Manufacturers (or equals)
 1. Kimball
 2. National
 3. Indiana
 4. Coalesse
 5. Herman Miller
 6. Nucraft
- P. Conference Seating
 1. Weight capacity minimum of 300 lbs
 2. Minimum seat width shall be 22"
 3. Pneumatic height adjustable
 4. 5-star swivel base with dual wheel casters
 5. Base understructure shall be steel.
 6. Upholstered seat with high density foam
 7. Chairs shall be either fully upholstered or mesh back.
 8. Upholstery shall be Crypton or Nanotex finish or approved equal. Minimum 75,000 double rubs using Wyzenbeek method.
 9. Approved Manufacturers (or equals)
 1. National
 2. SitOnIt
 3. Herman Miller
 4. Keilhauer
 5. Allseating
 6. Steelcase
- Q. Meeting Room Tables:
 1. HPL tops

2. Wood, flat PVC or vinyl edge, minimum 1.25" overall thickness
 3. Height shall be 29-30"
 4. Approved Manufacturers (or equals):
 1. KI
 2. National
 3. Indiana
 4. Herman Miller
 5. Versteel
- R. Meeting Room Seating
1. Weight capacity minimum of 300 lbs
 2. Minimum seat width shall be 22"
 3. Base understructure shall be steel.
 4. Upholstered seat
 5. Upholstery shall be Crypton or Nanotex finish or approved equal. Minimum 75,000 double rubs using Wyzenbeek method.
 6. Approved Manufacturers (or equals):
 1. National
 2. SitOnIt
 3. Herman Miller
 4. KI
 5. Steelcase
- S. Break Room Tables
1. HPL or metal tops
 2. Flat PVC or vinyl edge, minimum 1.25" overall thickness
 3. Minimum 30" deep/diameter
 4. Height shall be 29-42"
 5. Rectangular tables
 1. 60" wide rectangular tables, maximum seating capacity is 2 per side
 2. 84" wide rectangular tables, maximum seating capacity is 3 per side
 6. Circular tables
 1. 36" diameter tables, maximum seating capacity is 4
 2. 48" diameter tables, maximum seating capacity is 5
 3. 60" diameter tables, maximum seating capacity is 6
 7. Square tables
 1. 30" or 36" square tables, maximum capacity is 4
 8. Steel base
 9. Approved Manufacturers (or equals):
 1. KI
 2. Berco
 3. Versteel
 4. National
- T. Break Room Seating
1. Stackable
 2. Polypropylene back and seat
 3. Tubular steel frame
 4. Chairs with flex back option are acceptable.

5. Chair glides shall be specified according to type of floor (i.e. poly glides for VCT)
 6. Approved Manufacturers (or equals):
 1. KI
 2. Steelcase
 3. SitOnIt
 4. Haworth
- U. Steel Storage
1. Minimum 22 gauge steel finished in baked enamel
 2. Storage cabinets and lateral files shall have the capability of being keyed-alike.
 3. Master keys shall be provided.
 4. Vertical filing cabinets shall not be used.
 5. Lateral Files:
 1. Widths shall be 30", 36" or 42"
 2. Depths shall be 18"
 3. Maximum height shall be 5 drawers.
 4. Dual sided metal locking system that shall lock all drawers simultaneously.
 5. Drawer slides shall be of steel construction with carburized steel ball-bearings.
 6. Approved Manufacturers (or equals)
 1. Steelcase
 2. Herman Miller
 3. Knoll
 4. Haworth
 5. Great Openings
- V. Steel Storage Cabinets
1. Widths shall be 30", 36" or 42"
 2. Depths shall be 18" or 24"
 3. Heights shall be 28" to 84" maintaining required clearance for sprinkler system.
 4. Dual sided metal locking system that shall lock all drawers/doors simultaneously.
 5. Approved Manufacturers (or equals):
 1. Steelcase
 2. Herman Miller
 3. Knoll
 4. Haworth
 5. Great Openings
- W. Steel Storage Drawer Pedestals
1. Depths shall be 20"-30"
 2. Metal locking system that shall lock all drawers simultaneously.
 3. Shall have full extension drawers.

4. Approved Manufacturers (or equals):
 1. Steelcase
 2. Herman Miller
 3. Knoll
 4. Haworth
 5. Great Openings
- X. Task Seating
 1. Minimum requirements:
 1. Adjustable height arms
 2. Pneumatic adjustable height seat
 3. High-density foam seat cushion
 4. Seat fabric shall be Crypton, Nanotex, or approved equal. Minimum 75,000 double rubs using Wyzenbeek method.
 5. Mesh or upholstered back.
 6. Adjustable lumbar support
 7. Tilt lock mechanism
 8. Hard and soft casters shall be available. Casters shall be verified according to flooring type.
 9. Five star base with dual wheel casters
 2. Approved Manufacturers (or equals):
 1. Steelcase
 2. Highmark
 3. SitOnIt
 4. Allseating
 5. Knoll
 6. Herman Miller
 7. Haworth
 8. National

Document Revision History

Version	Section	Summary of Change	Date



2022 Section G – Sitework

INDEX

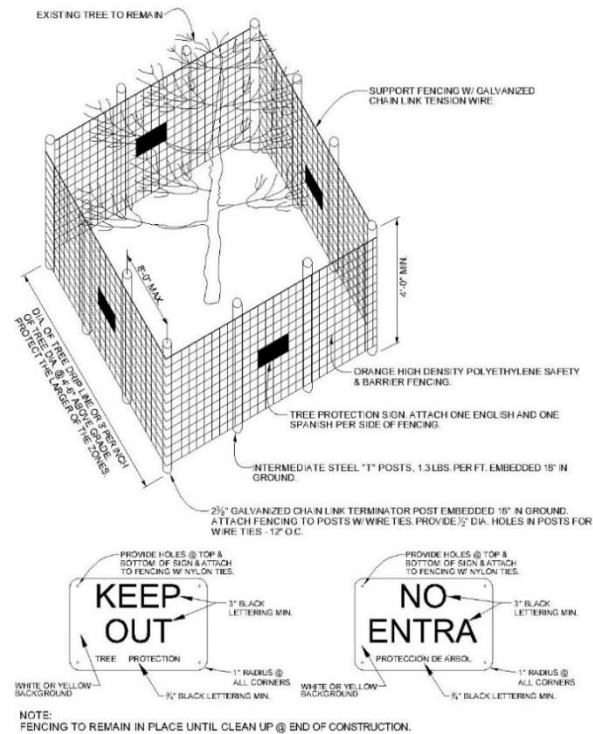
G10	Site Preparation
G20	Site Improvements
G30	Site Mechanical Utilities
G40	Electrical Site Improvements (Utilities)
Document Revision History	

G Sitework**G10 Site Preparation****G1010 Site Clearing****G1011 Clearing and Grubbing**

- A. Debris resulting from stripping and clearing operations shall be promptly removed from University property.

G1012 Tree Removal and Trimming

- A. Tree Protection:
 - 1. All trees within the project boundary that are designated to remain are to be protected using tree protection fencing with either HDPE safety or chain link fencing. No construction activity is to be performed inside the tree protection fencing.
 - 2. Designated Tree protection zones shall be the larger of:
 - 1. The drip line of the tree
 - 2. Diameter at breast height (in inches) x 1.5 (feet per inch)
 - 3. Tree protection fencing should be installed prior to the start of any land disturbance activity and maintained until final landscape is installed.
 - 4. The tree protection fencing should be inspected daily. Any failures of said fencing should be repaired immediately.



TREE PROTECTION FENCING

B. Stump Removal

1. Removal of trees and shrubs shall include the removal of stumps and roots to the extent that no root greater than 3 inches in diameter remains within 5 feet of either underground structure, utility line, under footings, or paved areas. Grubbing in open areas shall include removal of stumps and 3 inch or greater roots to 2 feet below finish grade elevations.

C. Selective Thinning

1. When trenching for utilities is required within the drip line, tunnel under or around roots by hand digging. Do not cut main lateral or tap roots. Cut smaller roots which interfere with a sharp pruning tool; do not chop or break.
2. Do not allow exposed roots to dry out before backfill is placed; provide temporary earth or moist burlap cover.
3. Any tree to remain that has had excavation within the drip line shall be pruned by a professional arborist according to the National Arborist Association Standards Class IV - Cutting Back or Drop Crotch Pruning.

4. Cutting back or drop crotch pruning shall consist of the reduction of tops, sides, under branches or individual limbs. This practice is to be undertaken only in cases of utility line interference, or where certain portions of the roots or root systems have been severed or severely damaged.
 1. All cuts shall be made sufficiently close to the trunk or parent limb, without cutting into the branch collar or leaving a protruding stub, so that closure can readily start under normal conditions. All cuts shall be clean. It is necessary to precut branches too heavy to handle to prevent splitting or peeling the bark. Where necessary, to prevent tree or property damage, branches shall be lowered to the ground by proper ropes or equipment.
 2. Remove the weaker, least desirable, crossed or rubbed branches. Such removal shall not leave holes in the general outline of the tree.
 3. Generally, in reducing size (cutting back) not more than one-third of the total area shall be reduced at a single operation. When cutting back, only drop crotch as much as necessary. Where practical, avoid cutting back to small suckers. All effort shall be made to cut back to a lateral, one-third the diameter of the cut being made. In reducing overall size, attention is to be given to the symmetrical appearance. Top is to be higher, and sides reduced in order to maintain a tree-like form. When cutting back trees, one shall have in mind to make them shapely and typical of their species.
 4. On thin bark trees, just enough limbs shall be removed to get the effect wanted without admitting too much sunlight to the trunk of the tree or the top of large branches. Care shall be taken with the following species: lindens, maples, beeches, apples, oaks, and other trees susceptible to sunscald, growing in different geographical areas. The damage may be minimized by doing work on susceptible species during the dormant season.
 5. In lifting the lower bottom branches of trees for under clearance, care shall be given to symmetrical appearance, and cuts shall not be made so large that they will prevent normal sap flow.
 6. Periodical drop crotching or cutting back of silver maples, poplars, and other trees with brittle and soft wood is an established practice and has proven beneficial in maintaining the safety of these trees over long periods of growth. Other trees with soft and brittle wood growing in different geographic areas may be specifically named when it is common practice to control growth by cut-back. An alternate method in some situations for maintaining the safety of these trees would be cabling and bracing.
 7. Maintain existing grade outside drip line of trees, unless otherwise indicated on plan. Do not leave open excavations in the vicinity of protected trees for longer than 2 days to prevent soil moisture reduction.
- D. Fertilization
 1. Where tree roots within the drip line will be covered with asphalt or concrete, feeders shall be installed as recommended by the National Arborist Association Standards

2. Install extended feeders where construction of wells or retaining walls is required within the drip line.
3. The design must provide a yard hydrant, irrigation system or other convenient water source adjacent to trees that remain.
4. The specifications shall define proper fertilization and the contractor shall fertilize affected trees during construction.

G1020 Site Demolition and Relocation**G1022 Demolition of Site Components**

- A. Demolition shall remove all parts of a building, including foundations, and all associated underground utilities.
- B. The demolition plan shall indicate requirements for control of dust and noise mitigation.

G1030 Site Earthwork**G1031 Site Grading Excavation**

- A. Finish grade slopes shall be shallow enough to allow mowing and maintenance (generally 3:1 or less).

G1032 Borrow Fill

- A. Specify project specific earthwork and compaction requirements based upon recommendations from the geotechnical investigation.
- B. Projects not obtaining a new geotechnical investigation shall coordinate compaction requirements with the UPL. site specific compaction requirements

G1033 Soil Stabilization & Treatment

- A. All projects, regardless of size, disturb land shall be designed to reduce erosion and sedimentation impacts through appropriate Best Management Practices (BMPs) per the latest edition of the Alabama Handbook for Erosion Control, Sediment Control and Stormwater Management of Construction Sites and Urban Areas by the Alabama Department of Environmental Management (ADEM).
- B. Post construction stormwater requirements shall be implemented in projects that increase impervious surface so that development will mimic pre-development hydrology are described in the Auburn University Post Construction Stormwater Manual.

G1037 Erosion Control

- A. Except where the Auburn University Design and Construction Standards are more stringent, design shall comply with The Alabama Handbook for Erosion and Sediment Control and Storm Water Management of Construction Sites and Urban Areas.

- B. The Erosion and Sediment Control Plan shall be prepared by a Qualified Credentialed Professional (QCP) as defined by ADEM.
- C. The Design Return Period Storm for sizing Erosion and Sediment Control Measures shall be a 5 year-24 hour storm.
- D. Before initiating any earthwork not directly associated with the installation of erosion and sediment control measures as indicated on the pre-construction erosion control plan, the Contractor shall submit a Land Disturbance Authorization form from the University Project Lead.
- E. Unless notified by the UPL, the Contractor shall be responsible for obtaining a Notice of Registration (NOR) from ADEM and providing all necessary inspections and corrective measures during construction. The Contractor shall provide proof of ADEM registration to the UPL prior to receiving the Land Disturbance Authorization permit.
- F. At the discretion of the UPL, turbidity monitoring will be implemented by the Owner under the following guidelines:
 - 1. Project sites that discharge directly to an open channel or stormwater conveyance
 - 2. Project sites where 0.5 acres or greater of disturbance is anticipated
 - 3. Sampling shall occur monthly or within 24 hours of any storm event greater than 0.5 inches
 - 4. Sampling locations should include site discharge point and upstream and downstream sample locations as determined in design
 - 5. Where upstream and downstream monitoring is implemented, any increase in turbidity shall be no more than 50 Nephelometric Turbidity Units (NTUs)
- G. ADEM shall be notified by the Owner if any sites are found to be non-compliant during inspections with the Contractor being responsible for any incurred regulatory fines throughout the course of construction.
- H. Erosion and Sediment Control Plan (ESCP)
 - 1. The Erosion and Sediment Control Plan is a set of drawings which provides the necessary measures to reduce erosion on construction sites and minimize the impacts of sediment, turbidity, and hydrologic changes off-site throughout the life of the project and beyond. It is to ensure that erosion and sediment control is appropriate for the planned use of the site.
 - 2. The ESCP shall be designed as a three phase plan to include the following:
 - 1. 8.2.1 Phase 1: Pre-Construction Site Plan Drawing - This plan to show necessary erosion sediment control measures to be installed before land disturbance authorization is granted. Only grading specifically identified as intended for erosion and sediment control shall be permitted prior to land disturbance authorization.
 - 2. Phase 2: Construction Site Plan Drawing
 - 3. Phase 3: Post-Construction Site Plan Drawing - Note: This plan to show necessary Erosion Sediment Control Measures to be installed before substantial completion to be awarded.
- I. Silt Fence (SF)
 - 1. All silt fence shall be installed in 2 parallel rows, 2 feet apart at project boundary.

2. Type A silt fence is the standard silt fence utilized by Auburn University.
3. Type A is used in locations of high flow and is supported by wire reinforcement.
4. Type A silt fence is reinforced galvanized steel of the following dimensions:
 1. 12 gauge “hog wire” with small openings oriented at the base of the silt fence.
 2. 14 gauge 4”x4” wire mesh size, W1.4/1.4

G1040 Hazardous Waste Remediation**G1042 Soil Restoration and Treatment**

- A. Hazardous materials survey and remediation are assumed to be separate from building design unless otherwise requested by the University Project Lead and/or Risk Management and Safety.
- B. Auburn University will contract directly with environmental consultants to perform the necessary assessments and remediation, if applicable. The consultant retained for such services must be a professional engineer with current registration in the State of Alabama in addition to any certifications required by local, state, and federal regulatory agencies.

G20 Site Improvements**G2010 Roadways**

- A. Fire apparatus access roads shall be included in the design taking into consideration building surrounding the project site.

G2012 Paving & Surfacing

- A. Roadways and Parking Lots
 1. Provide pavement specifications that reflect Alabama Department of Transportation (ALDOT) standard pavement mix design as appropriate for specific soil conditions and anticipated loading
 2. Street and parking lot layouts shall comply with Manual on Uniform Traffic Control Devices (MUTCD).. Parking space shall be 9’ wide and 18’ deep
 3. Routes to ADA accessible locations (i.e. accessible parking, drop off locations, accessible routes building entrances, etc.) shall be maintained or alternate routes shall be provided
- B. Permanent and temporary traffic regulatory signage and pavement markings shall meet the requirements of MUTCD
- C. All signage shall comply with the Auburn University Sign & Wayfinding Program Manual

D. Pavement markings shall be as follows:

	Non-reflective traffic rated paint	Thermoplastic, Class 2, Type A per ALDOT Specifications
Campus Roads		X
Parking Lots	X	

G2030 Pedestrian Paving

G2031 Paving & Surfacing

- A. Typical width shall be 6 feet for minor walks and 8 feet for major walks
- B. An accessible route must be provided outside of the construction site
- C. Selection of paving material shall be based on all of the following criteria:
 - 1. Landscape Master Plan
 - 2. Existing paving material in the vicinity
 - 3. Maintenance and durability
- D. Concrete Walks
 - 1. Minimum of six (6) inches thick with 6x6 welded wire fabric over 6 inches of compacted gravel base over a compacted soil sub-base
 - 2. Subgrade conditions must be considered during design of walks
 - 3. Light broom finish perpendicular to traffic flow
 - 4. Joints shall be tooled.
 - 5. No fibrous mesh
 - 6. No stamped or patterned concrete
 - 7. One of the coloring agents described below shall be mixed into the concrete at the batch plant. Both mixes begin with 4000psi concrete with a 3 inch slump.
 - 1. Synthetic Pigment: Medium Alabama Ochre at 12.5 lbs. per yard, by Alabama Pigments Company, conforming to ASTM C979, synthetic mineral-oxide or water reducing admixtures, color stable, free of carbon black, non-fading, and resistant to lime and other alkalis
 - 2. Natural Pigment: Ochre #548 at 37.5 lbs. per yard, by Southern Color or New Riverside in Cartersville, Georgia
 - 3. Exceptions for omitting coloring agent to match existing must be approved by the University Project Lead
 - 8. Joint sealants
 - 1. Sealant color shall match the surrounding concrete.
 - 2. For Ochre colored concrete use BASF "Saltbox" or equivalent.
- E. Bituminous Walks
 - 1. Utilize an ALDOT approved mix for light-duty traffic
 - 2. Typical bituminous walks shall be a full 2 inch compacted thickness (220 lbs. per square yard wearing course asphalt) on a 4 inch compacted gravel base

3. The base and the bituminous material shall each be compacted to 98% of their test densities
- F. Masonry Pavers
 1. Clay Brick Pavers
 1. Impervious Pavers
 2. Pavers to be installed on bedding sand on top of 6" concrete slab meeting requirements of concrete walk.
 3. Polymeric sand to be used to stabilize joints
 4. Primary Paver – 4"x8" Heavy Vehicular paver English Edge Full Range by Pine Hall Brick
 5. Secondary Paver – 4"x8" Heavy Vehicular paver Georgian Edge Buff by Pine Hall Brick
 2. Detectable Warning Paver – 4"x8" Heavy Vehicular Truncated Dome paver Pathway Red by Pine Hall Brick
 3. Pervious Pavers
 1. Pavers shall be installed on pervious stone base per manufacturer recommendations
 2. Primary Pervious Paver – 2 1/4" thick StormPave permeable paver Full Range by Pine Hall Brick
 4. When a curb ramp is built on one side of a street, a companion ramp is required on the opposite side of the street. When project limits would normally end within a street intersection, the limits must be extended to allow construction of a companion ramp on the opposite side of the intersection.

G2040 Site Development

- A. Structural Steel
 1. All structural steel in exterior locations (such as cornices, parapets, handrails, guard rails, or canopies) shall be hot dip galvanized steel and powder coated Auburn Bronze.

G2041 Fences and Gates

- A. Fencing shall be in accordance with the Landscape Master Plan.
- B. Bollards:
 1. Fixed:
 1. 6" dia. X 48", 11 gauge steel
 2. Concrete filled, rounded top set in concrete footing
 3. 2 feet above grade
 4. Maximum spacing: 66" o.c.
 5. Painted Deep Bronze (Matthews MP37092-R105749)
 2. Removable & Locking:
 1. 6" x 30" removable section (24" above grade)
 2. 8" x 32" sleeve insert in concrete footing
 3. Top of insert shall be removable and set flush with grade
 4. Maximum gap on insert for upper section: 3/8"
 5. Powder coated Deep Bronze (Matthews MP37092-R105749)

6. 3" wide yellow reflective stripe around top
 7. With locking pin with tabs for padlock
- C. Post and Chain:
1. Post:
 1. 3" dia. X 60", 11 gauge tube,
 2. 36" above grade, set in concrete footing
 3. Capped with cast iron bollard cap (Orleans Ornamental No. 9539) or equal welded to tube.
 4. Provide 1-1/4" dia and 3/8" through holes for chain and securing bolt
 5. Powder coated Deep Bronze (Matthews MP37092-R105749) after fabrication
 2. Chain:
 1. 5/16" galvanized chain
 2. Secured to post with 5/16" bolt with lock washer and nut
 3. Painted Deep Bronze (Matthews MP37092-R105749)

G2042 Retaining Walls

- A. Retaining walls shall be cast in place concrete and constructed with vertical drainage system behind the wall with an outlet pipe connected to the storm drainage system, or with a direct outlet to a drainage channel.
- B. Drainage pipe shall include wrapping the pipe with filter fabric sock and careful bedding of the pipe with appropriate fill material.
- C. Weep holes as a means of drainage for retaining wall systems are not to be used without prior approval.
- D. All exposed concrete shall be brick veneered or colored to match the concrete sidewalk requirements

G2045 Site Furnishings

- A. Bicycle Racks
 1. "Campus Rack" by the DERO Bike Rack Company. Color: Statuary Bronze Powder Coat.
 2. Surface Mounted on concrete pad or brick pavers
 3. Bicycle racks shall be installed at the following ratios:
 1. Residence Halls: one bicycle stall for every four beds
 2. Covered bicycle parking coordinated with adjacent building architecture to be provided at residence halls.
 3. Classroom Buildings: one bicycle stall for every eight occupants plus six stalls
 4. Office/Administrative Buildings: one bicycle stall for every twenty occupants plus six stalls.
- B. Site Seating
 1. Fixed Furnishings
 1. Benches
 1. All benches to be surface mounted to concrete or brick paver pad

2. Campus Standard Bench - Bronze Steelsites Series Model RB-28 by Victor Stanley
2. Tables and Chairs
 1. Fixed tables and chairs to be surface mounted to concrete or brick paver pad
 2. Provide ADA compliant seating
 3. Campus Standard Table and Chair – Stormcloud 35 Collection Mingle Seating by Landscape Forms
- C. Loose Furnishings
 1. Trash and Recycling
 1. Waste and Recycling Receptacles – Victor Stanley Steelsites Series Model RB-36 powdercoated VS Bronze. Provide labeling bands.
 2. Waste and Recycling Compactor – Solar powered Big Belly compacting receptacle
- D. Trash and Recycling Dumpsters
 1. For new buildings, provide a standard outdoor service area to place 3-6 recycling 95-gallon carts, a cardboard recycling dumpster and at least one trash dumpster.
 2. High volume areas (i.e. dining venues, residence halls, etc.) may require more than one trash dumpster, cardboard recycling dumpster, other waste and recycling equipment (i.e. compactor, baler, etc.) towable carts for cardboard and trash, additional 95-gallon carts or containers for other waste (i.e. grease, food waste, animal bedding, etc.)
 3. Locations shall reduce the visual impact of trash and recycling dumpsters and equipment.
 4. Dumpster enclosures shall be located in close proximity to the service dock of each building.
 5. Paved access for staff to deposit waste and vehicle access by a front load refuse truck (or service vehicle determined by the University Project Lead) shall be considered in the location. Provide turn around route or access without creating a traffic hazard. Allow for overhead clearance of 25' at the loading point.
 6. Masonry, wood, or plant screening wall shall be provided for each location.
 7. Front end load dumpsters shall be used where space permits.
 8. Dumpster Pad:
 1. A reinforced concrete pad shall be installed under and in front of each dumpster to prevent damage from the front wheels of the service vehicle.
 2. A minimum of (dumpster width plus 6') x 15' shall be allotted for each front end load dumpster. The same area requirements shall be allotted for cardboard recycling dumpsters.
 3. Shall extend 6' in front of any trash or recycle container.
 9. Provide heavy duty grade paving for the route that the refuse truck will take to service the dumpsters.
 10. Provide signage and striping to ensure adequate access to waste and recycling area.
 11. Connect surface drains for trash compactor pads to sanitary sewer.

G2050 Landscaping

- A. Landscaping and plant materials shall be warranted for one year unless otherwise specified

G2054 Seeding and Sodding**A. Lawns**

1. Permanent lawns shall be sodded. Seeding is allowed only for temporary purposes
2. The areas to be grassed shall be held down 4" below finished grade prior to sodding
3. Sodded grasses shall be:
 1. Tifway 419 Bermudagrass
 2. Emerald Zoysiagrass
 3. Meyer Zoysiagrass
 4. Discovery Bermudagrass
 5. Celebration Bermudagrass.
4. Fertilizer shall be a commercial fertilizer delivered in unopened original containers each bearing the manufacturer's guaranteed analysis. Any fertilizer which comes caked or otherwise damaged shall not be accepted. Fertilizer selection and application rate shall be determined by soil analysis. Lime shall be granulated agricultural limestone applied at a rate according to soil sample analysis. Apply fertilizer uniformly at specified rate with an approved distributor prior to seeding. Fertilizer shall be worked into the top three to four inches of the soil
5. Mulch for seeded areas shall be weed-free grain straw. Quantity shall be 3,300 pounds per acre (approximately 75 pounds per 1000 square feet) or 65 bales per acre (1-1/2 bales per 1000 square feet)
6. Cultivation average shall be a 4" deep layer of topsoil after scarification to a depth of 6" minimum. Pulverize the soil with a roller type pulverizer with 4" tines. Hand rake the soil to level and remove loose stones and other debris leaving a smooth friable condition suitable for sodding
7. All seeding shall be conducted with moist but not wet soil and broadcasted by means which will ensure uniform distribution and thorough coverage of the entire area. Areas which do not show a prompt "catch" or have been washed shall be reseeded for thorough coverage

B. Maintenance

1. Installed landscaping shall be maintained until final acceptance of the landscaping
2. Sodded areas shall be sufficiently irrigated to maintain a continually moist condition
3. Mowing operations shall be conducted to keep the lawn in a neat and well-groomed appearance. The lawn shall only be cut when grass and soil are dry. Not more than 1/3 of the total leaf surface is to be removed at one mowing. It is not necessary to remove clippings if grass is mowed according to these specifications

4. General maintenance by the Owner, after final acceptance, shall not void the warranty
5. Soil analysis, seed and fertilizer data, and instructions for planting and care of the lawn shall be submitted to the University Project Lead
6. Warranty: Sod shall be warranted for six months after final acceptance of landscaping.

G2057 Irrigation Systems

- A. Irrigation systems shall be designed to minimize potable water use
- B. All fixed irrigation systems shall fully and seamlessly integrate with the current networked irrigation control system. System shall have the following capabilities at a minimum:
 1. Web based water management software
 2. Advanced flow management capability
 3. Weather monitoring devices
 4. Flexible communication options
 5. Moisture sensing capability
- C. Irrigation Controllers shall be grounded
- D. Drip irrigation to be installed in all shrub, annual, perennial, and tree areas of the landscape. Drip irrigation shall be staked to stable ground every 4'
- E. Gear driven rotor sprinklers shall be installed in all turf areas. Type of head depends on sprinkler head spacing
- F. Sprinkler head spacing of 35-60' use large rotor with swing arm such as Rainbird Falcon, Stainless Steel or approved equivalent.
- G. Sprinkler head spacing of 20-35' use Hunter I-20 with flex pipe, or approved equivalent.
- H. Sprinkler head spacing of less than 20' use spray head such as Rainbird 1806 Sam or approved equivalent.
- I. All sprinkler heads must have a check valve to prevent line drainage
- J. Nozzle selection must utilize Matched Precipitation Rates
- K. Main isolation valves shall be full port brass ball valve inside a valve vault with a double check backflow preventer
- L. Master valves:
 1. Shall be installed after the backflow prevention consisting of a normally open valve sized according to design flow.
 2. Electrically operated with a minimum of #14 AWG for conventional wire or appropriately sized per manufacturer specifications for two wire
 3. Brass construction
 4. Buckner/Superior or approved equivalent
- M. Irrigation flow meters shall be installed after the master valve. Flow meters are to be sized according to the required design flow. Flow meter must have the capability to communicate with the irrigation system
- N. Brass quick-connect hose bibs shall be 1" Rainbird 55k or approved equivalent and placed on the irrigation main line. Bibs should be placed around the site such that ALL the landscape can be watered via hoses of maximum length of 100 feet. These quick-connect hose bibs should be located DOWNSTREAM of a non-

return water meter and double-check valve backflow preventer and UPSTREAM of any irrigation station valve. These quick connect hose-bibs are required of ALL projects, even ones that have automatic irrigation systems.

- O. Valves shall be installed in a minimum of a 12" valve box
- P. Wire junctions shall be installed in a 10" round valve box with waterproof connectors.
- Q. All field wires shall be a minimum #14AWG rated for underground use
- R. Provide minimum 6" PVC sleeves under roadways, walkways, (hardscape) to accommodate installation of sprinkler system piping and wiring. Provide stamped indicator where sleeve traverses hardscape to allow for quick identification and location of sleeves
- S. All irrigation piping shall be installed with a #14 copper tracer wire
- T. Water service to irrigation system shall have a utility isolation valve upstream of a non-return water meter (provided by Auburn University), meter bypass and a back flow preventer. Irrigation meter shall be separate from the building water service.

G30 Site Mechanical Utilities

- A. Above ground utility appurtenances located in planting beds shall be one inch (1") above the landscaped surface.
- B. Above ground utility appurtenances located in lawn areas shall be flush to one inch (1") below the landscaped surface.
- C. Do not backfill utility trenches until approved by the University Project Lead.
- D. Survey grade as-builts shall be provided by the contractor including boring coordinates of trenchless installed utilities.
- E. Buried Piping
 - 1. Provide a minimum of 18" vertical and horizontal clearance between utilities.
 - 2. Domestic water, chilled water and fire lines shall be above other utilities in crossings.
- F. Utility Trench Bedding and Backfill
 - 1. The following requirements apply to potable water, fire, sanitary sewer, and storm sewer lines.
 - 1. Bedding Materials:
 - 1. Where trenches are excavated in soil, bedding material shall be #57 stone to a depth of approximately 4" under barrel of pipe.
 - 2. Where trenches are excavated in rock, bedding material shall be #57 stone, placed and compacted to a depth of approximately 6" under barrel of pipe.
 - 2. Backfill Materials
 - 1. Where trenches are excavated in soil, backfill material shall be #57 stone to ½ the diameter of the pipe, then the remainder shall be placed and compacted in suitable soil.
 - 2. #57 stone shall be used for backfill in the following trenched locations:
 - 1. In rock to a depth of 12 inches above the top of the pipe
 - 2. Under paved areas

3. Beneath footings and slabs
 4. At utility crossings to a depth of 12" above the highest pipe.
 3. Backfill with soil that can be smoothly dressed to match surface of ground adjoining the edges of the trench, and that will support the vegetation desired for the finished surface.
- G. General Utility Testing Requirements
1. The University Project Lead shall be notified a minimum of 48 hours prior to any testing.
 2. The contractor is solely responsible for safety during all testing.
 3. The results of all tests shall be provided to the Designer and the University Project Lead.

G3010 Water Supply

G3011 Potable Water Distribution and Storage

- A. Piping and Fittings
1. 3" piping shall not be used
 2. Piping 2-1/2" and smaller shall be Copper.
 1. Copper pipe 1" or smaller shall be soft annealed type K.
 2. Copper pipe 1-1/2" or larger shall be rigid type K.
 3. Couplings for copper pipe shall be crimping type rings Rigid ProPress system or approved equal, solid brass conductive union couplings Mueller 110 series or silver brazed, or approved equal.
 3. Piping 4" and larger shall be ductile iron.
 1. Ductile iron pipe and fittings shall be cement mortar lined per ANSI/AWWA A21.4/C104. Ductile iron pipe shall also be furnished with outside asphaltic coating of 1 mil thickness per ANSI/AWWA A21.51/C151.
 2. All ductile iron pipe and fittings shall have a minimum pressure class rating of 350.
 3. Joints for ductile iron pipe to be installed underground shall be "Push-on" joint pipe per ANSI/AWWA A21.11-07/C111.
 4. Gaskets for "Push-on" joint pipe shall be Styrene Butadiene Rubber locking type with high strength stainless steel wedges equally spaced around the gasket for full restraint per ANSI/AWWA A21.11-06/C111. Gaskets shall be:
 1. US Pipe and Foundry "Field Lok 350."
 2. American Cast Iron Pipe Company "Fast Grip."
 3. Additional Manufacturers may be submitted to University Project Lead for review.
 5. Joints for ductile iron pipe to be installed above ground shall be "Flanged" joint per ANSI/AWWA A21.10-08, A21.15-05/C110, and C115.
 6. Gaskets for "Flanged" joint pipe shall be Styrene Butadiene Rubber per ANSI/AWWA A21.11-06/C111.

7. Hardware for “Flanged” joint pipe shall be hexagonal type per ASTM A307-10, Grade B.
 8. All below grade ductile iron fittings and valves shall be restrained by use of bolted restraint device shall be mega-lugs by EBBA Iron or approved equal.
 4. All mechanical joint fittings requiring thrust blocks shall be wrapped in plastic prior to installation of concrete.
 5. All new water mains shall include underground warning tape placed 1’ above pipe during pipe backfill operations. Warning tape shall be non-conductive Poly 3” wide with 1” lettering 4 mils thick. Warning tape shall conform to APWA uniform color codes and shall read “BURIED WATER LINE”.
- B. Valves
1. All service lines off the main shall have an isolation valve.
 2. All 2” or larger service lines must include a tri-valve arrangement.
 3. All gate valves shall have a minimum pressure class rating of 250 with iron-body, bronze mounted, inside-screw, resilient seat, non-rising stem and equipped with rubber O-ring seals at the top of the stems.
 4. Gate valve bodies shall have mechanical joints for use below grade or flanged joints for above grade applications. 2” gate valves installed in vaults shall be standard threaded NPT connections.
 5. Mechanical joint gate valves shall be manufactured per AWWA C515 and provided by Mueller Company (Model Number), M & H Industries (Model Number), or approved equal.
 6. Flanged joint gate valves shall be manufactured per ANSI A21.15 and provided by Mueller Company (Model Number), M & H Industries (Model Number), or approved equal.
 7. Valves 2” and larger installed below grade shall have a 2” square valve operating nut and turn left or counterclockwise to open.
 8. All valves and valve extensions shall terminate within 2’ of finished grade.
 9. A valve jar shall be provided from valve housing to finish grade.
 10. Valves installed above grade shall have hand wheels.
 11. Automatic air release valves shall be combination type, single body, double orifice with large orifice having a diameter of 2" and small orifice having a diameter of 3/32". Valve body and cover shall be cast iron per ASTM A48, Class 30. Float shall be stainless steel per ASTM A240. Air release valves shall be installed in a precast concrete manhole with a standard cover. Automatic air release valves shall be APCO model 145C or approved equal.
- C. Backflow Preventers
1. Backflow prevention devices shall be Double Check or Reduced Pressure Zone type. Double Checks are the University’s preference for non-high risk plumbing applications. Designers shall use AWWA M14 “backflow Recommended Practices” for final determination of Double Check or Reduced Pressure Zone backflow preventers. Backflow Preventers shall be Watts Water Technologies models LF 709 and LF909 or approved equal for ¾” to 10” devices.

2. Enclosures for Reduced Pressure Zone backflow preventers installed above grade shall be heated and shall be Hydrocowl, Hot Box, Lok box, or approved equal. Interior RPZ installations shall include a dedicated floor drain near the RPZ's discharge bowl and piping.
 3. Exterior double check backflow preventers should be installed below grade in a meter box or vault.
 4. All non-irrigation and non-fire system backflow preventers shall be installed with a bypass for use during testing.
- D. Inserting Valves
1. Inserting valves shall be TEAM valve or approved equal.
 2. Shall be ductile iron bodied resilient wedge gate valves rated to 250 psig meeting the requirements of AWWA C515. Sizes 12" and smaller must be compatible with Cast/Grey Iron, all classes of Ductile Iron, IPS PVC, C900 & C909, Steel, and AC pipe diameters without changing top or bottom of split valve body.
 3. Valve exterior coating shall be 8 mils minimum of Fusion-bonded Epoxy meeting C550.
 4. The gate valve stem and wedge nut shall be copper alloy in accordance with Section 4.4.5.1 of the AWWA C515 Standard.
 5. The NRS stem must have an integral thrust collar in accordance with Section 4.4.5.3 of AWWA C515 Standard. Two-piece stem collars are not acceptable. The wedge nut shall be independent of the wedge and held in place on three sides by the wedge to prevent possible misalignment. Operated by 2" square wrench nut according to ASTM A126.
- E. Automatic Air Release Valves:
1. Shall be Val-Matic or approved equal.
 2. Automatic air release valves for installation on 24" diameter and smaller Ductile Iron Mains shall be similar and equivalent to Val-matic #15A, 1/2" inlet pipe thread, suitable for operating pressures below 150 psi.
 3. Air release valves shall be combination type, single body, double orifice with large orifice having a diameter of 1/2" and small orifice having a diameter of 1/16".
 4. Valve body and cover shall be cast iron in accordance with ASTM A48, Class 30.
 5. Float shall be stainless steel in accordance with ASTM A240.
 6. The air release valve shall not be placed in service until the water main has been flushed out and all the air has been manually vented through the horizontal bypass valve during water main filling operation.
 7. Each air release valve assembly shall consist of the following:
 1. One (1) Mueller double strap service saddle
 2. One (1) corporation stop, Mueller Thread x 1/2" I.P. thread (inside)
 3. Five (5) brass or copper pipe nipples (1/2")
 4. One (1) brass or copper union (1/2")
 5. One (1) brass or copper tee (1/2"x1/2"x1/2")
 6. Two (2) gate valves, wedge disc, rising stem, 1/2" Crane #431-UB, w/handwheel

7. One (1) air release valve as specified hereinabove
8. One (1) air release valve vault as specified herein.

F. Valve Boxes

1. Valve boxes shall be two piece adjustable screw type asphalt coated with an inside diameter of 5 ¼". Sigma Corporation model VB261-8 or approved equal.
2. Valve box lid shall be cast iron drop in non-locking type imprinted with "Water" on the top. Sigma Corporation model VB2600W or approved equal.
3. The following general note shall be added to plans that include installation of a valve box. Valve box risers shall be cast iron and shall conform to that of valve box top section and shall be used in appropriate heights to adapt to changing landscapes.
4. Valve Boxes shall have a pre-cast concrete collar in landscaped areas and poured-in-place concrete collars in paved areas.
5. Pre-cast concrete collars shall be 4000 psi with 24" outside diameter with a 10" inside diameter center hole.
6. Poured-in-place concrete collars shall be 4000 psi 24"x 24" square with inside hole sized to fit valve box.

G. Meters

1. Meters and meter strainers for services from the AU distribution system shall be provided by Auburn University.
2. Provide a strainer and locking bypass piping system sufficient to sustain water service during meter and backflow preventer outage.
3. All new meter sets will include automated meter reading equipment to be provided by Auburn University Utility Services and installed by contractor. Include accessible conduit access from meter to outside of the building to install AMR radio.
4. Meter boxes in landscaped areas shall be Black Sigma 1730 with "Auburn University Water" in top.
5. Meter boxes for 1 ½" and smaller meters shall be high density reinforced concrete meter box with non-settling shoulders with a high-density, RF transparent, plastic lid. Nicor or approved equal.
6. Meter vaults for 2" and larger meters shall be pre-cast or poured-in-place vaults, which house meter assemblies and backflow prevention valves centered about the vault. Vaults shall have a locking aluminum traffic rated lid.

H. Testing

1. Domestic Water Lines:
 1. All pipelines shall be quality control tested in accordance with procedures and practices applicable to the various types and kinds of pipe and to the various sizes of pipe. The Contractor is reminded that personnel not experienced in testing procedures and practices should neither be allowed to conduct the test nor assist in the test procedures.
 2. The Contractor is solely responsible for safety during testing.

3. The hydrostatic test is to be performed at a pressure of 1.5 times the working pressure of the system at the point of the test, but not less than 150 psi.
4. Test pressures shall not exceed pipe or restraint device design pressures.
5. Test pressures shall not exceed the rated pressure of the boundary valves.
6. Water mains shall be sufficiently backfilled and restrained to prevent movement under pressure. Likewise, fitting restraints should be permanently installed with sufficient cure time for concrete thrust blocking prior to the test.
7. The line shall be flushed at a minimum flow of 3 feet per second to remove debris and air from the line. If air cannot be removed via flushing, then taps will be made at the points of highest elevation. All taps made shall be converted to manual air release valves through the use of lockable curb stops installed in an approved meter box.
8. The Contractor shall furnish all meters, gauges, pressure recorders, test plugs, valves, couplings, pitot gauges, test piping and fittings, pumps, compressors, receivers, motors, engines, electric power, fuel, water, supplies, labor tools, materials, equipment, and supervision necessary to perform the tests required and shall make all connections necessary to perform the tests required.
9. Should any pipe line, or any section of the line, fail to meet the criteria established herein below, any deficiencies shall be corrected and the testing repeated until the specified test results have been achieved.
10. All water supply mains and other water lines underground shall be tested in accordance with the requirements of ANSI/AWWA C600 (for ductile iron pipe) or C605 (for PVC pipe) and in accordance with the requirements of these Specifications.
11. Test pressure shall not be applied to instruments, controls, regulators, or equipment.
12. Sections of mains placed under test shall be 1200 feet or less in length unless the concurrence of the Architect/Engineer is first secured.
13. Sections of mains to be placed under test shall be isolated by means of valves or test plugs.
14. The duration of the test shall be 24 hours, and the test pressure shall be 150 psi or 1½ times the normal working pressure, whichever is greater.
15. Pressure shall be recorded on a 24 hour pressure recorder satisfactory to the Engineer and test charts shall be provided to the Engineer and to the University Utilities Services Supervisor prior to acceptance of testing.
16. No pipeline, or section of pipeline, will be accepted if the leakage is greater than that as determined by application of the following formula:
 1. $L = SD \times (\sqrt{P/133,200})$
 1. $L =$ Allowable leakage in gallons per hour
 2. $D =$ Nominal diameter of pipe in inches
 3. $S =$ Length of pipe being tested in feet
 4. $P =$ Average test pressure in PSIG

17. During testing the pressure in the main or line being tested shall be maintained as closely as possible to the test pressure specified.
 18. The pressure shall not be allowed to fall more than 5 psi below the specified test pressure.
 19. Should the pressure drop more than 5 psi below the specified test pressure the test shall be restarted.
 20. The water added to the main or pipe line in order to maintain the desired test pressure shall be metered through a bench-tested meter registering in gallons and fractions of a gallon.
 21. The quantity of water added to the main or line during the test period shall be the leakage.
 22. All visible leaks shall be repaired even when tested leakage rates are less than the limits as determined by application of the formula given hereinabove.
 23. Contractor shall prepare reports of testing activities and submit them to the Designer and the Facilities Management Utilities Department.
- I. Water Mains and Hydrants Cleaning/Disinfecting
1. The Contractor shall disinfect the pipe, pipe fittings, valves, and hydrants installed in the system.
 2. In general, all disinfection shall be in accordance with AWWA C651, latest revision. At a minimum contractor shall disinfect line in a manner that will result in a chlorine concentration of 50 parts per million (ppm) throughout the newly installed line. The concentration shall remain in the line for a minimum of 24 hours to ensure all bacteria have been eliminated. The residual chlorine concentration, following the 24 hour disinfection period, shall be no less than 25 ppm.
 3. A representative from Auburn Utility Services Department shall witness de-chlorination procedure and sampling activities.
 4. Samples for bacteriological examination by the State Health Department shall be taken on consecutive days (two sets of samples taken 24 hours apart) by the Contractor and delivered to the State Health Department; and if the water quality does not meet the standards of the Health Department, the disinfection process shall be repeated until satisfactory water is obtained.
 5. Samples for bacteriological examination shall be collected at no greater than 2,000 foot intervals along transmission mains.
 6. The chain of custody letters for all disinfection sampling shall be turned into the Design Engineer and the University Utility Services Supervisor.
 7. The interior of the pipe fittings and accessories shall be kept clean and free from dirt; pipe shall be cleaned before installation; and shall be protected during installation to prevent debris entering pipe.
 8. During periods when pipe installation is not in progress, open ends of installed pipe shall be protected by means of water-tight plug or other means satisfactory to the Architect/Engineer.
 9. All joints of pipe in trench shall be made up tightly before stopping work at night.

10. After water mains are installed and pressure tested, they shall be dechlorinated prior to flushing thoroughly, either through fire hydrants or by means of taps at the end of the mains (taps shall be large enough to ensure a cleaning velocity of at least 3.0 f.p.s. in mains).
11. Should the flushed water not be dechlorinated, it shall be put into a temporary holding basin for natural de-chlorination
12. The Contractor shall furnish all chemical feed pumps, generator sets, valves, connections, materials, labor, and equipment required for proper disinfection of the mains.
13. The Contractor shall prepare reports of purging and disinfecting activities and submit them to the Engineer and the University Utility Services Supervisor.
14. After approval of all bacteriological testing written approval from the Utilities Services Supervisor must be obtained in order to connect to the system.

G3014 Fire Protection Distribution & Storage

A. General

1. Existing fire hydrants shall be accessible to fire apparatus during construction, alteration and/or demolition.
2. Water lines supplying fire hydrants shall be a minimum of 6 inches.
3. Provide 4" minimum ductile iron pipe, valves, and fittings.
4. No fire main shall have any structure, temporary or permanent, built over the top of it unless approved by University Project Lead.
5. All domestic and fire lines shall be to be flushed, chlorinated, and tested in compliance with G3011.I.
6. If a fire flow test is required, the designer shall request the test from the UPL

B. Hydrants

1. Fire hydrant shall be no more than 100 feet from fire department connection.
2. Hydrant steamer nozzle connection orientation shall be as determined by Auburn City fire department.
3. Fire hydrants shall be installed plumb and such that nozzles are approximately 18" above finished grade.
4. Review geotechnical report for the presence of impervious soils in the project area. In the event impervious soils are present a drainage pit 2' in diameter and 2' deep shall be excavated below each hydrant and filled compactly with coarse gravel or crushed stone under and around the hydrant foot and to a level 6" above hydrant weep holes.
5. Provide isolation valves no more than 5' from fire hydrant.
6. Hydrants shall be 3 nozzle type in compliance with AWWA C502. Mueller Super-Centurian, Model 250 or approved equal.
7. All fire hydrant assemblies shall include isolation valves.
8. Hydrants shall arrive at the job site with a factory coating of silver paint.
9. Fire hydrant extensions shall be used to bring hydrants up to grade. Extensions shall be by the same manufacturer as the hydrant. No more than one extension riser per hydrant set.
10. Hydrant anchoring system is to be designed by the engineer.

11. Anchoring shall be accomplished by one of the following methods:
 1. EBBA Iron MEGA LUG series for ductile iron or approved equal
 2. With stainless steel all-thread rod. At a minimum, all-thread rod shall be $\frac{3}{4}$ " diameter, 18-8 stainless steel.
 3. Concrete braces shall be used in all new fire hydrant sets.
 4. Concrete braces shall not block hydrant weep holes.
12. Post Indicator Valves are required on all fire service lines and shall be no less than 40 feet from the building.

G3020 Sanitary Sewer

A. General

1. Package Pumping/Lift Stations are not allowed.
2. No sanitary sewer manhole, piping or fittings shall have any structure, temporary or permanent, built over the top of it.
3. Designer shall provide verification that existing system capacity is compatible with the current proposed design.
4. All new sanitary sewer lines shall be designed with the following minimum line sizes: Laterals 6" and Mains 8".
5. All new sanitary sewer lines shall be designed such that the velocity of the flow in the pipe shall not be less than 2 feet per second, nor exceed 10 feet per second.
6. Sanitary sewer lines shall be a minimum of 18 inches below potable water lines.
7. Sewer lines and manholes which are no longer in service shall be removed.

G3021 Piping

A. New Piping

1. Ductile iron pipe and fittings shall be cement mortar lined with asphaltic seal coat in accordance with ANSI/AWWA A21.4/C104. Ductile iron pipe shall also be furnished with outside asphaltic coating of 1 mil thickness per ANSI/AWWA A21.51/C151. Pipe shall be installed such that the pipe bell is upstream of the pipe spigot.
2. All ductile iron pipe and fittings shall have a minimum pressure class rating of 350.
3. Joints for ductile iron pipe to be installed underground shall be push-on joint type, in compliance with ANSI/AWWA A21.11-07/C111.
4. Gaskets for push-on joint type shall be styrene butadiene rubber.
5. All new sanitary sewer laterals and mains shall include underground warning tape placed 1' above pipe during pipe backfill operations. Warning tape shall be non-conductive Poly 3" wide with 1" lettering 4 mils thick. Warning tape shall conform to American Public Works Association (APWA) uniform color codes and shall read "BURIED SEWER LINE".
6. For connections to existing infrastructure, standard flexible couplings are preferred. Document locations with GPS. Do not use a shielded (no-hub) coupling.

B. Pipe Rehabilitation

1. Rehabilitation of existing sanitary sewer lines and manholes shall be reviewed and approved by Auburn University Distribution System Engineer with final approval from UPL. Acceptable rehabilitation methods include the following:
2. Cured-In-Place Pipe (CIPP) Lining Systems
 1. Conform to standards from the American Society for Testing and Materials, such as: ASTM F1216 (Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube), ASTM F1743 (Rehabilitation of Existing Pipelines and Conduits by Pulled-In-Place Installation of Cured-In-Place Thermosetting Resin Pipe (CIPP)), ASTM D5813 (Cured-In-Place Thermosetting Resin Sewer Pipe), ASTM D790 (Test Methods for Flexural Properties of Un-Reinforced and Reinforced Plastics and Electrical Insulating Materials), and D2990 (Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics)
3. Pipe Bursting (PBM)
 1. The Pipe Bursting process is defined as the reconstruction of gravity sewer pipe by installing an approved pipe material (HDPE), through the alignment of the existing sewer line. Approved process involves the use of a hydraulic "moling" device, pneumatic hammer, or a conical shaped rigid or static bursting head or flared plug of a suitable size to break out the old pipe and simultaneously install a new HDPE pipe of the same or larger host pipe size.
 2. Method used must define process for reconnection of all existing or new sewer service house laterals, watertight sealing at manholes, and reconstruction of manhole inverts.
 3. Television inspection of the new pipeline is required.
 4. The Contractor shall be certified as a fully trained PBM user by the Pipe Bursting System Manufacturer that the Contractor intends to utilize on the job. A copy of certification is required with the bid.

C. New Installation Testing

1. All visible or audible leaks in any section of the sewer, manholes, or appurtenances shall be repaired.
2. Comprehensive quality assurance program including visual inspection, TV/video recordings, and air testing shall be performed to ensure sewers are uniformly bedded and backfilled, all joints are tight with fully compressed gaskets, confirm that no joint opening exceeds 1/4", lines have smooth and uniform interior sections with respect to surfaces, grade, and alignment and confirm that lines are watertight within allowable limits.
3. TV Video Inspection: Using equipment specifically designed for sewer inspection, provide a video report (digital format) for review and approval by Designer for every segment of new sanitary sewer line and lateral. Final approved video and report shall be submitted with the closeout documents. Media shall be clearly labeled and cross referenced to an Auburn University utility map obtained from the University Project Lead.

D. Low Pressure Air Testing

1. Newly constructed sanitary sewer mains shall be watertight within allowable limits.
2. The total quantity of infiltration into the sewer (including manholes) shall not exceed 50 gallons per mile of sewer per inch of inside diameter per 24 hours and in no case shall it exceed 2,500 gallons per mile per 24 hours.
3. In order that final testing of the sewers not be deferred until the sewers are operating under 'wet weather' and high water table conditions, and that surface restoration work can closely follow construction work. The "low-pressure air testing procedure" shall be employed in order to determine the probable acceptability of the sewers as reasonably watertight conduits (within the limits specified) when operating under 'wet weather' and high water table conditions.
4. Sewers of sizes 30" and larger will be examined for leaks and/or other interior deficiencies by making a complete interior examination of the pipelines.
5. Sewers smaller than 30" shall be tested.
6. If the elevation of the ground water table, at the time of the last visual examination and measurement of leakage should have been less than two (2) feet over the top of the pipe throughout the entire length of the test, the section shall then be tested for exfiltration by use of low-pressure air testing practice as set forth in ASTM C969.
7. The "low-pressure air test" shall generally conform to the hereinafter outlined procedure:
 1. Designer shall specify cleaning procedure to be utilized prior to testing.
 2. If the pipe to be tested is subject to external pressure exerted by elevation of ground water table, the elevation of ground water table (with reference to invert of sewer) shall be determined. This may be done by either of the following methods: (1) Insert a pipe probe through backfill to elevation of invert by boring or jetting. Equip top end of probe with a bubbler head. Slowly pass air through bubbler head and probe. Read pressure from air gauge mounted on bubbler head. All base gage pressures specified for the test shall be increased by gage reading. Gage shall be low-pressure, wide range. (2) Install ½ inch diameter pipe through manhole wall at level approximately at top of sewer; turn down pipe outside of manhole to run to elevation of invert; and cap pipe inside of manhole. This should be done at the time when the manhole is constructed. When the line is to be tested remove cap, clear test pipe with compressed air, and connect clear plastic tube to test pipe. Start flow of water through pipe and tube, and read elevation of water in tube (with reference to invert of pipe). Divide reading by 2.31 and add resulting to invert of pipe). Divide reading by 2.31 and add resulting pressure (in psi) to add base gage pressures specified for the test. After all testing has been completed cap or plug test pipe at manhole wall.

3. Add air slowly to the plugged section of the sewer under test until the internal air pressure has been raised to 4.0 psig base plus any pressure allowance representing external head as determined above.
4. After the pre-set pressure (4.0 psig base + allowance) has been obtained, allow at least two minutes for air temperature to stabilize, adding only the amount of air required to maintain the pre-set pressure, then close air supply valve.
5. When the pressure decreased to a gage reading equal to 3.5 psig base + allowance (such gage reading being termed stabilized pressure), start stopwatch. Determine time in seconds marking drop of 1.0 psig of internal air pressure.
6. Refer to the AIR TEST TABLE following this section to determine minimum permissible pressure holding time in seconds for particular section of sewer being tested.
8. As stated hereinabove, surface restoration shall closely follow construction work. It follows; therefore, that air testing of completed sections of sewer shall closely follow installation of the sewers in order that surface restoration work might be undertaken.
9. The Contractor shall be responsible for observance of all safety precautions and maintenance of safe conditions during air testing.
10. These precautions shall include but not be limited to ensuring that personnel not experienced in air testing procedure not be allowed to conduct the air tests and that personnel are not allowed in the manholes at ends of test sections during tests.
11. Pneumatic plugs shall be seal tested in pipe sections outside of trench before being used to plug sewers; and such test sections shall be internally pressurized to levels adequate to determine sealing efficiency of plugs.
12. Air supply lines to pneumatic plugs and to sealed section shall be equipped with pressure regulating sets.
13. Return line from sealed section shall be equipped with pressure gage to monitor pressure rise in sealed section.

AIR TEST TABLE

MINIMUM HOLDING TIME IN SECONDS
REQUIRED FOR PRESSURE TO DROP FROM 3½ TO 2½ PSIG

Pipe Size														
LF	4"	6"	8"	10"	12"	15"	18"	21"	24"	27"	30"	33"	36"	39"
25	4	10	18	28	40	62	89	121	158	200	248	299	356	418
50	9	20	35	55	79	124	178	243	317	401	495	599	713	837
75	13	30	53	83	119	186	267	364	475	601	743	898	1020	1105
100	18	40	70	110	158	248	356	485	634	765	851	935		
125	22	50	88	138	198	309	446	595	680					
150	26	59	106	165	238	371	510							
175	31	69	123	193	277	425								
200	35	79	141	220	317									
225	40	89	158	248	340									
250	44	99	176	275										
275	48	109	194	283										
300	53	119	211											
350	62	139	158											
400	70	158												
450	70	170												
500	88													
550	07													

G3022 Manholes and Cleanouts

A. Manholes

1. Precast reinforced concrete manholes shall meet the requirements of ASTM C-478. Concrete shall have a minimum compressive strength of 4,000psi at 28 days. Cement shall be Type II with C3A content of 6.5% or less. Manhole connections for sewer piping smaller than 24" shall be accomplished through the use of flexible connectors, connections for sewer piping 24" or larger should be accomplished using mortar comprised of 1 part Portland Type II cement and 2 parts sand by volume.
2. Manholes shall have interior surfaces coating of high-build glass-flake cementitious epoxy to dry film thickness of not less than 20 mils. Cementitious epoxy coating shall be PCS-9043 Type II, Permite Coatings, Coal Tar Epoxy coating or approved equal, to dry film thickness of not less than 30 mils or be impregnated with a concrete waterproofing cementitious crystalline admixture such as Xypex.

3. Manhole base and riser sections shall be equipped with non-penetrating lifting inserts, Press-Seal Gasket Corporation or approved equal, and adhere to the following thicknesses:
 1. Floor Slab – Minimum 6-inch thick
 2. Walls – Minimum 4-inch thick
4. Manhole cone section shall be eccentric type, equipped with non-penetrating lifting inserts, Press-Seal Gasket Corporation or approved equal, and be suitable for mounting cast iron manhole frames and covers as described below.
5. Joints between manhole sections shall be offset tongue and groove type and shall utilize a pre-lubricated manhole gasket which meets the following requirements:
 1. Gasket shall consist of a compression section and a serrated mantle section which slides over the compression section as the manhole sections are placed together.
 2. Gasket shall meet the requirements of ASTM C 443, Tylox Super-Seal as manufactured by Hamilton Kent or approved equal.
6. Manhole frames and covers shall be cast from gray iron meeting the requirements of ANSI A48-83, Class 30 or greater conforming to the following:
 1. All manhole covers shall be self-sealing type with non-penetrating pick holes.
 2. Frames and covers installed in open areas shall weigh not less than 290 lbs. Frames and covers subject to traffic shall be H 20 rated and shall weigh not less than 375 lbs.
 3. Covers shall be labeled “SANITARY SEWER”.
7. Manhole steps shall conform to one of the following requirements:
 1. Gray Iron or Ductile Iron integrally cast into the manhole barrel, meeting the requirements of ANSI A48-83.
 2. Gray Iron or Ductile Iron equipped with inserts integrally cast into the manhole barrel having steps bolted on, meeting the requirements of ANSI A48-83.
 3. Copolymer polypropylene plastic, meeting the requirements of ASTM D 2146 reinforced with a ½” diameter deformed bar meeting the requirements of ASTM A 615.
8. Manhole inverts shall be constructed of mortar comprised of 1 part Portland Type II cement and 2 parts sand by volume. Inverts should be hand troweled to a smooth finish. Top of invert shall be a minimum of 8” wide to allow crawler type camera accessibility. Piping and Fittings
9. To accommodate for wider inverts manholes shall be designed and constructed utilizing 2 tenths of a foot (0.2’ or 2.4”) drop across each manhole or match crown at pipe size changes. In the event 2 tenths of a foot (0.2’ or 2.4”) drop across the manhole is not possible a 5’ diameter Type I base section shall be utilized, and the top of the invert cannot be less than 8” wide.

10. Turns in manholes that change the direction of flow shall not exceed ninety degrees.
 11. Incoming lines with inverts 24" or higher above the exiting invert shall have an exterior drop connection.
 12. Maximum spacing between sanitary manholes shall be 400'.
 13. Manholes shall be installed on mains at any location where there is a change in grade, or direction of flow.
 14. All building sewer laterals shall connect to the sanitary sewer collection system at a manhole.
 15. Maximum length of sanitary sewer laterals shall be 100' from the face of the building. Beyond that distance laterals shall be considered mains and all rules for sanitary mains shall apply.
- B. Manhole Rehabilitation
1. Sanitary Sewer Manholes: Cementitious Fiber-Reinforced Structural Monolithic Manhole Lining System to be applied as per the manufacturer's recommendations

G3030 Storm Sewer

- A. General
1. No storm sewer manhole, piping or fittings shall have any structure, temporary or permanent, built over the top of it.
 2. Provide minimum 6" laterals and 12" mains.
 3. Minimum 3.5 feet per second of full pipe flow velocity.
 4. Maximum 15 feet per second of full pipe flow velocity.
 5. Remove existing sewer lines and manholes which are no longer in service.
 6. In locations where leaf clogging of conventional drains would be expected provide scupper or cast-iron dome type drains.
 7. New development shall provide no increased peak rate of runoff with control of runoff rates for the 2-, 5-, 10-, 25- year (24 hour) storm events to less than or equal to existing and safe passage of 100 year storm volumes.
 8. Water quality treatment shall be provided for the runoff generated by the first 1.2 inches of rainfall in storm events with goals to promote infiltration of runoff from impervious areas to the maximum extent practical.
 9. Storm sewers shall be designed for a 25 year design frequency except where crossing roadways which shall be designed for a 50 year frequency.
 10. Install removable bars or grills at open ends of culverts, drains and pipes 10" diameter and larger.
 11. Curb inlets along roadways and in parking lots shall be ALDOT Type S self-cleaning inlets. Allowable spread for roadway applications is 6' or 1/2 of travel lane width whichever is less.
 12. Gutter downspouts which connect to underground storm system shall utilize a cast iron downspout boot of Barry Pattern & Foundry type B25A or approved equal to transition between downspout and drainage lateral.
 13. Inlet sizing and spacing shall be designed to allow no more than 6' diameter spread around inlets during design rain event.
 14. All storm sewer junction boxes shall have an access.

15. No conflict boxes will be allowed.

G3031 Piping

A. Piping and Fittings

1. Pipe 12" and greater:
 1. Reinforced Concrete Pipe (RCP) must conform to the requirements of ASTM C76, Wall type B or C. Pipe class shall be determined by laying depth; Class III for cuts 0 to 10 feet, Class IV for cuts 10 to 20 feet, Class V for all cuts exceeding 20 feet. Pipe shall be installed such that the pipe bell is upstream of the pipe spigot.
 2. Pipe end treatment shall be bell and spigot manufactured in accordance with ASTM C76 with joint lengths no less than 8' and no greater than 16'. Gaskets for bell and spigot joints shall be rubber O-ring gaskets manufactured in accordance with ASTM C361 and ASTM C433.
 3. RCP shall be manufactured wet cast, dry cast or centrifugally cast or by the re-densification method.
 4. All pipe lift holes are to be plugged with POPIT, Inc. brand lift hole plugs or approved equal.
 5. All joints in RCP shall be fully wrapped in filter fabric meeting the requirements of ALDOT Type A silt fence.
2. Pipe smaller than 12" in diameter:
 1. Ductile iron pipe which shall be cement mortar lined in accordance with ANSI A21.4/ AWWA C104; standard thickness, with asphaltic seal coat. Ductile iron pipe shall also be furnished with outside asphaltic coating of 1 mil thickness per ANSI A21.51/AWWAC151. Pipe shall be installed such that the pipe bell is upstream of the pipe spigot.
 2. All ductile iron pipe and fittings shall have a minimum pressure class rating of 350.
 3. Joints for ductile iron pipe to be installed underground shall be "Push-on" joint pipe, in compliance with ANSI/AWWA A21.11-07/C111.
 4. Gaskets for "Push-on" joint pipe shall be Styrene Butadiene Rubber.
 5. For connections to existing infrastructure, standard flexible couplings are preferred. Document locations with GPS. Do not use a shielded (no-hub) coupling.
3. All new storm sewer laterals and mains shall include underground warning tape placed 1' above pipe during pipe backfill operations. Warning tape shall be non-conductive Poly 3" wide with 1" lettering 4 mils thick. Warning tape shall conform to APWA uniform color codes and shall read "BURIED SEWER LINE".
4. Provide combination cleanout plug/relief on first cleanout outside of building.
5. Cleanouts shall be installed on laterals at any location where there is a change in grade, or direction in flow.
6. All storm sewer wyes shall have a cleanout within one foot of the upstream side of the wye.

B. New Installation Testing**1. Contractor shall ensure:**

1. Lines are uniformly bedded and backfilled,
2. Joints are tight with fully compressed gaskets,
3. Jo joint opening exceeds $\frac{1}{4}$ ",
4. Smooth and uniform interior sections with respect to surfaces, grade, and alignment, and
5. Lines are watertight within allowable limits.

2. All lines shall be tested in accordance with procedures and practices applicable to the various types and kinds of pipe and to the various sizes of pipe. The Contractor is reminded that personnel not experienced in testing procedures and practices, and particularly in air-testing of pipelines, should neither be allowed to conduct the test nor assist in the test procedures. Contractor shall furnish all labor, supervision, materials and equipment required for testing of sewers.

A. TV Video Inspection

1. Contractor shall televise and record every segment of new storm sewer line and provide a video report for Auburn University Facilities Management Utilities Department review. Auburn University Facilities Management requires 15 days to review and respond to the contractor concerning any items of concern.
2. Contractor's television camera shall be specifically designed for sewer line inspection which meets the following requirements:
 1. Lighting for the camera shall be adequate and adjustable to allow a clear picture of the entire periphery of the pipe.
 2. Camera shall be waterproof and operative in 100% humidity conditions.
 3. Camera shall be small enough to pass through and clearly televise the interior of a 6" diameter sewer and all other larger sewer lines up to and including 30".
 4. Camera height shall be adjustable such that it is centered about the sewer line while performing the inspection.
 5. Camera focal length shall be adjustable through a range of 6" to infinity.
 6. Camera shall be capable of receiving and transmitting a picture having not less than 600 lines of resolution.
3. Recordings shall be delivered to Auburn University Facilities Management Utilities Department via USB flash drive or web link. Flash drive or web link shall be clearly labeled and cross referenced to a map such that the reviewer can easily determine the segment of storm sewer line being reviewed.

G3032 Manholes and Cleanouts

- A. Manholes shall be Precast Reinforced concrete only. No block or brick masonry. Precast Reinforced Concrete Manholes shall meet the requirements of ASTM C-478. Cement shall be Type II with C3A content of 6.5% or less. Manhole connections shall be accomplished using flexible connectors or using mortar comprised of 1 part Portland Type II cement and 2 parts sand by volume.

- B. Manhole base, eccentric cone and riser section shall be equipped with non-penetrating lifting inserts, Press-Seal GASKET Corporation or approved equal.
- C. Manhole cone section shall be suitable for mounting cast iron manhole frames and covers as described below.
- D. Joints between manhole sections shall be offset tongue and groove type and shall utilize a pre-lubricated manhole gasket which meets the following requirements:
 - 1. Gasket shall consist of a compression section and a serrated mantle section which slides over the compression section as the manhole sections are placed together.
 - 2. Gasket shall meet the requirements of ASTM C 443, Tylox Super-Seal as manufactured by Hamilton Kent or approved equal.
- E. Manhole frames and covers shall be cast from gray iron meeting the requirements of ASTM A48, Class 30 or greater conforming to the following:
 - 1. Minimum clear space opening for frames and covers is 21 7/8".
 - 2. Non-drainage frames and covers installed in landscaped areas shall weigh not less than 290 lbs. Non-drainage frames and covers installed in hardscape areas and subject to traffic shall be H 20 rated and shall weigh not less than 375 lbs. Non-drainage frames and covers installed in Type-S inlets shall be Neenah Foundry R-6144 or approved equal. Drainage frames and covers installed in landscaped areas shall be Neenah Foundry R-2560-EA or approved equal. In the event a round cover is not practical use frame and cover of Neenah Foundry R-4346 or approved equal. Drainage frames and covers installed in hardscape areas and subject traffic shall be H 20 rated and shall be Neenah Foundry R-3561 or approved equal. Frames and covers installed in pedestrian areas shall be rated for pedestrian service.
- F. Covers shall be labeled "STORM SEWER."
- G. Manhole steps shall conform to one of the following requirements:
 - 1. Gray Iron or Ductile Iron integrally cast into the manhole barrel, meeting the requirements of ASTM A48.
 - 2. Gray Iron or Ductile Iron equipped with inserts integrally cast into the manhole barrel having steps bolted on, meeting the requirements of ASTM A48.
 - 3. Copolymer polypropylene plastic, meeting the requirements of ASTM D 2146 reinforced with a 1/2" diameter deformed bar meeting the requirements of ASTM A 615.
- H. Manhole inverts shall be constructed of mortar comprised of 1 part Portland Type II cement and 2 parts sand by volume. Inverts should be hand troweled to a smooth finish. Top of invert shall be a minimum of 8" wide to allow crawler type camera accessibility. To accommodate for wider inverts manholes shall be designed and constructed utilizing 0.2' drop across each manhole or match crown at pipe size changes.
- I. Turns in manholes that change the direction of flow shall not exceed ninety degrees.
- J. Maximum spacing between storm sewer manholes shall be 400'.
- K. Manholes shall be installed on mains at any location where there is a change in grade, or direction of flow.

- L. All building drainage laterals shall connect to the storm sewer collection system at a manhole, junction box, or inlet box.

G3035 Retention Ponds

A. Underground Detention

1. Underground detention structure shall meet the following minimum requirements:
 1. All underground detention structures should be constructed on precast concrete vaults, poured in place concrete structures or reinforced concrete pipe.
 2. Multiple barrels of reinforced concrete pipe shall have a manifold at one end with reinforced concrete pipe equal in diameter to the largest pipe barrel used in the detention system, or a junction box larger than the largest pipe barrel used in the detention system.
 3. A trash collection structure must be installed upstream of all underground detention structures.
 4. All underground detention structures must include an air release structure large enough to prevent air locking during a rain event.
 5. All underground detention structures shall have a minimum of 1 standard manhole access point including manhole steps.

G3040 Heating Distribution

G3043 Hot Water Supply System

A. Piping

1. Approved manufacturers
 1. Perma-Pipe
 2. Rovanco
 3. Thermacor
2. Pipe Materials:
 1. Carrier Pipe:
 1. Steel, ASTM A 53, Grade B., seamless Type S or ERW Type E, standard weight for sizes 2-inches and larger.
 2. Provide piping in 40 foot lengths.
 3. Ends: Square cut, beveled for butt-welding
 4. Straight Sections: Provide 6 inches of exposed pipe at each end for field joint fabrication.
3. Carrier Pipe Insulation:
 1. Polyurethane Foam Pipe Insulation:
 1. Thermal Conductivity (k-Value): 0.14 BTU in/hr-sf-°F at 75°F per ASTM C518.
 2. Maximum Operation Temperature: 250°F.
 3. Moisture Absorption: ASTM D2842, maximum 2% by volume.
 4. Minimum 90% closed cell.
 5. Dry Density: 2 lb/cu. ft. maximum.

6. Compressive Strength: 17 psi minimum.
7. Water-Vapor Transmission: 3 perm inches maximum according to ASTM E96.
8. Flexural Strength: 25 psi minimum per ASTM D790.
9. Factory inspected to assure no insulation voids.
2. Insulation Thickness:

Pipe Size	Insulation Thickness (min)
2"	1.41"
2 1/2"	1.80"
3"	1.49"
4"	1.99"
6"	2.00"
8"	1.99"
10"	1.56"
12"	1.57"
14"	1.99"
18"	2.00"

4. Jacket:
 1. Extruded black, high density polyethylene (HDPE), manufactured in accordance with ASTM D-3350
5. Fittings:
 1. Factory prefabricated and pre-insulated with jacket identical to straight sections
 2. Pipe fittings shall be forged, beveled for butt welding
 3. Long radius elbows
 4. Provide straight run joints insulated to specific thickness, jacketed with full length heat shrinkable wrap around sleeve.
 5. Flange insulation and jacket shall be installed to provide a seamless water barrier between the pipe and valve.
 6. Follow manufacturer's instruction for field joint insulation and jacketing of field fabricated joints.
6. Pipe accessories include the following:
 1. Moisture Barrier End Seals:
 2. Factory applied, sealed to jacket and carrier pipe.
 3. Certify that end seals have passed a 20-foot head pressure test.
 4. Completely seal exposed end of insulation with mastic or similar sealant suitable for buried application.
7. Factory test the carrier pipe to 150% of the normal system operating pressure. Furnish test certificates.
8. Hydrostatic Pressure Test: Perform at one and 150% of the normal system operating pressure for minimum two hours. Remove trapped air from system prior to test.

B. Valves

1. All valves shall be Ball Valves
2. Approved manufacturers:
 1. Vexve, or engineer approved equal.
3. Provide valves with 2 inch square operating nut.
4. Valve must seal tight (zero leak through).
5. Pressure Rating:
 1. 150 psig at 250 deg F
6. Connection Type:
 1. Flanged or Welded
7. Insulation
 1. Spray ceramic insulation to 100 mils minimum thickness. Product shall be equivalent to CL Systems 100 by Envirotrol, Inc.
 2. Pit wrap to manufacturers guidelines.
8. Bolting
 1. Studs: ASTM A 193 / A 193 M, Grade B7, continuously threaded per ASME B 1.1, Class 2A fit, coarse thread series, length per ASME B 16.5.
 2. Nuts: ASTM A 194/A 194 M, Grade 24 or 7, hexagon semi-burnished, heavy series, threaded to ASME B1.1, Class 2B, coarse thread series.
9. Gaskets
 1. Flange Gaskets: Spiral wound graphite filled in accordance with ASME B16.20, 1/8 inch thick. Gaskets must be compatible with the flowing fluid, temperature, and pressure of the system. Equivalent to Garlock flexseal RW flexible graphite.
 2. No paper or cardboard gaskets.
10. Valve Boxes
 1. Valve boxes should be traffic rated and large enough to allow service/maintenance of the valves.

G3050 Cooling Distribution**G3051 Chilled Water Piping****A. Piping**

1. Approved manufacturers:
 1. Perma-Pipe
 2. Rovanco
 3. Thermacor
2. Pipe Materials
 1. Carrier Pipe:
 1. Ductile iron, ANSI/AWWA C150/A21.50, cement lined to ANSI/AWWA C104/A21.4, asphaltic coating, to ANSI/AWWA C151/A21.51, Class 50 or 51 for sizes 3 inches and larger.
 2. Provide piping in 18-20 foot lengths.
 3. Ends: Restrained Mechanical Joints.

4. Straight Sections: Provide 6 inches of exposed pipe at each end for field joint fabrication.
3. Carrier Pipe Insulation:
 1. Polyurethane Foam Pipe Insulation
 1. Thermal Conductivity (k-Value): 0.14 BTU in/hr-sf-°F at 75°F per ASTM C518.
 2. Maximum Operation Temperature: 150°F.
 3. Moisture Absorption: ASTM D2842, maximum 2% by volume.
 4. Minimum 90% closed cell.
 5. Dry Density: 2 lb/cu. ft. maximum.
 6. Compressive Strength: 17 psi minimum.
 7. Water-Vapor Transmission: 3 perm inches maximum according to ASTM E96.
 8. Flexural Strength: 25 psi minimum per ASTM D790.
 9. Factory inspected to assure no insulation voids.
 2. Pipe Size Insulation Thickness

Pipe Size	Insulation Thickness (min)
4"	1.81"
6"	1.84"
8"	1.77"
10"	1.35"
12"	1.31"
14"	1.23"
16"	1.22"
18"	1.15"
20"	1.17"
24"	0.95"

4. Jacket:
 1. Extruded black, high density polyethylene (HDPE), manufactured in accordance with ASTM D-3350
5. Fittings:
 1. Field insulated with Urethane Foam or approved equal.
 2. Jacket shall be PVC with Asphalt wrap.
 3. Ductile iron to ANSI/AWWA C153/A21.53.
 4. Restrained joint in compliance with ANSI/AWWA C110/A21.10.
 5. Lined to ANSI/AWWA C104/A21.4 and asphalt coated to ANSI/AWWA C151/A21.51, C104/A21.4.
 6. Provide straight run joints insulated to specific thickness, jacketed with full length heat shrinkable wrap around sleeve with components meeting ANSI/AWWA C110/A21.10

7. Insulation and jacket shall be installed to provide a seamless water barrier between the pipe and valve.
8. Follow manufacturer's instruction for field joint insulation and jacketing of field fabricated joints.
6. Pipe accessories:
 1. Moisture Barrier End Seals:
 1. Factory applied, sealed to jacket and carrier pipe.
 2. Certify that end seals have passed a 20-foot head pressure test.
 3. Completely seal exposed end of insulation with mastic or similar sealant suitable for buried application.
 2. Fitting Restraints:
 1. Type: Multiple gripping wedge with follower gland in accordance with ANSI/AWWA C151/A21.51.
 2. Working Pressures: 3 inch – 16 inch: 350 psig and 18 inch – 24 inch: 250 psig.
 3. Material: Cast 65-45-12 ductile iron in accordance with ASTM A 536.
 4. Wedges: Heat treated within a range of 370 to 470 BHN.
 3. Joint Restraints:
 1. Type: Boltless, integral restraining push on gasket.
 2. Working Pressures: UL listed for 350 psi in accordance with ANSI/AWWA C111/A21.11.
7. Factory test the carrier pipe to 150% of the operating pressure of system. Furnish test certificates.
8. Hydrostatic Pressure Test: Perform at one and one-half times normal system operating pressure for minimum two hours. Remove trapped air from system prior to test.
- A. Valves
 1. All valves shall be Gate Valves or Ball Valves
 2. Approved manufacturers:
 1. Vexve, or engineer approved equal.
 3. Provide non-rising stem valves with 2-inch square operating nut.
 4. Valve must seal tight (zero leak through).
 5. Pressure Rating: 250-psi AWWA rated working pressure.
 6. Valve Insulation
 1. Insulation shall be spray ceramic insulation to 100 mils minimum thickness. Product shall be equivalent to CL Systems 100 by Envirotrol, Inc.
 2. Pit wrap to manufacturer's guidelines.
 7. Bolting
 1. Studs: ASTM A 193 / A 193 M, Grade B7, continuously threaded per ASME B 1.1. Class 2A fit, coarse thread series, length per ASME B 16.5.
 2. Nuts: ASTM A 194/A 194 M, Grade 24 or 7, hexagon semi-burnished, heavy series, threaded to ASME B1.1, Class 2B, coarse thread series.

8. Gaskets
 1. Flange Gaskets: Spiral wound graphite filled in accordance with ASME B16.20, 1/8 inch thick. Gaskets must be compatible with the flowing fluid, temperature, and pressure of the system. Product shall be equivalent to Garlock flexseal RW flexible graphite.
9. Valve Boxes
 1. Valve boxes should be traffic rated and large enough to allow service/maintenance of the valves.

G3060 Fuel Distribution**A. General**

1. Do not install temporary or permanent structures over natural gas mains and laterals.

G3061 Fuel Piping**A. Natural Gas**

1. Piping and Fittings
 1. Polyethylene (PE) natural gas pipe and fittings shall be PE 2406 medium density polyethylene (MDPE) meeting cell classification 234363E per ASTM D3350.
 2. All pipe and fittings material shall be opaque, yellow in color, stabilized against ultraviolet deterioration and suitable for unprotected outdoor storage for at least 4 years.
 3. All new natural gas mains and laterals shall include underground warning tape placed 1' above pipe during pipe backfill operations. Warning tape shall be non-conductive Poly 3" wide with 1" lettering 4 mils thick. Warning tape shall conform to APWA uniform color codes and shall read "BURIED GAS LINE".
 4. All buried natural gas line shall have a #12 yellow sheathed solid copper wire installed 6" above pipe and brought above grade through a valve jar.
 5. Fittings shall be of the same diameter, type, and wall thickness of the pipeline being constructed. Fittings shall be manufactured and tested in accordance with ASTM D2513 and applicable Federal Department of Transportation regulations.
 6. Line tapping fittings shall be bypass type and of such design that flow through the pipeline being tapped will not be interrupted at any time during the tapping operation.
 7. Electrofusion fittings shall be PE 2406 medium density polyethylene material manufactured in accordance with ASTM F1055.
 8. Polyethylene gas pipe and fittings may be joined together to other materials by transition fittings or fully restrained mechanical couplings. These devices shall be designed for joining polyethylene gas piping to another material and shall be approved by the Federal Department of Transportation.

9. Transitions between unlike wall thicknesses greater than 1 DR shall be made with a transition nipple or by mechanical means.
10. Butt, socket, and saddle fusion joints in polyethylene gas pipe shall be made using procedures that have been qualified and approved in accordance with CFR Title 49 Part 192.
11. Installation of the gas transmission mains and other gas pipelines shall comply with ASME B31.8.
12. 3" polyethylene natural gas main shall not be used.
13. There shall be a minimum separation of 18" between natural gas lines and insulated utility lines.
2. Valves
 1. Valves for service ½" through 12" shall be PE 2406 medium density polyethylene ball valves rated for service under working pressure of not less than 175 psi.
 2. Valve ends shall be either butt fusion or heat fusion welded.
 3. Valves 2" and larger installed below grade shall have a 2" square valve operating nut and turn left or counter-clockwise to open.
 4. All service lines off the main shall have an isolation valve.
 5. All 2" or larger service lines must include a tri valve arrangement.
 6. Valves shall be located (tied) to two permanent benchmarks (X, Y, & Z coordinates) on as-built drawings.
 7. All valves installed below grade deeper than 4' shall have a valve extension to terminate within 2' of finished grade.
3. Valve Boxes
 1. Valve boxes shall be two piece adjustable screw type asphalt coated with an inside diameter of 5 ¼". Sigma Corporation model VB261-8 or equal.
 2. Valve box lid shall be cast iron drop in non-locking type imprinted with "Gas" on the top, Sigma Corporation model VB2600W or equal.
 3. Valve Boxes shall have a pre-cast concrete collar in landscaped areas and poured-in-place concrete collars in paved areas.
 4. Pre-cast concrete collars shall be 4000 psi with 24" outside diameter with a 10" inside diameter center hole.
 5. Poured-in-place concrete collars shall be 4000 psi 24"x 24" square with inside hole sized to fit valve box.
4. Pipe Bedding
 1. Pipe trenches excavated in earth (soils).
 1. Where trenches are excavated in earth (soils), the bottom of the trench shall be evenly graded to an elevation approximately 2" below the pipe in order to accommodate the bedding material.
 2. Bedding material of native soil as described by CFR Title 49 Part 192, shall be placed across the entire width of the trench and shall be compacted to approximately 90% of Standard Proctor Density up to the level of the bottom of the pipe.
 3. The trench shall be backfilled with native soil as described by CFR Title 49 Part 192, from top of bedding to level 4" above the top of

- the pipe, and the material shall be compacted to approximately 95% of Standard Proctor Density.
4. The cross-sectional area of the trench from level 2" below bottom of pipe to level 4" above top of pipe and extending across entire width of trench constitutes the pipe zone where trenches are excavated in soils.
 2. Pipe trenches excavated in rock
 1. Where trenches are excavated in rock the trench shall be excavated to depth 6" below the pipe and bedding material as specified hereinabove shall be placed and compacted to approximately 90% of Standard Proctor Density.
 2. Backfill from top of bedding to level 1'-0" above top of pipe shall be same material as specified for bedding and shall be compacted to approximately 95% of Standard Proctor Density.
 3. The cross-sectional area of the trench from level 6" below bottom of pipe to level 1'-0" above top of pipe and extending across entire width of trench constitutes the pipe zone when trenches are excavated in rock.
 4. The remaining depths of the trenches, from the tops of the pipe zones shall be backfill in accordance with the requirements of these standards, see Section G10, Site Preparation.
 5. Meters and Regulators
 1. Designer shall include, on drawings, in tabular form (i.e. schedule) the service description, minimum design flow (CFH), maximum design flow (CFH), required pressure at inlet and outlet of each meter set (PSIG).
 2. Designer shall provide a layout drawing of the meter set including location of valve(s), regulator(s), and meter(s).
 3. Meter set to be installed by University approved natural gas system contractor.
 4. The Designer shall consult the gas meter manufacturer and include the manufacturer's recommended length of straight pipe runs to be installed, both before and after the meter.
 5. Designer shall notify the University Project Lead a minimum of 60 days before a meter is required to allow for ordering and delivery.
 6. All new services lines are to include installation of a meter and regulator.
 7. Auburn University Utility Services provides all gas meters and meter regulators for services from AU's system.
 8. Requirements for natural gas system piping (Heat Fusion Joining) as follows:
 1. Butt, socket, and saddle fusion joints in polyethylene gas pipe shall be made using procedures that have been qualified and approved by the Federal Department of Transportation (DOT) in accordance with CFR, Title 49, Part 192.283
 2. The Contractor shall ensure that all persons making heat fusion joints have been qualified to make joints in accordance the above referenced CFR code.

3. The Contractor shall maintain records of qualified personnel, and shall certify that qualified training was received not more than twelve (12) months prior to commencing work.
9. Locate meters and regulators away from building fresh air intakes.
10. All above grade black iron or steel gas pipe shall be painted to match meter and regulator with primer, intermediate, and finish coat of 6.5 – 9.5 mils DFT per coat.
6. Pipe Testing:
 1. Sections under test shall be isolated by valves or caps.
 2. The Contractor shall clean and test each section of the gas pipelines.
 3. Pipe line cleaning and purging will be accomplished by introducing compressed air into the mains and exhausting the air through suitable openings.
 4. Volatile combustible liquids shall not be permitted to enter the pipelines and shall not be used for cleaning pipelines. Should interior surfaces of the pipe be found to be wetted with such liquids, or should it be known that such liquids have been used for cleaning interior surfaces of the pipelines, or should it be found that such liquids have been allowed to enter the pipelines, steaming of the facilities shall be employed until all combustible liquids have been evaporated and swept out of the main to be tested.
 5. The Contractor shall furnish and install recording test gauges as required to determine pressure conditions in the section (or sections) under test.
 6. After the pressure in the section (or sections) under test has stabilized the test pressure shall be set at 90 psi for a period of not less than 24 hours, and the line shall be walked for detection of any leaks.
 7. Any drop in pressure shall be considered to be evidence of leakage, and a failed test. The Contractor shall locate and repair such leaks, and shall repeat the test until satisfactory results are obtained.
 8. Satisfactory results shall be obtained for all sections of the pipelines before the project is accepted by the Owner.
 9. The original and three copies of each test chart shall be furnished to the Owner.
 10. Dated, times, identification of particular pipeline section and signatures of the witnesses shall be shown on each original chart.
 11. After all testing has been satisfactorily completed all vents and pressure taps shall be closed with permanent caps. Caps shall be a maximum of 6” from the main.

G40 Electrical Site Improvements (Utilities)**G4010 Electrical Distribution****G4013 Underground Power Distribution****A. Underground Ducts**

1. Ductbanks shall be concrete encased PVC for primary and secondary power distribution.
2. Sufficient spare conduits are to be furnished in underground ductbanks to allow for installation of one future/additional circuit of the same size/rating as those already provided with cable/conductor
3. Provide #12 AWG solid copper tracer wire in all non-metallic underground conduits.
4. All permanent electrical service is to be provided underground

G4020 Site Lighting**G4021 Fixtures and Transformers****A. Fixtures General**

1. Exterior lighting shall meet the lighting power densities as established by ASHRAE 90.1.
2. A dispersed placement pattern of pathway lighting is preferred. Photometric study and catalog cut sheets shall be provided at the Design Development Phase. Document the foot-candle levels at the site boundary.
3. All exterior lighting shall be controlled by a photoelectric cell. A single photocell may be provided for multiple fixtures. Provide a lighting contactor with a HOA switch.
4. No building mounted site lighting shall be used
5. Power for exterior lighting shall be from multiple circuits fed from the building.
6. Alternate circuits for all site lighting to keep from losing all lighting is not lost with a single short circuit.

B. Parking Lot and Street Lighting Fixture

1. Approve Manufacturer
 1. Kim 'Altitude' LED Series or approved equal
2. Color:
 1. 3000 K
3. Housing:
 1. Dark bronze finish
4. Glass lens

C. Pedestrian Lighting Fixture

1. Approved Manufacturer:
 1. Holophane 'Granville' LED Series or approved equal
2. Color:
 1. 3000 K

3. Housing:
 1. Dark bronze finish
4. Glass prismatic lens (acorn fixture)

G4022 Poles

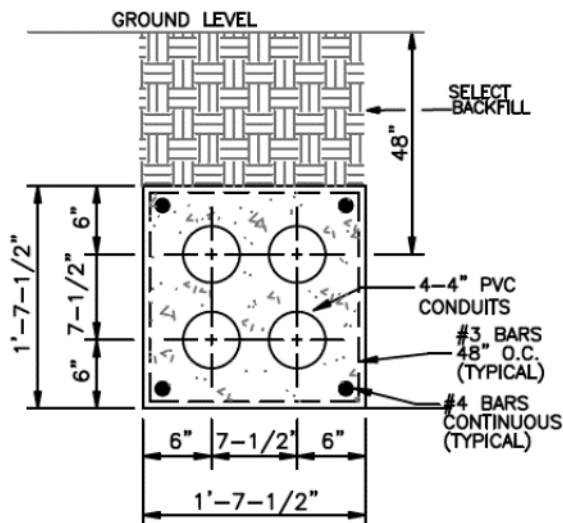
- A. Street and Parking Lot
 1. 30' Tapered cast aluminum pole with dark bronze finish on round reinforced concrete pole base extending 30" above grade.
- B. Pedways
 1. 12' Tapered cast aluminum fluted pole with dark bronze finish on round reinforced concrete pole base extending 4" above grade.
 2. Wadsworth base for fluted poles
 3. Use hinged base with tapered smooth pole in areas with similar light poles.

G4030 Site Communication and Security**G4031 Site Communication Systems**

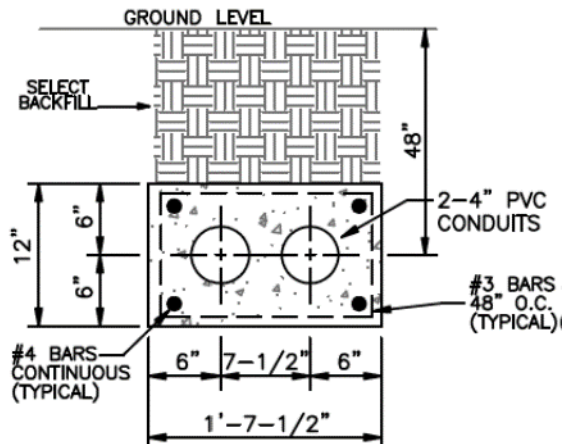
- A. Quality Assurance for installing OSP cabling:
 1. Contractor's on-site superintendent must have a minimum of 5 years of OSP experience and must possess one of the following certifications:
 2. Building Industry Consulting Services International (BISCI) Installer 2 for Copper and Optical Fiber
 3. Fiber Optic Association (FOA) CFOS/O certification (Fiber Optic Specialist for Outside Plant Installation)
- B. Ductbanks:
 1. Underground conduit installed for telecommunications shall be installed in a concrete encased ductbank located 36" below grade.
 2. Ductbanks shall be topped with an orange dye.
 3. Provide detectable warning tape printed with "communication line below", 12" above top of ductbank when backfilling
 4. All underground conduit (including bored conduit) shall be installed with a copper 12 AWG high density polyethylene (HMWPE) (insulation color orange) tracer wire for locating purposes.
 5. All underground conduit shall be photographed and GPS mapped prior to backfilling.
 6. Provide a minimum of two 4-inch schedule 40 PVC conduits shall be installed from the appropriate telecommunications manhole/handhole to the building BET telecom room.
 7. Conduits shall have a 210-lb poly pull line installed in each conduit.
 8. 90-degree bends shall be 48" radius elbows. Standard 90-degree elbows shall NOT be used.
 9. The UPL and OIT PM shall be notified when the ductbank conduit is installed BEFORE concrete is poured, for inspection and photographing. All ductbank conduits are required to have a mandrel successfully pulled through

each conduit without binding or abnormal pulling tension. A ductbank will not be covered until it has passed inspection by the Owner.

10. Ductbanks shall be encased with a minimum 3000 PSI concrete reinforced with rebar cage.
11. Conduits ends shall have compression type plugs installed.
12. Where bends are required, manufactured bends should be used whenever possible. Bends made manually shall be coordinated with OIT and shall not reduce the internal diameter of the conduit. No section of conduit shall contain more than two 90-degree bends, or equivalent between pull points (e.g., handholes, maintenance holes, and vaults). Back to back 90 degree bends shall be avoided.
13. Manholes shall be a telecommunications-type precast concrete with a precast collar minimum height of 12" with traffic rated frame and cover.
14. The section length of conduit shall not exceed (400 ft) between pulling points.
15. Hand holes shall be Quazite stackable enclosures with traffic-rated lid rated TIER 22.
16. Combined electrical and telecommunication pathways shall be coordinated with the Owner.
17. Typical Communication Ductbanks:
 1. Coordinate requirements and size specific to project needs.



DUCT SECTION-4 WAY
N.T.S. (4 COMMUNICATIONS)



DUCT SECTION - 2 WAY
N.T.S. (2 COMMUNICATIONS)

G4032 Site Security & Alarm Systems

A. Emergency Phones:

1. Shall be a Gai-Tronics 234 Silent Sentinel Stanchion, 297-003 Smart Phone Stainless with a 530-001 LED Strobe 120 VAC.

2. Power for emergency phone shall not be connected to irrigation system power.
3. Power for emergency phone shall be on dedicated circuit, connected to emergency power if generator is provided in project.
4. Shall be ADA compliant.
5. Emergency Phones require two conduits from a building depicted on the electrical plans. One $\frac{3}{4}$ " conduit for power and One 1" conduit for telecom cabling as well as a grounding rod shall be installed. The grounding rod and the conduits shall be installed in the concrete base pad of the emergency phone within the area of the bolt template. The electrical contractor shall install pull strings in both conduits, construct the concrete pad upon which the phone will be mounted and stub-up the conduits 6-12 inches above the pad. AU Telecom will supply the electrical contractor with the emergency phone template kit consisting of four j-bolts, nuts, washers, and a plastic spacing template to ensure proper j-bolt spacing in the concrete pad.
6. If a project will impact an emergency phone, that emergency phone shall be relocated temporarily or permanently as required to provide adequate phone coverage on campus.

Appendix G1 Water Treatment Requirements

- A. Purpose
 - 1. This document is to provide guidance to the University Project Lead on the hydronic system construction, installation and/or renovation for the establishing of required water treatment conditions.
 - 2. It is to be performed in conjunction with and under the technical direction of the Utilities & Energy Plant Operations Department.
- B. Below Grade Hydronic Piping
 - 1. Submittals
 - 1. Provide product data for all chemical treatment materials, chemicals and equipment. Product data shall include chemical explanation, SDS, layouts of feeding equipment and equipment detail sheets.
 - 2. Quality Assurance
 - 1. Retain the resources of the chemical water treatment contractor who is already under contract with the client.
 - 2. The water treatment chemical and service supplier shall be a recognized specialist, active in the field of industrial water treatment for at least five years, whose major business is in the field of water treatment, and who has full time service personnel within the area of the job site. Laboratory facilities shall be available. Service personnel shall be degreed specialists in the fields of mechanical or chemical engineering or chemistry.
 - 3. Furnish and install all equipment and material on this project in accordance with the requirements of the authority having jurisdiction, suitable for its intended use on this project, approved by the U.S. Environmental Protection Agency (EPA), and local Department of Environmental Protection, and so certified by the manufacturer.
 - 4. If not already known, analyze the water from the local water supplier to be used on the project, before establishing treatment procedures.
 - 5. The cleaning sequence will not be deemed completed until fully signed off and agreed upon by the Auburn University Plant Operations Department.
 - 3. Safety
 - 1. All chemical and analytical reagents supplied by the vendor shall meet all applicable government regulations. The bidders shall submit an SDS for all proposed products with the initial technical proposal. The vendor shall be responsible for providing up to date SDS for all chemicals supplied including reagents.
 - 2. The mechanical contractor shall be responsible for the safe cleanup of any chemical spills relating to products supplied by the vendor and caused by failure or malfunction of the chemical feed equipment or due to the actions of the field service personnel. Cleanup shall be performed in accordance with all current government regulations and good safety practices. Vendor shall maintain a 24 hour hot line for emergency situations. Bidder shall provide the phone number and procedure to

- access the hot line including estimated response time in the event of an emergency.
4. Technical Services
 1. Mechanical contractor shall be responsible for handling of all water treatment chemicals.
 2. All chemical deliveries shall be made to the point of use by the vendor or an ahead of time agreed up on location such as the mechanical contractors lay down yard. The contractor shall remove, following local, state and federal governances all chemical containment systems as instructed by the vendor.
 5. Procedure
 1. General Requirements
 1. Pump Strainer shall be fine mesh (3/64-inch maximum).
 2. Preparation:
 1. Contractor shall provide a minimum notice of fourteen (14) days to the water treatment vendor to allow for delivery of chemicals.
 2. Contractor will notify the University Project Lead fourteen (14) working days prior to filling for pressure testing and cleaning of new water pipes. The new piping system shall not be connected/operated until the chemical clean-up is performed.
 3. Contractor shall determine supply and return diameters and provide linear footage to the chemical vendor to determine the amount of chemical required for cleaning and/or sterilization.
 4. Contractor shall install a two-inch (2") bypass inside the mechanical room before the building isolation valves to aid in cleaning, sterilization, flushing and treatment of lateral lines.
 5. If the cleaning chemical is calculated (by chemical vendor) to be 5 gallons or more, a 3/4" nipple and locking stainless steel ball valve should be installed on the suction side of the system pump prior to system being cleaned. This will allow easy addition of cleaning chemical to the loop if the by-pass feeder is not large enough.
 2. Cleaning, Sterilization, Flushing Sequence:
 1. Once a section of pipe between isolation valves is complete, the piping shall be hydro tested, sterilized and treated, in that order. If filling of the pipe is to occur as the pipe sections are constructed, then hydro testing and sterilization shall be accomplished as the pipe is constructed, otherwise, hydro testing and sterilization can be done at the end of each job if no water is put into the pipe for any reason. Under no circumstance shall the pipe remain untreated for more than one week after initial filling.
 2. All water shall be metered into the pipe and amounts shall be tabulated and given to University Project Lead to indicate the volume of water in each pipe section between isolation valves. Pipe

quantities and sizes shall also be tabulated to verify piping is filled completely.

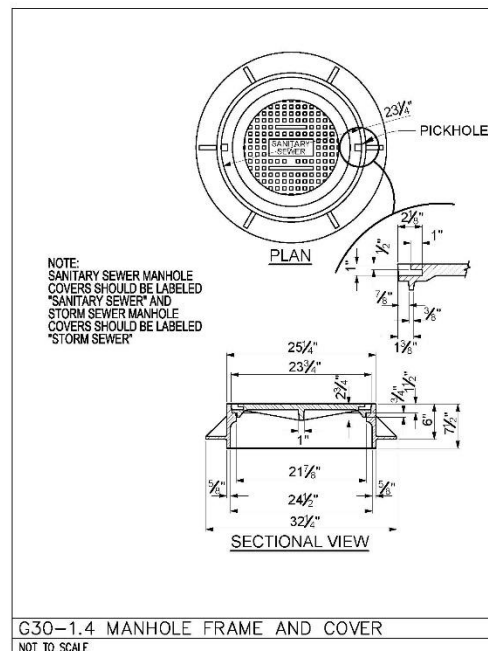
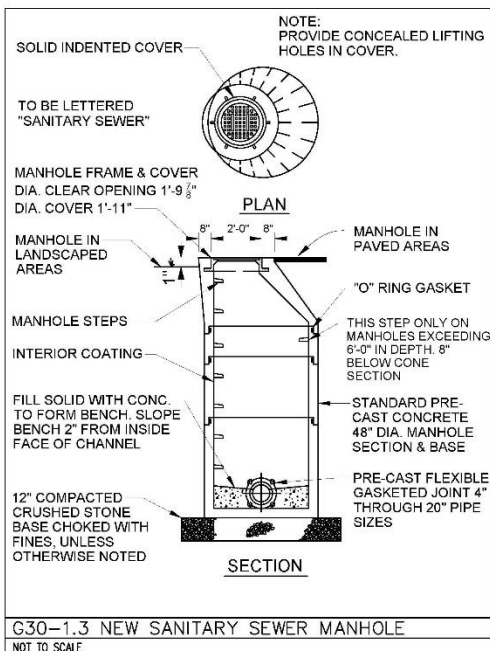
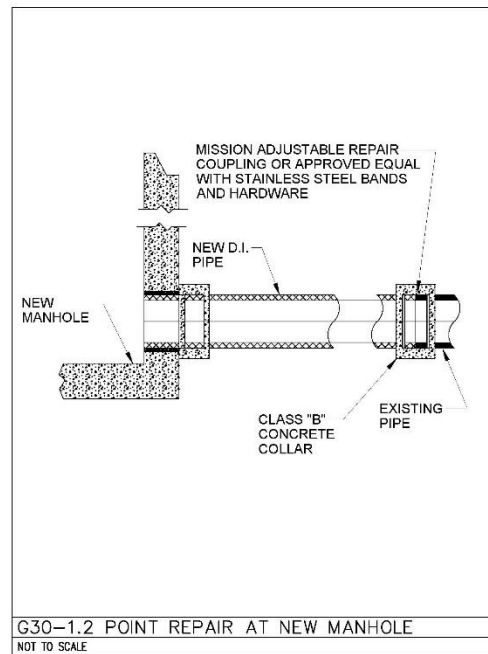
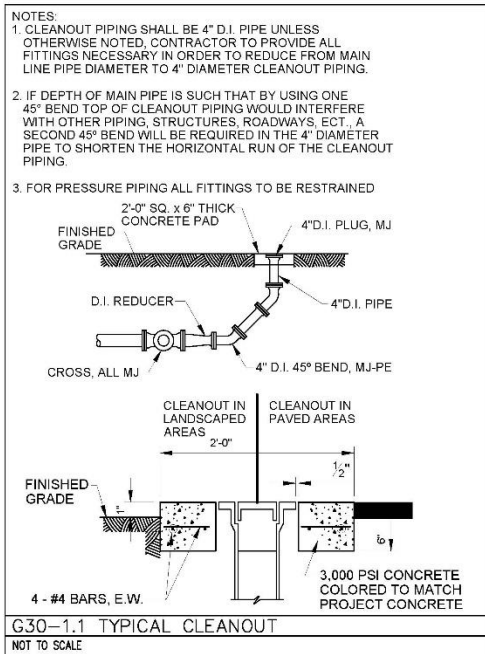
3. The system must be flushed (prior to startup cleaning) until water runs clear to remove existing dirt and debris
4. Two twelve (12) ounce bottles of the system water shall be taken for laboratory analysis prior to the start of the addition of chemicals for cleaning and sterilization. University Project Lead will be responsible for providing the sample bottles to the mechanical contractor.
5. Cleaning and/or sterilization chemicals should be added to the system at levels determined by the chemical vendor.
6. Place the re-circulation pump at the low point of the area to be cleaned so that adequate venting can occur at the high point of the system.
7. At the high point crossover, contractor to provide a ball valve and sample point for ease of water testing and for venting air from the system.
8. Two twelve (12) ounce bottles of the system water shall be taken for laboratory analysis three hours after chemical addition
9. Two twelve (12) ounce bottles of the system water shall be taken for laboratory analysis twelve hours after chemical addition
10. Circulate the solution for at least twenty-four (24) hours or as recommended by the University Project Lead, whichever is less. Balance valves shall be included to ensure pump is operated with sufficient head. Valve shall be manually modulated to obtain proper flow from pump. Pump differential head and certified pump curves shall be utilized to determine pump flow. Biocide shall be circulated to maintain a minimum pipe flow as shown in the following table. Flow rate shall be determined based on the largest diameter piping in the system.

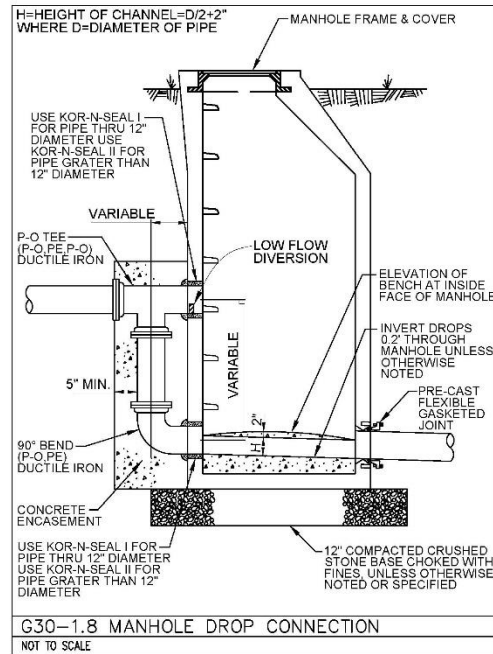
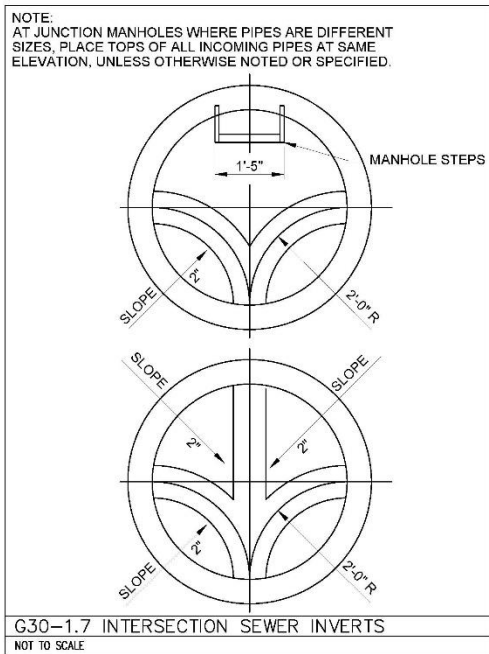
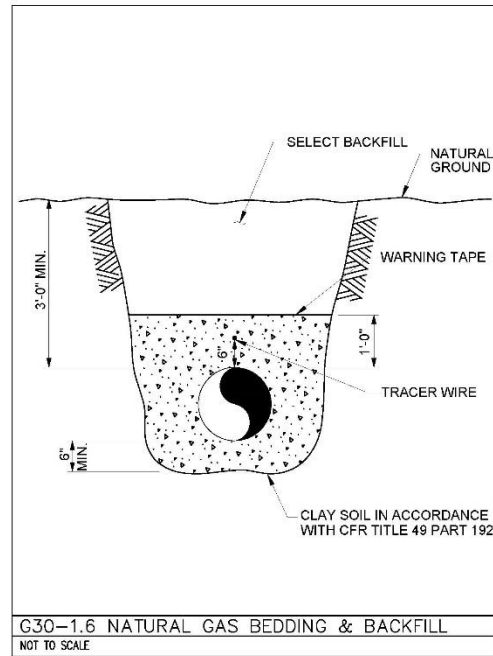
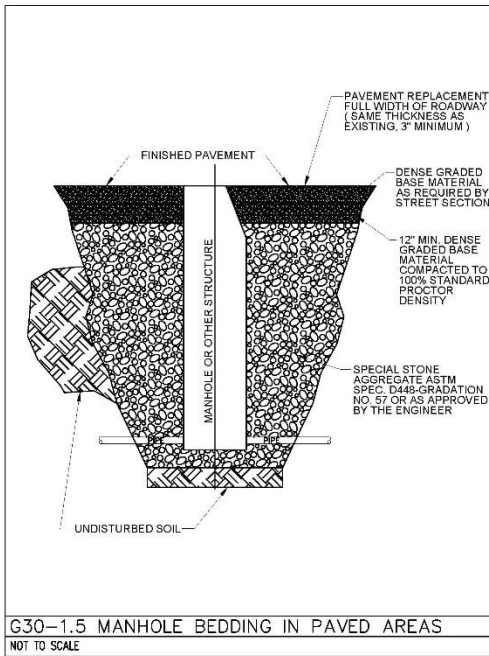
MINIMUM CLEANING WATER	
<i>Pipe Size (in)</i>	<i>Flow (gpm)</i>
2	45
4	100
6	250
10	500
14	960
15 thru 30	1,250

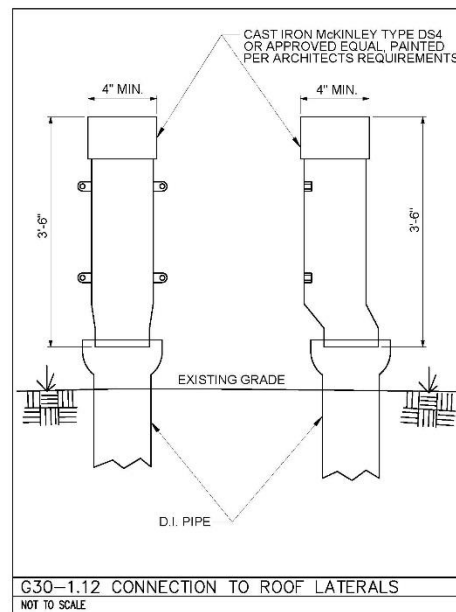
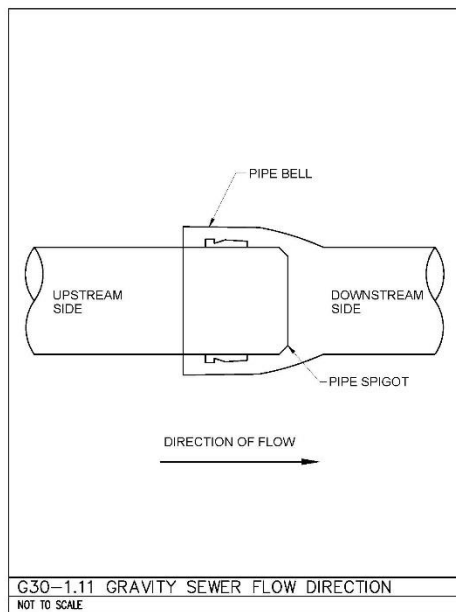
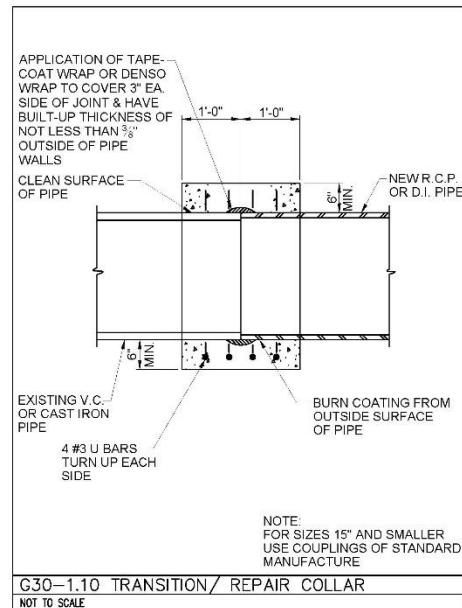
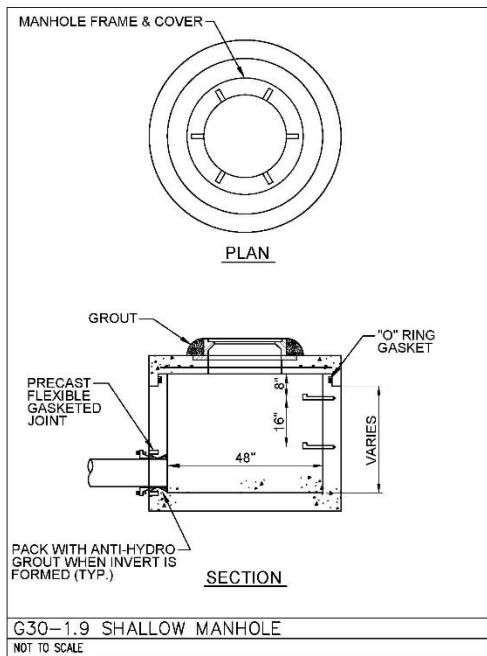
11. Twenty four (24) hours following the start of the cleaning process, two twelve (12) ounce bottles of system water shall be gathered for laboratory analysis.

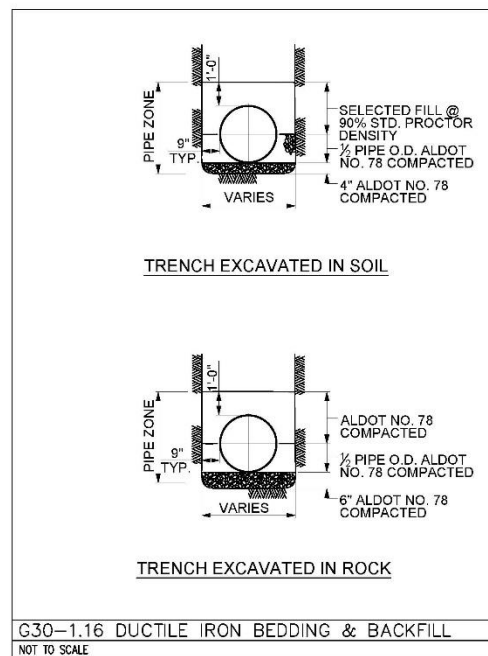
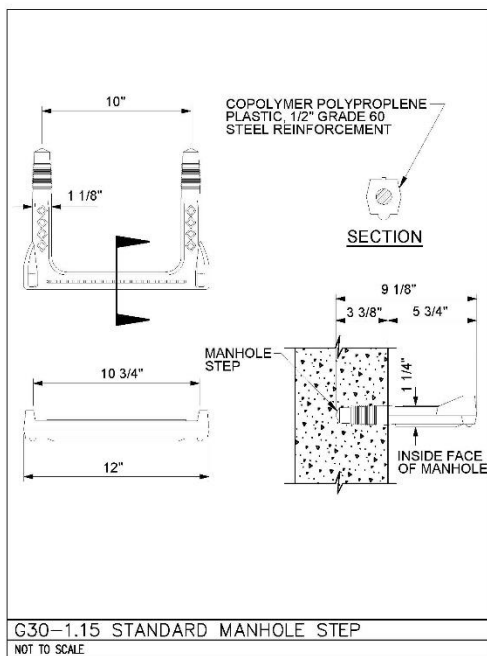
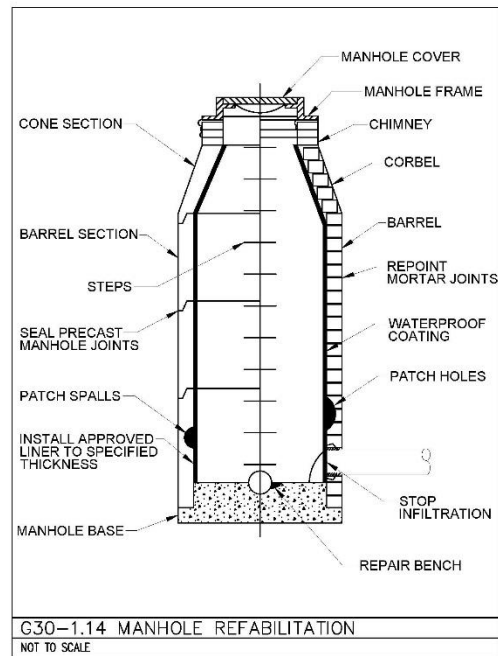
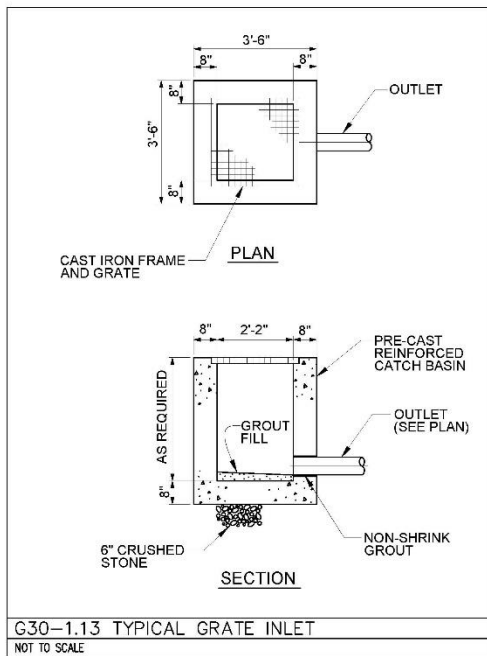
12. Following cleaning, drain systems as quickly as possible. Flush with clean water until the University Project Lead or the chemical vendor verifies the water is back to city water quality.
 13. Remove strainer(s).
 14. Inspect, remove sludge, and flush low points with clean water after cleaning process is completed. Include disassembly of components as required. Under no circumstance shall cross overs or ball valves be left underground. Where crossovers and valves are used, they must be removed, plugged, sealed and adequately insulated prior to burial.
3. Water Treatment
 1. Within 48 hours following the completion of the cleaning sequence, the water treatment chemicals shall be added and circulated as recommended by the University Project Lead.
 2. Two additional twelve (12) ounce bottles shall be gathered for laboratory analysis once treated water is in the pipe.
4. Chemicals
 1. Underground Chilled Water, Ductile Lined
 1. Sterilization Chemicals shall be non-oxidizing biocide which has halogen like effects such as 2,2-dibromo-3-nitrilopropionamide, also known as DBNPA. Use Suez WTS Spectrus NX1102 or equivalent.
 2. Water Treatment Chemical shall be Suez WTS Corrshield MD4100 or equivalent.
 2. Underground Chilled Water, Non-Ductile Lined
 1. Cleaning and Sterilization Chemicals shall be:
 2. Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products. Use Suez WTS Ferroquest FQ7103 at 3% of system volume.
 3. Non-oxidizing biocide which has halogen like effects such as 2,2-dibromo-3-nitrilopropionamide, also known as DBNPA. Use Suez WTS Spectrus NX1102 or equivalent.
 4. Water Treatment Chemical shall be Suez WTS Corrshield MD4100 or equivalent.
 3. Underground Hot Water
 1. Cleaning and Sterilization Chemicals shall be liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products. Use Suez WTS Ferroquest FQ7103 at 3% of system volume.
 2. Water Treatment Chemical shall be Suez WTS Corrshield NT4207 or equivalent

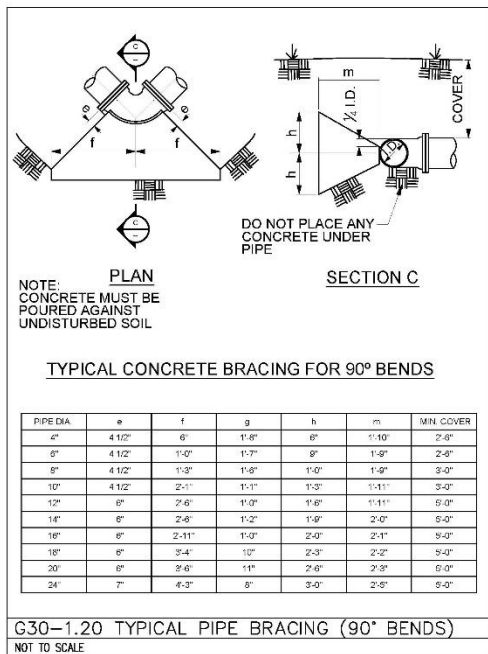
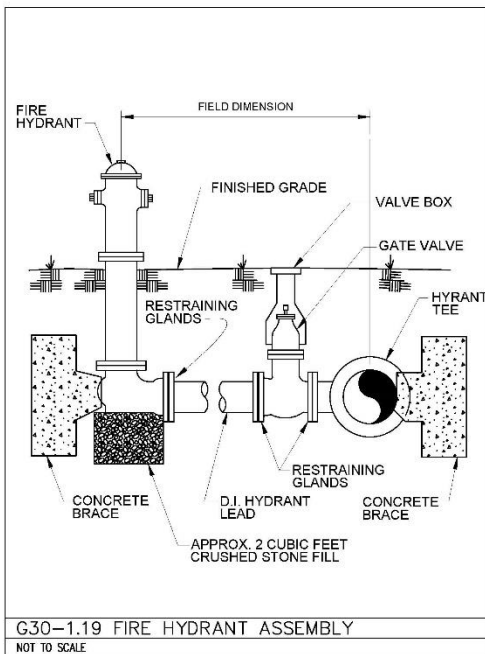
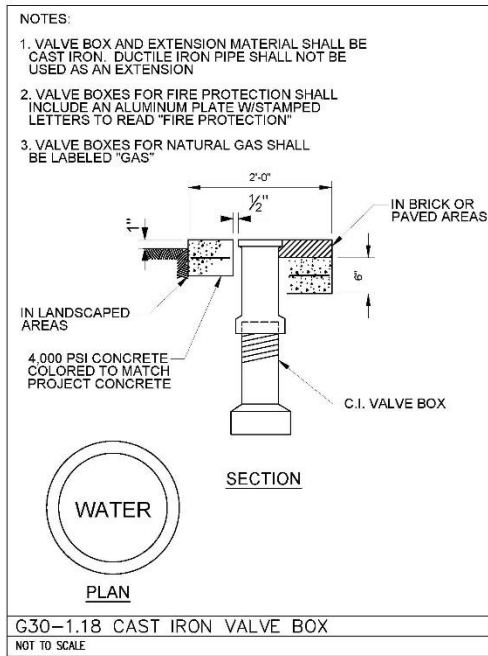
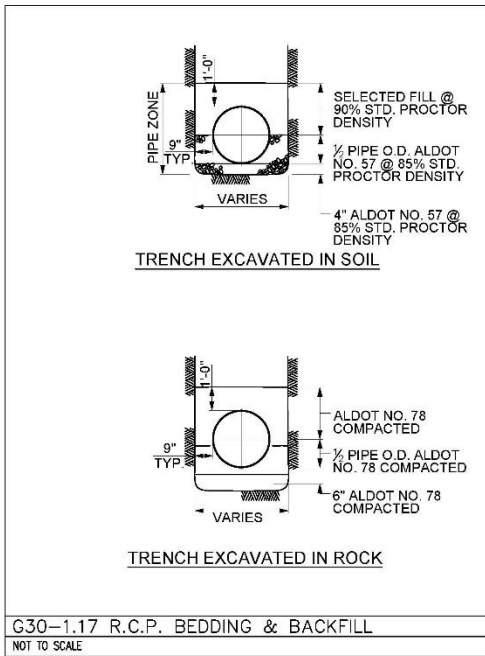
Appendix G2 Standard Utility Details

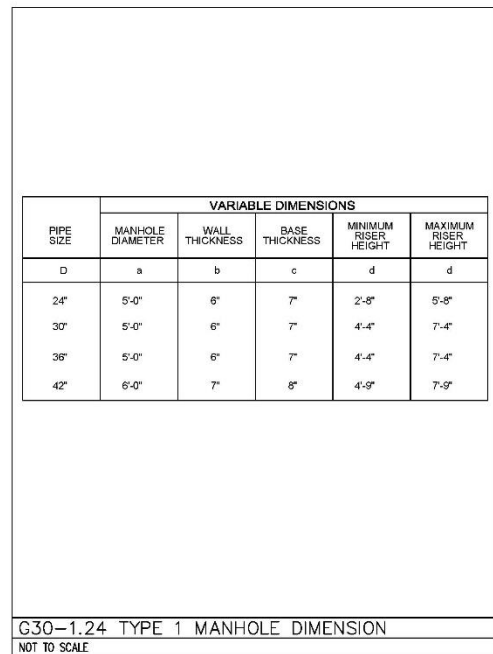
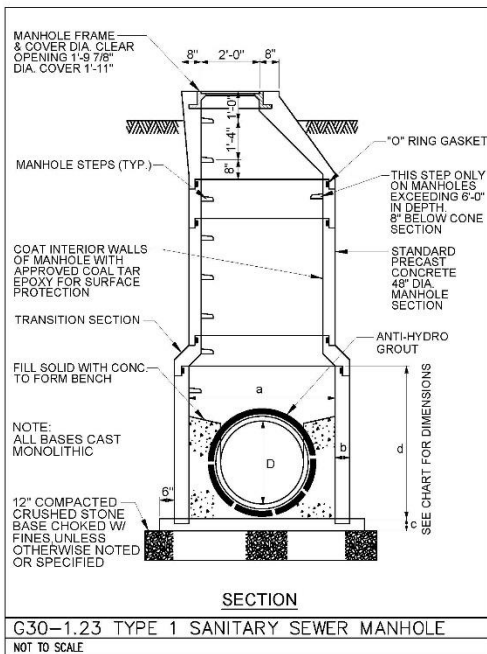
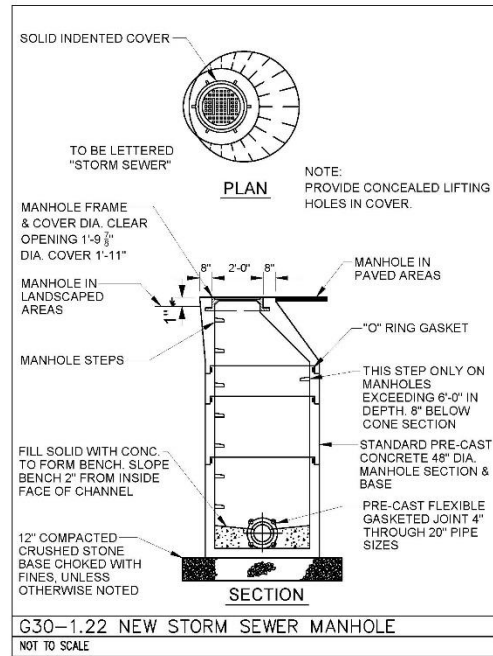
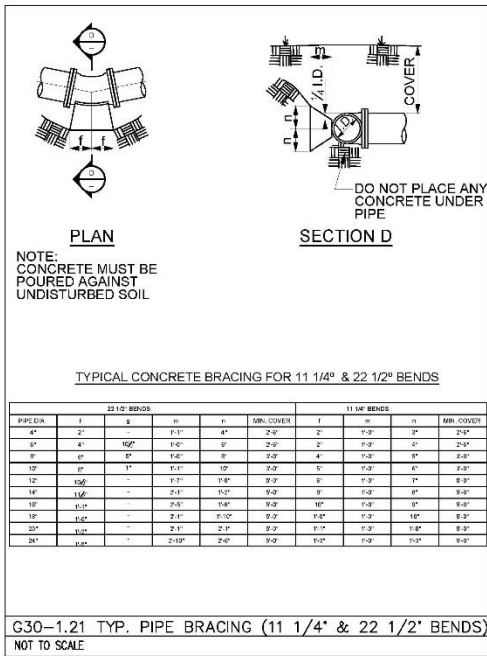


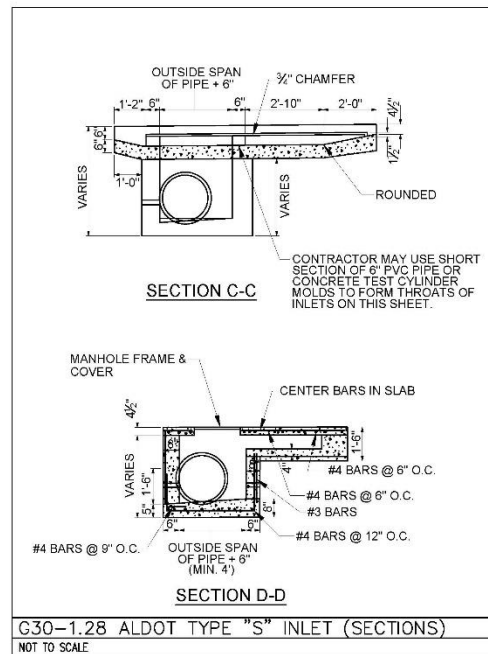
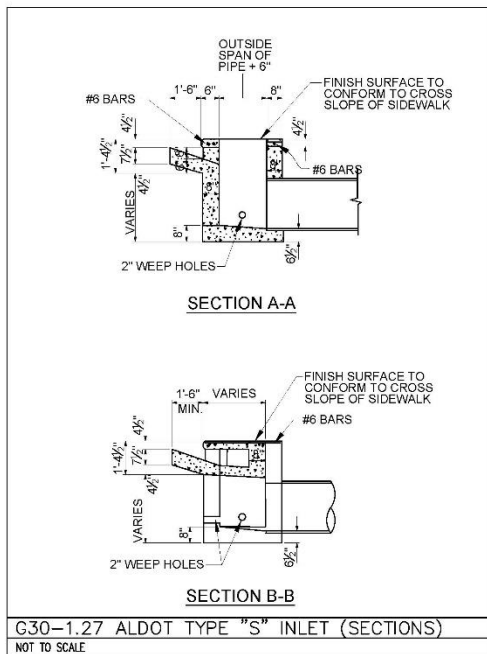
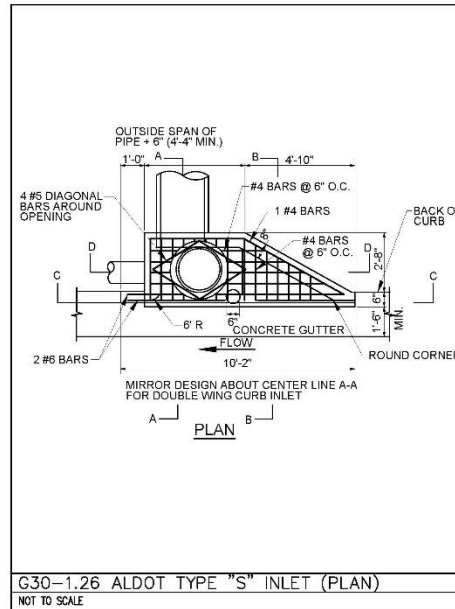
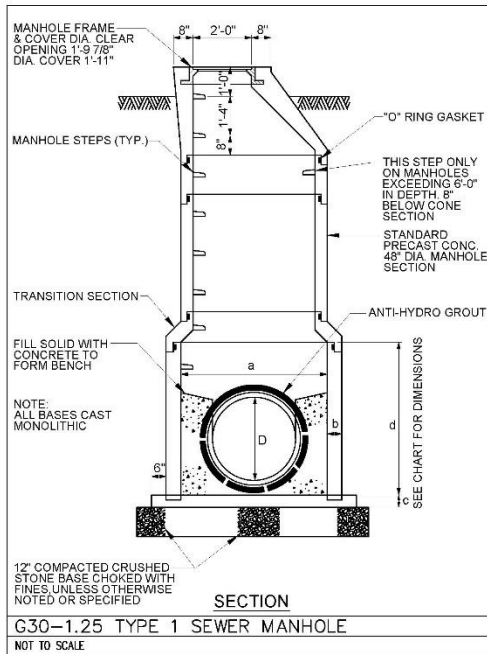












Document Revision History

Version	Section	Summary of Change	Date



2022 Sustainability & Space Programming Requirements

INDEX

Sustainability
Space Programming
Document Revision History

Sustainable Building Standards

Auburn University is committed to sustainable building and construction practices. Architects/Engineers are expected to provide an environmentally responsible design while adhering to current adopted editions of codes/standards, and Auburn University Design and Construction Standards. The standards identify a minimum level of design and process requirements for all new construction and renovation projects while providing enough flexibility for individual project teams to meet project goals.

Using the *Harvard Green Building Standards* project tiers as a model, apply the following table for project-required Elements.

Tier	Area of Concern	Required Elements
1	New building construction and full building renovations	<ul style="list-style-type: none"> • Sustainability Charette • Life Cycle Cost • Energy Modeling • Commissioning • LEED Silver Compliance
2	Partial building renovations or fit outs. HVAC, Lighting, Plumbing, Finishes in scope. Base building HVAC and envelope are unaffected.	<ul style="list-style-type: none"> • Evaluate energy conservation measures. • Commissioning • LEED Certification not mandatory. Seek LEED requirements were practical
3	Systems renovations. Includes AHU replacement, plumbing retrofit, lighting retrofit, elevators, etc.	<ul style="list-style-type: none"> • Evaluate energy conservation measures. • Commission new or existing equipment replacement • Reduce waste impact by recycle and reuse. • LEED Certification is not required.
4	Landscape projects, paint, flooring, and roof replacements, etc.	<ul style="list-style-type: none"> • LEED Certification is not required. • Reduce waste impact by recycling and reusing.

Space Programming Requirements

The Design Team should use these conditions to supplement the building occupant's programming needs. The requirements herein should be incorporated into the building's overall program.

Attic Space:

- A. Where attic spaces are provided, design the space for future storage space build-out if not included in the design to include structural capacity, fire protection, access, and egress.

“Attic Stock” Storage Room:

- A. A room of the appropriate size (minimum size 8'x10') to store the Attic Stock shall be designed into the project.
- B. The room shall be accessible from a public corridor.

Custodial Closets:

- A. General
 - 1. Provide Custodial Closets in each project over 40,000 square feet.
 - 2. Provide one (1) custodian closet for each 15,000 - 18,000 square feet of building floor space with a minimum of one (1) for each floor.
 - 3. An additional storage room of at least 200 square feet in size shall be located in each building.
 - 4. In each project over 100,000 square feet, provide an office and a break room to accommodate eight custodial employees.
- B. Basic Requirements for Custodial Closets:
 - 1. Dedicated space (i.e., no shared use/function)
 - 2. Minimum area: 100 square feet.
 - 3. Located adjacent to the freight elevator/service entrance.
 - 4. Provided with shelving on at least one wall.
 - 5. Not be located at the dead end of a corridor, on a stair landing, inside another room, under stairways, or in narrow spaces.
 - 6. Each Custodial Closet shall be provided with:
 - 1. Floor drain.
 - 2. Space for a 6' step ladder.
 - 3. Pegs for storage of rotary brushes.
 - 4. Hangers for wet mops over floor receptors.
 - 5. Hangers for dust mops and brooms furnished by the owner.
 - 6. Hard surface walls and 10' high ceilings.
 - 7. Adjustable shelves for supplies.
 - 8. A 36" door that swings out of the room.
 - 9. Minimum 24"x24" terrazzo mop receptor with 4" front curb and 6" side curbs located in one corner on the wall beside the entrance door. The remainder of the floor area in the closet may be trowel finished, sealed

- concrete with a ceramic tile base. A waterproof membrane shall be provided under the entire floor, and the floor shall be pitched to receptor or a drain.
10. Hot and cold water. Faucet shall be threaded for a hose connection, mounted 36" above the floor and provided with check valves on supplies and a vacuum breaker before the threaded hose connection.
 11. A duplex receptacle in "open" wall and power for 3 buffers.
 12. Floor space for large floor finishing machine.
 13. Space for 40" H x 26" W 48" L trash cart.
 14. Adequate lighting, but no light fixtures or sprinkler heads located above mop receptor.
 15. If a fire alarm is present, install a heat detector if a mop sink is provided; provide a smoke detector if no mop sink is provided.

Single Toilet Room:

- A. Provide a minimum of one single toilet room within each building core on each floor.
- B. This single restroom is in addition to the code required plumbing fixtures.
- C. ADA compliant
- D. Include a baby changing station.
- E. Signage: "RESTROOM" and "BABY CHANGING STATION"

Shower:

- A. Provide a minimum of one single-stall shower room within each new or large-scale renovated project which contains office or administrative space.
- B. ADA compliant.
- C. Provide collapsible water retainer shower dam.
- D. Signage: "SHOWER"
- E. May combine with Single Toilet Room

Lactation Room:

- A. Provide a minimum of one lactation room within each new or large-scale renovation project which contains office or administrative space.
- B. Space shall contain:
 1. Sink
 2. Small refrigerator
 3. Counter
 4. Chair
 5. Mirror
- C. Signage: "LACTATION ROOM".

Mechanical Rooms and Electrical Rooms:

- A. Provide separate rooms for electrical equipment and mechanical equipment.
- B. No ceilings

- C. Primary mechanical and electrical equipment rooms shall be located with access to the building exterior and allow for convenient service vehicle access and equipment removal.
- D. These spaces shall not be combined with custodian closets.
- E. Provide fire alarm audio/visual notification and pull station at the exit
- F. In new facilities, electrical rooms shall be vertically stacked (with sufficient overlap) to permit straight/vertical route of busway and cable raceway between multiple levels.
- G. In new facilities, electrical rooms shall be centrally located (minimal cable lengths) to reduce costs & voltage drop.
- H. Lighting in mechanical/electrical rooms shall operate when normal power is interrupted.
- I. Convenience receptacles in each mechanical/electrical room shall be on dedicated circuits connected to standby generator when one is provided.
- J. Door openings shall swing out of room and shall open to a common corridor or to the exterior of the building and be sized to allow replacement of equipment without structural modifications. Provide panic hardware doors.
- K. Transformer vaults and mechanical equipment rooms should not be accessible to building occupants.
- L. Locate occupants' equipment and controls within space controlled by the occupants. This includes fuses, circuit breakers, switches, valves, etc., that serve departmental equipment.

Telecom Rooms & Systems:

- A. Follow the TIA/EIA-569 industry standards for telecommunications spaces and pathways.
- B. The telecommunications Building Entrance Terminal (BET) or Main Distribution Frame (MDF) and Intermediate Distribution Frame (IDF) rooms shall:
- C. Be a dedicated rooms and not shared space with electrical or mechanical equipment.
- D. Be accessible from a corridor or the exterior.
- E. Not have an exterior window
- F. The telecommunications networking electronics are sensitive to electrical fields created by transformers and distribution power panels and are not suited for the dirty environment of a mechanical room.
- G. Per TIA/EIA-569 industry standards, a minimum of one telecom room per floor is required. Additional telecom rooms may be necessary if the floor area to be served exceeds 1000 square meters. Additional telecom rooms are required as necessary to keep the length of the cable pathway from the telecom room to the work area within 90 meters.
- H. Telecommunication rooms should at minimum be sized according to the following BICSI – Telecommunications Distribution Methods Manual (TDMM) standard. These sizes are minimum requirements based on Telecom equipment only, adding other equipment (e.g., lighting panels, access control, or security camera panels) will require additional space:

Building Area	Telecom Room Size
Less than or equal to 93m ² (1000ft ²)	Wall Cabinets, Self-Contained Cabinets, or Enclosed Cabinets
Less than or equal to 465m ² (5000ft ²)	<ul style="list-style-type: none"> • Shallow Closet: 0.6m deep x 2.6m wide (2ft deep x 8.5ft wide)
≈465 m ² (5000 ft ²) or less	3.0m x 2.4m (10ft x 8ft)
Larger than ≈465 m ² and less than or equal to ≈743 m ² (>5000 ft ² to 8000 ft ²)	≈3 m (10 ft) by ≈2.74 m (9 ft).
Greater than 800m ² (8000ft ²)	3.0m x 3.4m (10ft x 11ft) Provide one for every 1000m ² (10,000ft ²)

- I. HVAC system design requirements:
 1. Optimum Temperature Range: 65-73 degrees F
 2. Maximum Temperature: 73 degrees F
 3. Relative Humidity Range: 30% to 55%
 4. Minimum Airflow: one air change per hour
 5. Heat Load: 3,000 Btu/hr
 6. 24/7 operation
 7. Dedicated Unit
- J. The room should have finished walls and floors.
- K. Doors shall be lockable, 36-in wide & 80 in height minimum, No door sills, No center posts. If it is anticipated that large equipment will be delivered to the telecom room, a double door (72 in) wide by (90 in) high without doorsill and center post is recommended.
- L. Minimum floor loading of 2.4 kPA (50 lb/ft²)
- M. The floors can either be finished, painted or concrete with an adequate sealer.
- N. No suspended ceilings
- O. Minimum ceiling height of 8-ft 6-in
- P. No floor drains.
- Q. Do not route drains through telecom rooms.
- R. Only piping that is serving the telecom room may enter the space. All pipe penetrations must be sealed.
- S. Lighting
 1. Shall be a minimum of 500 lux (50 foot-candles) measured 1 m (3 ft) above the finished floor, in the middle of all aisles between cabinets and racks. The

- lighting shall be controlled by one or more switches located near the entrance door(s) to the room.
2. Provide at least one emergency light (battery backup or on generator if one provided)
 3. Lighting circuits shall not be powered from the same electrical distribution panel as the power receptacles in the telecom room.
 4. Light fixtures located a minimum of 8-ft 6-in above the finished floor
- T. Provide Two 20-amp 120-volt NEMA duplex power outlets on separate circuit breakers installed in a single quad outlet configuration near the top of the backboard on each wall under the cable tray. These outlets/circuits should be connected to the generator if one is provided.
- U. Provide basket tray that circumnavigates the telecom room backboard, mounted at 90 to 96 inches A.F.F.
- V. Provide one duplex 20A 120V power convenience outlet on dedicated circuit, connected to generator if one is provided.
- W. Conduits should only cross a backboard vertically in corners.
- X. Typical Telecom Room:
1. https://www.auburn.edu/oit/pdfs/telecom-room-layout_TYPICAL.pdf
- Y. Technology Design, Procurement, and Installation Responsibility Matrix:
1. <https://www.auburn.edu/oit/pdfs/technology-matrix.pdf>

Stairways:

- A. Provide one (1) 20 Amp duplex, 120 volt receptacle on each floor stair landing.
- B. Natural light in stairwells is desirable.
- C. Lighting shall be wall mounted at the landings at 8'-9' A.F.F.
- D. Provide interior doors on magnetic hold-opens connected to fire alarm system for enclosed stairwells.

Security / Electronic Access Control System (EACS) Rooms

- A. All Security Systems, Intrusion Systems, Duress Systems, Camera Systems, and EACS power supplies and components shall be located within these rooms.
- B. Security / EACS rooms shall be designed with the same requirements as Telecom Rooms unless noted otherwise below.
- C. Environmentally controlled Security/ EACS Rooms sized for designed systems as well as future expansion of systems based on the total number of doors as possible future access-controlled points.
- D. Minimum height of 8-ft 6-in
- E. Minimum floor loading of 50 lbs. per square foot.
- F. The room shall have finished walls.
- G. The floors shall either be finished, painted or concrete with an adequate sealant.
- H. There shall be no floor drains or any kind of drainage in or into any Security/EACS room.
- I. There shall be no overhead pipe joints for pass-through plumbing and all pipe penetrations shall be sealed.
- J. Doors shall be electronically lockable and equipped with an EACS reader, 36-in wide & 80 in height minimum, No door sills. If it is anticipated that large

- equipment shall be delivered to the Security/EACS room, a double door (72 in. wide by 90 in. high) without doorsill and with a keyed removable center mullion.
- K. The Security/EACS rooms shall be accessible only from a hallway, a corridor, or outside and not located behind any offices, labs, classrooms or other spaces and shall not have an exterior window.
 - L. These rooms shall also contain the electrical panels, with isolated ground, on emergency power backup, supplying power to the equipment housed within as well as the required networking equipment for both the Security and EACS systems.
 - M. Each power supply shall be on a separate disconnect for service and repair so as not to disrupt remaining system operations.
 - N. The equipment backboard shall be constructed of ¾-inch plywood painted on all sides. The backboard shall be of either fire-retardant plywood or painted with two coats of fire-resistant paint. The plywood should be mounted vertically to all walls in every Security/EACS room. The plywood is required for the mounting of termination hardware and electronic equipment, therefore requires toggle or butterfly bolts for fastening to the wall.
 - O. Buildings in excess of 10,000 square feet may require additional Security/EACS rooms to keep the length of the cable pathway from the Security/EACS room to the device within 250 feet. Typically, a minimum of one (1) Security/EACS room per floor is required in a building.
 - P. Only Security/EACS related equipment shall be located within these dedicated rooms and not shared space with electrical or mechanical equipment that does not directly serve the room.
 - Q. The Security/EACS electronics are sensitive to electrical fields created by transformers and distribution power panels and are not suited for the dirty environment of a mechanical room.
 - R. Provide cable tray that circumnavigates the entire Security/EACS room between 84 inches and 90 inches AFF.
 - S. Conduits entering the Security/EACS room shall terminate at the backboard edge either directly above or directly below the plywood backboard to minimize the routing of cables around the room. No Security/EACS conduit should penetrate the ceiling or floor more than 3 inches from the wall that supports a backboard.
 - T. At no time shall a conduit cross a backboard vertically except in corners.
 - U. Conduits shall be connected to the cable tray by either direct mechanical connection or via a cable tray bridge.
 - V. Security/EACS cabling is never allowed to hang in free space without support.
 - W. Provide two 20-amp 120-volt NEMA duplex power outlets on separate circuit breakers should be installed in a single quad outlet faceplate near the top of the backboard on each wall under the cable tray that circumnavigates the Security/EACS room backboard, typically at 84 to 90 inches AFF. These outlets/circuits shall be on an emergency circuit connected to the backup generator.
 - X. One duplex 20A 120V power convenience outlet, on a separate circuit breaker, shall be installed elsewhere in each Security/EACS room for power tools, test equipment, etc.

Y. Lighting

1. Shall be a minimum of 500 lux (50 foot-candles) measured 1 m (3 ft.) above the finished floor.
2. The lighting shall be controlled by one or more switches located near the entrance door(s) to the room. Dimmer or timed switches shall not be used.
3. Lighting fixtures should not be powered from the same electrical distribution panel as the equipment in the Security/EACS room.
4. Light fixtures located a minimum of 8-ft 6-in above the finished floor.
5. Lights should be on an emergency backup power circuit.

Facility Security**A. General**

1. This document provides internal policy, guidance, and considerations for integrating physical security in all Auburn University owned, managed, or occupied buildings. Security shall be an integral consideration in the selection and development of both new building sites and renovation projects. The guidelines set forth minimum security features and arrangements that are required for all campus buildings and facilities.

B. Facility Threat Level (TL) Designation**1. General**

1. The level of security required will be dependent on the function of the facility and of specific space within the facility.
2. Final determination of the required level(s) of security shall be determined by Auburn University Campus Safety and Security coordinated by the UPL.

2. Designations**1. TL-1 General**

1. All campus buildings and facilities, not otherwise defined below.

2. TL-2 Confidential

1. Buildings, or spaces within buildings or facilities in which information of a confidential nature is stored or otherwise maintained. This category includes, but not limited to, human resources file rooms; student records rooms or other areas regulated by the Family Education Rights and Privacy Act; records covered by the Health Insurance Portability and Accountability Act of 1996; and areas housing proprietary research or sensitive operational information.

3. TL-3 Known Threat

1. Areas, buildings or other spaces known to be, or logically assumed to be, targeted for destruction, disruption, or vandalism by extremist individuals or groups, as well as areas of specific safety concern to students, faculty, visitors, or staff. These areas include, but not limited to, the College of Veterinary Medicine, areas housing or providing care for animals, buildings which house controlled substances, student dormitories, parking decks and other certain

parking areas and walkways as determined by security specialist from AU Campus Safety & Security

4. TL-4 Hazardous Materials & Bio-Safety Laboratories

1. Areas used for storage or utilization of hazardous chemicals or materials, and laboratories known to or intended to house potentially dangerous biological or radiological agents.

3. Site Security:

1. Structural barriers such as bollards and fencing shall be installed at the primary and secondary entrances to new buildings to prevent vehicular approaches and intrusions.
2. Landscaping shall be selected and placed in such a manner that opportunities for concealment and interference with security camera views are minimized.
3. TL-1 & TL-2: no additional requirements.
4. TL-3 & TL-4
 1. Provide locking gates or doors to separate off-limits areas to the public.

C. CCTV Camera Location Requirements

1. TL-1

1. Coverage of the entire Loading Dock.
2. Ground level openings.

2. TL-2

1. Comply with TL-1
2. Entrance to confidential information and records storage rooms.

3. TL-3

1. Comply with TL-2
2. Parking lots, parking decks, and roadway entrances
3. Walkways and stairwells.

4. TL-4

1. Comply with TL-3
2. Entrance to rooms with hazmat and/or biological safety cabinets
3. Entrance to rooms with laboratory storage areas.

Document Revision History

Version	Section	Summary of Change	Date
1.0	Telecom Rms & Systems	Add: Technology Responsibility Matrix Link	2/14/23
1.0	Sustainability	Add: Sustainability Requirements	3/25/23
1.0	Facility Security	Add: Facility Security Requirements	4/10/23



2022 Door Hardware Standards

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Door Hardware Standards
Document Revision History

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INTRODUCTION

This is a “living document” and as such is updated on an as needed basis. All Auburn University projects shall adhere to the most current version as related to the bid date, within a reasonable time, of the project documents. The purpose of this document is to provide minimum requirements for the majority of typical openings.

This document applies to all new construction, renovation, and remodeling projects on all Auburn University properties.

If a variance to any item in this document is desired, these shall be reviewed and approved via the Design & Construction Standards variance form.

In any instance where this standard and code are not in agreement, code shall dictate the direction.

The Designer shall become familiar with and interpret this section of the Design and Construction Standards in accordance with the programmatic requirements of the Project.

Design Basis**A. General**

1. Finishes for door hardware shall match either US26D or US32D, consistently throughout the project. On renovation projects, other finishes may be submitted to the University Project Lead for review, if matching the existing finishes is desired.
2. Single-leaf door openings are preferred to double-leaf door openings. If double-leaf door openings are required by the project, a keyed removable mullion shall be provided.
3. If aluminum storefront systems are specified, only wide-stile doors are acceptable. Provide a 12” bottom rail on aluminum storefront doors.
4. Best permanent and construction cores shall be provided by the Contractor. At the completion of the project, AUFM will remove the construction cores, install the permanent cores and return the construction cores to the Contractor. AUFM shall develop the final keying schedule with the end-user, prior to procurement and delivery of the permanent cores. The project lead will arrange a meeting between Access Control and the client to discuss the final keying schedule. This meeting shall be a minimum of 12 weeks prior to the scheduled completion date.
5. Door Hardware Sets schedule shall be provided for all openings shall be included on the construction drawings, immediately adjacent to floor plans. A schedule within the Project Manual is not acceptable.

B. Access Control Hardware

1. Locksets shall accept Best 7-pin interchangeable cores and cylinders.
2. Manual/key latching or cylinder dogging is not acceptable.
3. All doors and frames shall be prepped for EPT-10 (Electric Power Transfer) when electrified hardware is present.
4. The programming and configuration for the access control system shall be by the Contractor with system integration by the System Integrator to the Access Control Center standards.

5. The use of electric strikes is not permissible due to inherently high failure rates.
 6. The use of electromagnetic locks is not permissible due to safety, security, and the inherently high failure rate.
- C. Hinges
1. Approved Manufacturers:
 1. Hager
 2. McKinney
 3. Stanley
 2. Continuous gear-type hinges, manufactured of extruded 6063-T6 aluminum alloy/temper and consisting of three interlocking extrusions in a pin-less assembly applied to the full height of the door and frame, shall be provided at all exterior openings. Finish to match door.
 3. Butt hinges shall be manufactured to template screw locations and be non-handed.
 4. Thrust bearings shall carry the vertical loads and be completely concealed by the gear cap the full length of the hinge.
 5. Hinges shall comply with ANSI A156, Grade 1.
 6. The use of electric hinges is not permissible due to inherently high failure rates.
- D. Mechanical Locks and Latches
1. Locksets shall accept Best 7-pin interchangeable cores and cylinders.
 2. Plastic parts in locksets are not acceptable.
 3. If specified, mortise-type locksets shall comply with ANSI A156, Grade 1, with 3/4 inch throw latch bolt. Inside trim shall include a turn lever to permit egress when door is locked. Mortise cylinders shall have a concealed internal set screw for securing the cylinder to the body. Best 45H Series shall be provided.
 4. If specified, cylinder-type locksets shall comply with ANSI A156, Grade 1. Inside trim shall include a turn lever to permit egress when door is locked. Provide 2¾" backset on cylinder locksets. Best 9K Series shall be provided.
 5. Deadbolts shall be constructed of hardened stainless steel and shall extend a minimum of 1" into the door casing, beyond the door strike. Levers shall be operated with a roller bearing spindle hub mechanism. The use of dead bolts shall be approved by University Project Lead.
 6. Latchbolts shall extend a minimum of 3/8" into the door casing, beyond the door strike.
 7. Furnish locksets with sufficient curved strike lip to protect door trim.
 8. Locksets to have self-aligning, thru-bolted trim.
 9. Auxiliary dead latches shall be constructed of one piece hardened stainless steel, permanently lubricated.
 10. Lever handles shall be forged of cast brass, bronze, or stainless steel and shall conform to ANSI A117.1. Hollow cavity levers are not acceptable.
 11. Mechanical dogging is not allowed.
- E. Door Closers
1. Closers shall be provided by LCN.

2. Closers on exterior openings shall be LCN 4040 Series.
 3. Closers on interior openings shall be LCN 1461 Series.
 4. Closers shall be mounted on interior side of space/room. Closer shall be mounted in an inverted overhead position or in a parallel arm position.
 5. Closers shall be equipped with “delayed-action” feature.
 6. Closers shall be equipped with “back-check” feature.
 7. Closers shall have a ten-year warranty.
 8. Hold open alarms are not allowed.
- F. Operating Trim
1. Approved Manufacturers:
 1. Glynn-Johnson
 2. McKinney
 3. Rockwood
 2. Flush and surface bolts shall comply with ANSI A156, Grade 1.
 3. Coordinators shall comply with ANSI A156, Grade 1.
 4. Where through-bolts are used to attach hardware to doors, spacer sleeves in doors shall be provided to prevent collapse of the door.
 5. Thru-bolt fasteners shall be templated so as not to make contact with the frame assembly.
- G. Architectural Trim
1. Approved Manufacturers:
 1. Glynn-Johnson
 2. McKinney
 3. Rockwood
 2. Metal protection plates shall comply with ANSI A156, Grade 1. Provide .050 stainless steel plate with four beveled edges, door leaf width, less 2” for a single door, less 1” for pairs of doors. Provide 8” height kick- and 34” for armor-plate.
 3. Furnish screws to match finish.
- H. Door Stops and Holders
1. Approved Manufacturers:
 1. Glynn-Johnson
 2. Rockwood
 3. Sargent
 2. Provide an overhead stop at exterior openings, similar to Glynn-Johnson 100.
 3. Wall stops are preferred.
 4. Floor stops are not desired unless a wall stop cannot be provided.
 5. Electromagnetic hold opens, tied into the fire alarm system, may be used on interior smoke and fire doors located in corridors.
- I. Door Seals
1. Approved Manufacturers:
 1. National Guard
 2. Pemko
 3. Zero
 2. Provide sound-rated seals at all classrooms, offices and sleeping units, and those spaces recommended by the Designer, or Acoustician.

3. Weatherstripping shall be provided by the storefront manufacturer.
- J. Thresholds
 1. Approved Manufacturers:
 1. National Guard
 2. Pemko
 3. Zero
 2. Provide ADA-compliant thresholds at all exterior openings and those spaces recommended by the Designer.

DEFINITIONS

SH: Security Hardware. Monitored by electronic access control system

GH: General Hardware. No electronic monitoring.

ADA: Openings requiring some level of compliance with the Americans with Disabilities Act (ADA) regulations.

TS: Tornado Shelter.

Base Operation Intent Quick Reference Guide

AREA TYPE	OPENING TYPE	BASE OPERATION INTENT	HW SET ⁽¹⁾
<ul style="list-style-type: none"> Exterior Opening ADA accessible with Vestibule 	Main Entry Point	<ul style="list-style-type: none"> Access controlled by credential access and electronically. Capable of real-time remote programming and monitoring. Free egress at all times. 	ADA-01.00
<ul style="list-style-type: none"> Exterior Opening 	Main Entry Point	<ul style="list-style-type: none"> Access controlled by credential access and electronically. Capable of real-time remote programming and monitoring. Free egress at all times. 	SH-01.00
<ul style="list-style-type: none"> Exterior Opening 	Secondary Entry Point	<ul style="list-style-type: none"> Access controlled electronically. Capable of real-time remote programming and monitoring. Free egress at all times. 	SH-02.00
<ul style="list-style-type: none"> Exterior Opening 	Exit Only Point	<ul style="list-style-type: none"> Access is never available. Capable of real-time remote monitoring. Free egress at all times. 	SH-03.00
<ul style="list-style-type: none"> Interior vestibule ADA accessible 	Secondary Entry Point	<ul style="list-style-type: none"> ADA operated opening Free ingress and egress at all times. Non-locking opening 	ADA-03.00
<ul style="list-style-type: none"> Interior vestibule 	Secondary Entry Point	<ul style="list-style-type: none"> Free ingress and egress at all times. 	GH-1.00
<ul style="list-style-type: none"> Classroom ⁽²⁾ Research Lab ⁽²⁾ Computer Lab ⁽²⁾ Assembly Hall ⁽²⁾ 	Main Entry Point for this room type with occupancy of less than 50 persons.	<ul style="list-style-type: none"> Access controlled by credential access and electronically. Capable of real-time remote programming and monitoring. Free egress at all times. 	SH-01.00 SH-04.00
<ul style="list-style-type: none"> Classroom ADA Research Lab ADA Computer Lab ADA Assembly Hall ADA 	Main Entry Point for this room type with occupancy of 50 persons or more.	<ul style="list-style-type: none"> Access controlled by credential access and electronically. Capable of real-time remote programming and monitoring. Free egress at all times. 	ADA-02.00

<ul style="list-style-type: none"> Classroom Research Lab Computer Lab Assembly Hall 	Secondary Entry Point for this room type regardless of occupancy count.	<ul style="list-style-type: none"> Access controlled electronically. Capable of real-time remote programming and monitoring. Free egress at all times. 	SH-02.00 SH-05.00
<ul style="list-style-type: none"> Classroom Research Lab Computer Lab Assembly Hall 	Exit Only Point for this room type regardless of occupancy.	<ul style="list-style-type: none"> Access is never available. Capable of real-time remote monitoring. Free egress at all times. 	SH-03.00 SH-06.00
<ul style="list-style-type: none"> Mechanical Room Electrical Room Fire Pump Room Telecomm Room Elevator Room Security/Access Control Room 	Main Entry Point	<ul style="list-style-type: none"> Access controlled by credential access and electronically. Capable of real-time remote programming and monitoring. Free egress at all times. 	SH-1.00
<ul style="list-style-type: none"> Mechanical Room Electrical Room Fire Pump Room Telecomm Room Elevator Room Security/Access Control Room 	Secondary Entry Point	<ul style="list-style-type: none"> Access controlled electronically. Capable of real-time remote programming and monitoring. Free egress at all times. 	SH-02.00
<ul style="list-style-type: none"> Mechanical Room Electrical Room Fire Pump Room Telecomm Room Elevator Room Security/Access Control Room 	Exit Only Point	<ul style="list-style-type: none"> Access is never available. Capable of real-time remote monitoring. Free egress at all times. 	SH-03.00
<ul style="list-style-type: none"> Custodial/Janitorial Room Storage Room 	Main entry point	<ul style="list-style-type: none"> Door is never unlocked Access by key from outside Free egress at all times 	GH-02.00
<ul style="list-style-type: none"> Restroom – Public 	Main entry point	<ul style="list-style-type: none"> Door is never locked Free egress at all times 	GH-01.00
<ul style="list-style-type: none"> Restroom – Private Mother's Room 	Main entry point	<ul style="list-style-type: none"> Lockable from inside only Visual indication of occupancy Free egress at all times 	GH-03.00
<ul style="list-style-type: none"> Office 	Main entry point	<ul style="list-style-type: none"> Access by key from outside May be locked from either side Maybe unlocked from either side Free egress at all times 	GH-04.00

• Office Suite Entry	Main entry point	<ul style="list-style-type: none"> Access controlled by credential access and electronically. Capable of real-time remote programming and monitoring. Free egress at all times. 	SH-01.00 SH-04.00
• Office Suite Entry	Secondary entry point	<ul style="list-style-type: none"> Access controlled by credential access and electronically. Capable of real-time remote programming and monitoring. Free egress at all times. 	SH-01.00 SH-02.00 SH-04.00 SH-05.00
• Office Suite Entry	Exit only point	<ul style="list-style-type: none"> Access is never available. Capable of real-time remote monitoring. Free egress at all times. 	SH-03.00 SH-06.00
• Terrace/Balcony with access to exterior.	Main entry point Egress is free into the building.	<ul style="list-style-type: none"> Access controlled by credential access and electronically. Capable of real-time remote programming and monitoring. Free egress at all times. 	SH-01.00 SH-04.00
• Closet: - Secure	Secure access point	<ul style="list-style-type: none"> Access by key from outside Free egress at all times 	GH-02.00
• Closet: – Non Secure	Non-secure access point	<ul style="list-style-type: none"> Door is never locked Free egress at all times 	GH-05.00
• Dorm – Suite	Main entry point	<ul style="list-style-type: none"> Access by key from outside Door is never unlocked Free egress at all times 	GH-06.00
• Dorm – Bedroom	Main entry point	<ul style="list-style-type: none"> Access by key from outside Free egress at all times 	GH-10.00
• Corridor – Security Point	Secure access point	<ul style="list-style-type: none"> Access controlled by credential access and electronically. Capable of real-time remote programming and monitoring. Free egress at all times. 	SH-01.00
• Corridor – Smoke/Fire	Smoke/Fire containment	<ul style="list-style-type: none"> Door cannot be locked Electrically held open when not in use and is connected to Fire Alarm system to close during a smoke/fire event Doors must positive latch Free egress at all times 	GH-08.00
• Stairwell - General	Non-secure access point	<ul style="list-style-type: none"> Door cannot be locked 	GH-07.00

		<ul style="list-style-type: none"> Doors must positive latch at all times Free egress at all times 	
<ul style="list-style-type: none"> Stairwell – Secure Access Point 	Secure access point	<ul style="list-style-type: none"> Access controlled by credential access and electronically. Capable of real-time remote programming and monitoring. Doors must positive latch at all times Free egress at all times. During an active fire event door will unlock. 	SH-07.00
<ul style="list-style-type: none"> Tornado Shelter 	Reinforced Door System	<ul style="list-style-type: none"> Door cannot be locked Electrically held open when not in use Can be released to close electronically during a sheltering event Doors must positive latch Free ingress and egress at all times 	TS-01.00 TS-02.00
<ul style="list-style-type: none"> Coiling Overhead Roll-Up Door - Exterior 	Exterior Roll-Up Door	<ul style="list-style-type: none"> Capable of real-time remote monitoring 	SH-08.00

- ⁽¹⁾ Some areas may offer multiple hardware sets dependent on life safety code requirements or client preferences for usage and level of desired security.
- ⁽²⁾ A panic hardware device shall be used in any situation that code requires, regardless of the standard hardware set listed general applications. Fire and Life Safety Requirement shall determine if panic hardware must be used.
- ⁽³⁾ Double door openings are to be avoided where possible. However, when used must contain a keyed removable mullion

Manufacturer's Abbreviations

<u>Code</u>	<u>Name</u>
ALG	ALLEGION
ALT	ALTRONIX
APT	APTIQ
BES	BEST ACCESS SYSTEM
CUR	CURRAN ENGINEERING
DOR	DORMAKABA
GE	GENERAL ELECTRIC
GLY	GLYNN JOHNSON
HAG	HAGER HINGE
IVE	IVES
LCN	LCN
LNL	LENEL
MCK	MCKINNY
NGP	NATIONAL GUARD PRODUCTS
PEM	PEMKO
ROC	ROCKWOOD
SCE	SCHLAGE ELECTRONICS
SEC	SECURITRON
SEN	SENTROL
STA	STANLEY
TRI	TRIMCO
VON	VON DUPRIN
WIK	WIKK INDUSTRIES

Option List

<u>Code</u>	<u>Description</u>
C	QUICK CONNECT WIRING SYSTEM
EL	ELECTRIC UNLOCKING - 98 RIM ("E" TRIMS)
RX	REQUEST TO EXIT
24V	24V SOLENOID (STD)
CON	MOLEX ELECTRICAL CONNECTOR
CON	MOLEX ELECTRICAL CONNECTOR (EPT 10)
DEL	DELAYED ACTION
FSE	FAIL SECURE-EL. UNLOCKING ("E" TRIMS)
NRP	NON REMOVEABLE PIN STD/HWT HINGE
QEL	QUIET ELECTRIC LATCH RETRACTION
RQE	REQUEST TO EXIT
VIN	VISUAL INDICATOR
VIT	VISUAL INDICATOR THUMB-TURN
24VDC	24 Volt Direct Current (for "E" trims)
WP-RX	WATERPROOF REQUEST TO EXIT
EPT Prep	Electrical Power Transfer (EPT) Prep (full mortise)
900-4RL-FA	4 Relay Board Output Integrated Logic with Fire Alarm Relay

SET: SH-01.00

Opening Type: Electrified Panic Device – with Reader

Opening with Reader and panic-device hardware. Used as an ingress and egress point during both normal operational hours and afterhours access. Free egress at all times.

QTY	TYPE	FINISH	MFGR	DESCRIPTION
1	READER ⁽⁴⁾			Mobile Enabled Multi-Technology Reader
	BLK ⁽²⁾	SCE		
1	1076 ⁽¹⁾			Door Contact
		TBD ⁽²⁾	SEN	
1	PS906 900-4RL-FA			Power Supply
	N/A	VON		
1	98/99 QEL WP-RX CON ⁽¹⁾			Electrified Exit Rim Device w/ Quick Connects
	TBD ⁽²⁾	VON		
1	PULL TRIM ⁽¹⁾			Pull Trim
		TBD ⁽²⁾	TBD	
1	EPT-10-CON ⁽¹⁾			Power Transfer w/ Quick Connects
	TBD ⁽²⁾	ALG		
1	112HDxEPT ⁽¹⁾			Continuous Hinge w/ EPT Prep
	TBD ⁽²⁾	IVE		
1	12E72S2RP			Rim Cylinder
	TBD ⁽²⁾	BES		
1	4040XP ⁽¹⁾			Door Closer
	TBD ⁽²⁾	LCN		
1	CON-38 ^{(1) (3)}			38" Quick Connect Device to EPT Harness
	N/A	ALG		
1	CON-192P ^{(1) (3)}			192" Quick Connect EPT to JB Harness
	N/A	ALG		

- (1) Exact part number TBD upon door survey
 (2) Finish TBD upon door survey. Preferred finishes are Satin Chrome or Dark Bronze.
 (3) Wiring harnesses are used to connect the door hardware (exit device) to the EPT and from the EPT to the junction box. Consult door manufacturer for harness length requirements.
 (4) Schlage MTB11 for Mullion Mount, MTB15 for Wall Mount set to Auburn University Configuration.

Notes:

- Opening shall receive all components necessary in order to electronically lock and unlock the door and to allow entry with a valid Auburn University credential.
- Door Hardware shall allow free egress at all times.
- The status of the door shall be monitored via the existing access control software. The condition of the door shall be programmable within the software to lock and/or unlock according to the predefined time-zones within the software.
- Upon a forced door and/or door held condition the software shall initiate an alarm to alert the Auburn University Department of Campus Safety & Security of the condition of the door.
- The door must be capable of real-time remote programming and monitoring.

SET: SH-02.00

Opening Type: Electrified Panic Device – no Reader

Opening with panic-device hardware and without Reader used for both ingress and egress during normal operating hours. Free egress at all times.

QTY	TYPE	FINISH	MFGR	DESCRIPTION
1	1076 ⁽¹⁾	TBD ⁽²⁾	SEN	Door Contact
1 ⁽⁴⁾	PS906 900-4RL-FA N/A	VON		Power Supply
1	98/99 QEL WP-RX CON ⁽¹⁾ TBD ⁽²⁾	VON		Electrified Exit Rim Device w/ Quick Connects
1	PULL TRIM ⁽¹⁾	TBD ⁽²⁾	TBD	Pull Trim
1	EPT-10-CON ⁽¹⁾ TBD ⁽²⁾	ALG		Power Transfer w/ Quick Connects
1	112HDxEPT ⁽¹⁾ TBD ⁽²⁾	IVE		Continuous Hinge w/ EPT Prep
1	4040XP ⁽¹⁾ TBD ⁽²⁾	LCN		Door Closer
1	CON-38 ^{(1) (4)} N/A	ALG		38" Quick Connect Device to EPT Harness
1	CON-192P ^{(1) (4)} N/A	ALG		192" Quick Connect EPT to JB Harness

⁽¹⁾ Exact part number TBD upon door survey

⁽²⁾ Finish TBD upon door survey. Preferred finishes are Satin Chrome or Dark Bronze

⁽³⁾ Wiring harnesses are used to connect the door hardware (exit device) to the EPT and from the EPT to the junction box. Consult door manufacturer for harness length requirements.

⁽⁴⁾ Quantity TBD upon door survey

Notes:

- Opening shall receive all components necessary in order to electronically lock and unlock the door.
- The status of the door shall be monitored via the existing access control software.
- The condition of the door shall be programmable within the software to lock and/or unlock according to the predefined time-zones within the software.
- Upon a forced door and/or door held condition the software shall initiate an alarm to alert the Auburn University Department of Campus Safety & Security of the condition of the door.
- The door must be capable of real-time remote programming and monitoring.

SET: SH-03.00

Opening Type: Monitored Panic Device – Exit Only

Opening with panic-device hardware, no exterior trim, used for egress only. Free egress at all times.

QTY	TYPE	FINISH	MFGR	DESCRIPTION
1	1076 ⁽¹⁾	TBD ⁽²⁾	SEN	Door Contact
1	98/99EO WP-RX CON ⁽¹⁾	TBD ⁽²⁾	VON	Rim Device w/ Quick Connects
1	EPT-10-CON ⁽¹⁾	TBD ⁽²⁾	ALG	Power Transfer w/ Quick Connects
1	112HDxEPT ⁽¹⁾	TBD ⁽²⁾	IVE	Continuous Hinge w/ EPT Prep
1	4040XP ⁽¹⁾	TBD ⁽²⁾	LCN	Door Closer
1	CON-38 ^{(1) (3)}	N/A	ALG	38" Quick Connect Device to EPT Harness
1	CON-192P ^{(1) (3)}	N/A	ALG	192" Quick Connect EPT to JB Harness

⁽¹⁾ Exact part number TBD upon door survey

⁽²⁾ Finish TBD upon door survey. Preferred finishes are Satin Chrome or Dark Bronze

⁽³⁾ Wiring harnesses are used to connect the door hardware (exit device) to the EPT and from the EPT to the junction box. Consult door manufacturer for harness length requirements.

⁽⁴⁾ Quantity TBD upon door survey

Notes:

- Opening shall receive all components necessary in order for the status of the door to be monitored via the existing access control software.
- Upon a forced door and/or door held condition the software shall initiate an alarm to alert the Auburn University Department of Campus Safety & Security of the condition of the door.
- The door must be capable of real-time remote monitoring.

SET: SH-04.00

Opening Type: Electrified Mortise Lockset – With Reader

Opening with Reader and Mortise Lockset hardware. Used as an ingress and egress point during normal operational hours and controlled afterhours access. Free egress at all times.

QTY	TYPE	FINISH	MFGR	DESCRIPTION
1	READER ⁽⁴⁾			Mobile Enabled Multi-Technology Reader
	BLK ⁽²⁾	SCE		
1	45HW7DEU15H			Electrified Lockset: w/ DS, RQE & Quick Connects
	TBD ⁽²⁾	BES		626RH DS RQE C 24V ⁽¹⁾
1	EPT-12C ⁽¹⁾			Power Transfer w/ Quick Connects
	TBD ⁽²⁾	STA		
1	4040XP ⁽¹⁾			Door Closer
	TBD ⁽²⁾	LCN		
1	WH-38 ⁽¹⁾⁽³⁾			38" Quick Connect Lock to EPT Harness
	STA			N/A
1	WH-192P ⁽¹⁾⁽³⁾			192" Quick Connect EPT to JB Harness
	N/A	STA		
1 ⁽⁶⁾	ALTRONIX MAXIMAL ⁽¹⁾⁽⁵⁾			24 VDC Power Supply
	N/A	ALT		

- ⁽¹⁾ Exact part number TBD upon door survey
- ⁽²⁾ Finish TBD upon door survey. Preferred finishes are Satin Chrome or Dark Bronze
- ⁽³⁾ Wiring harnesses are used to connect the door hardware (mortise lockset) to the EPT and from the EPT to the junction box. Consult door manufacturer for harness length requirements.
- ⁽⁴⁾ Schlage MTB11 for Mullion Mount, MTB15 for Wall Mount set to Auburn University Configuration.
- ⁽⁵⁾ Exact part number and amperage required TBD by system requirements.
- ⁽⁶⁾ Quantity TBD upon door survey

Notes:

- Opening shall receive all components necessary to electronically lock and unlock the door and to allow entry with a valid Auburn University credential.
- Door Hardware shall always allow free egress.
- The status of the door shall be monitored via the existing access control software.
- The condition of the door shall be programmable within the software to lock and/or unlock according to the predefined time-zones within the software.
- Upon a forced door and/or door held condition the software shall initiate an alarm to alert the Auburn University Department of Campus Safety & Security of the condition of the door.
- The door must be capable of real-time remote programming and monitoring.

SET: SH-05.00

Opening Type: Electrified Mortise Lockset – No Reader

Opening with Mortise Lockset hardware without reader. Used for both ingress and egress during normal operating hours and no afterhours access. Free egress at all times.

QTY	TYPE	FINISH	MFGR	DESCRIPTION	
1	45HW7DEU15H			Electrified Lockset: w/ DS, RQE & Quick Connects	
TBD ⁽²⁾	BES			626RH DS RQE C 24V ⁽¹⁾	
1	EPT-12C ⁽¹⁾			Power Transfer w/ Quick Connects	
	TBD ⁽²⁾	STA			
3	3CB1HWx4.5x4.5 ⁽¹⁾			Butt Hinges	
	26D ⁽²⁾	IVE			
1	4040XP ⁽¹⁾			Door Closer	
	TBD ⁽²⁾	LCN			
1	WH-38 ^{(1) (3)}			38" Quick Connect Lock to EPT Harness	N/A
	STA				
1	WH-192P ^{(1) (3)}			192" Quick Connect EPT to JB Harness	
	N/A	STA			
1	ALTRONIX MAXIMAL ^{(1) (4)}			24 VDC Power Supply	
	N/A	ALT			

⁽¹⁾ Exact part number TBD upon door survey

⁽²⁾ Finish TBD upon door survey. Preferred finishes are Satin Chrome or Dark Bronze.

⁽³⁾ Wiring harnesses are used to connect the door hardware (mortise lockset) to the EPT and from the EPT to the junction box. Consult door manufacturer for harness length requirements.

⁽⁴⁾ Exact part number and amperage required TBD by system requirements.

Notes:

- Opening shall receive all components necessary to electronically lock and unlock the door.
- The status of the door shall be monitored via the existing access control software.
- The condition of the door shall be programmable within the software to lock and/or unlock according to the predefined time-zones within the software.
- Upon a forced door and/or door held condition the software shall initiate an alarm to alert the Auburn University Department of Campus Safety & Security of the condition of the door.
- The door must be capable of real-time remote programming and monitoring.

SET: SH-06.00

Opening Type: Electrified Mortise Lockset – Exit Only

Opening with Mortise Lockset: used for egress only. Free egress at all times.

QTY	TYPE	FINISH	MFGR	DESCRIPTION	
1	45HW15H626RH DS RQE C ⁽¹⁾			Wired Lockset: w/ DS, RQE & Quick Connects	TBD ⁽²⁾
	BES				
1	EPT-12C ⁽¹⁾			Power Transfer w/ Quick Connects	
	TBD ⁽²⁾	STA			
3	3CB1HWx4.5x4.5 ⁽¹⁾			Butt Hinges	
	26D ⁽²⁾	IVE			
1	4040XP ⁽¹⁾			Door Closer	
	TBD ⁽²⁾	LCN			
1	WH-38 ⁽¹⁾⁽³⁾			38" Quick Connect Lock to EPT Harness	N/A
	STA				
1	WH-192P ⁽¹⁾⁽³⁾			192" Quick Connect EPT to JB Harness	
	N/A	STA			

⁽¹⁾ Exact part number TBD upon door survey

⁽²⁾ Finish TBD upon door survey. Preferred finishes are Satin Chrome or Dark Bronze

⁽³⁾ Wiring harnesses are used to connect the door hardware (mortise lockset) to the EPT and from the EPT to the junction box. Consult door manufacturer for harness length requirements.

Notes:

- Opening shall receive all components necessary for the status of the door to be monitored via the existing access control software.
- Upon a forced door and/or door held condition the software shall initiate an alarm to alert the Auburn University Department of Campus Safety & Security of the condition of the door.
- The door must be capable of real-time remote monitoring.

SET: SH-07.00

Opening Type: Electrified Panic Device – With Reader

Opening with reader and panic-device hardware used in a stairwell or fire rated corridor entry. Used as an ingress and egress point during both normal operational hours and afterhours access. Free egress at all times.

QTY	TYPE	FINISH	MFGR	DESCRIPTION
1	READER ⁽⁴⁾			Mobile Enabled Multi-Technology Reader
	BLK ⁽²⁾	SCE		
1	1076 ⁽¹⁾			Door Contact
		TBD ⁽²⁾	SEN	
1	PS906 900-4RL-FA ⁽¹⁾			Power Supply
	N/A	VON		
1	98/99L-FxE996 WP-RX CON ⁽¹⁾⁽⁵⁾⁽⁶⁾			Electrified Exit Rim Device w/ Quick Connects
	TBD ⁽²⁾	VON		
1	EPT-10-CON ⁽¹⁾			Power Transfer w/ Quick Connects
	TBD ⁽²⁾	ALG		
1	112HDxEPT ⁽¹⁾			Continuous Hinge w/ EPT Prep
	TBD ⁽²⁾	IVE		
1	12E72S2RP			Rim Cylinder
	TBD ⁽²⁾	BES		
1	4040XP ⁽¹⁾			Door Closer
	TBD ⁽²⁾	LCN		
1	CON-38 ⁽¹⁾⁽³⁾			38" Quick Connect Device to EPT Harness
	N/A	ALG		
1	CON-192P ⁽¹⁾⁽³⁾			192" Quick Connect EPT to JB Harness
	N/A	ALG		

- (1) Exact part number TBD upon door survey
 (2) Finish TBD upon door survey. Preferred finishes are Satin Chrome or Dark Bronze.
 (3) Wiring harnesses are used to connect the door hardware (exit device) to the EPT and from the EPT to the junction box. Consult door manufacturer for harness length requirements.
 (4) Schlage MTB11 for Mullion Mount, MTB15 for Wall Mount set to Auburn University Configuration.
 (5) 06 Lever is preferred.
 (6) Fail Safe.

Notes:

- Opening shall receive all components necessary to electronically lock and unlock the door and to allow entry with a valid Auburn University credential.
- Door Hardware shall always allow free egress.
- The status of the door shall be monitored via the existing access control software.
- The condition of the door shall be programmable within the software to lock and/or unlock according to the predefined time-zones within the software.
- Upon a forced door and/or door held condition the software shall initiate an alarm to alert the Auburn University Department of Campus Safety & Security of the condition of the door.
- The door must be capable of real-time remote programming and monitoring.
- The door power supply must be connected to the Fire Alarm System and unlock, while maintaining positive latching, during an egress event per Life Safety Requirements.
- E996L trim to be phased out and replaced by M996L.

SET: SH-08.00

Opening Type: Overhead Coiling Door - Monitored

Overhead roll-up door monitored only

QTY	TYPE	FINISH		DESCRIPTION
			MFGR	
1	2207A-L ⁽¹⁾ TBD ⁽¹⁾	GE		Door Contact
⁽¹⁾ Exact part number TBD upon door survey				

Notes:

- Opening shall receive all components necessary in order for the status of the door to be monitored via the existing access control software.
- Upon a forced door and/or door held condition the software shall initiate an alarm to alert the Auburn University Department of Campus Safety & Security of the condition of the door.
- The door must be capable of real-time remote monitoring.

SET: ADA-01.00

Opening Type: Standard ADA Access Point

ADA entrance door vestibule with panic-device hardware and ADA bollard (if required in the specific application) containing a Mobile/Bluetooth Enabled Multi-Technology Reader and an ADA actuator. Used as an ingress and egress point during both normal operational hours and afterhours access. Free egress at all times.

QTY	TYPE	FINISH	MFGR	DESCRIPTION
1	READER ⁽⁴⁾ SCE			Mobile/Bluetooth Enabled Multi-Technology Reader BLK ⁽²⁾
1	1076 ⁽¹⁾	TBD ⁽²⁾	SEN	Door Contact
1 ⁽⁶⁾	PS906 4RL-FA ⁽¹⁾	N/A	VON	Power Supply
1	98/99 QEL WP-RX CON ⁽¹⁾	TBD ⁽²⁾	VON	Electrified Exit Rim Device w/ Quick Connects
1	PULL TRIM ⁽¹⁾	TBD ⁽²⁾	TBD	Pull Trim
1	EPT-10-CON ⁽¹⁾	TBD ⁽²⁾	ALG	Power Transfer w/ Quick Connects
1	112HDxEPT ⁽¹⁾	TBD ⁽²⁾	IVE	Continuous Hinge w/ EPT Prep
1	12E72S2RP	TBD ⁽²⁾	BES	Rim Cylinder
2	4642 REG ⁽¹⁾	TBD ⁽²⁾	LCN	ADA Door Operator
1	CON-38 ⁽¹⁾⁽³⁾	N/A	ALG	38" Quick Connect Device to EPT Harness
1	CON-192P ⁽¹⁾⁽³⁾	N/A	ALG	192" Quick Connect EPT to JB Harness
1	CE-916 ⁽¹⁾⁽⁵⁾	DBZ	CUR	ADA Bollard
4	I36 ⁽¹⁾	TBD ⁽²⁾	WIKK	INGRESS'R Actuator

⁽¹⁾ Exact part number TBD upon door survey

⁽²⁾ Finish TBD upon door survey. Preferred finishes are Satin Chrome or Dark Bronze.

⁽³⁾ Wiring harnesses are used to connect the door hardware (exit device) to the EPT and from the EPT to the junction box. Consult door manufacturer for harness length requirements.

⁽⁴⁾ Schlage MTB11 for Mullion Mount, MTB15 for Wall Mount set to Auburn University Configuration.

⁽⁵⁾ Bollard (if required) should be ordered without factory cutouts and must be field prepped.

⁽⁶⁾ Quantity TBD upon door survey

Vestibule of less than 8 feet from door to door Schematics: ADA-01.11 & ADA-01.12 Vestibule of greater than 8 feet from door to door Schematics: ADA-01.21 & ADA-01.22

Notes:

- Opening shall receive all components necessary in order to electronically lock and unlock the door remotely and to allow entry with a valid Auburn University credential.
- Door Hardware shall allow free egress at all times.
- An access granted event using an Auburn University Mobile Credential will unlock the device and allow the actuator to be used to open the door.
- An access granted event using a valid Auburn University ADA Bluetooth Credential will unlock the device as well as activate the ADA operator to open the door.

- The status of the door shall be monitored via the existing access control software.
- The condition of the door shall be programmable within the software to lock and/or unlock according to the predefined time-zones within the software.
- Upon a forced door and/or door held condition the software shall initiate an alarm to alert the Auburn University Department of Campus Safety & Security of the condition of the door.
- The door must be capable of real-time remote programming and monitoring.
- Depending on the vestibule size will denote wiring and configuration requirements set by the Auburn University Office of Accessibility.

SET: ADA-02.00

Opening Type: Standard Single ADA Access Point

ADA entrance, without vestibule, door with panic-device hardware and ADA bollard (if required in the specific application) containing Mobile/Bluetooth Enabled Multi-Technology Reader and an ADA actuator. Used as an ingress and egress point during both normal operational hours and afterhours access. Free egress at all times.

QTY	TYPE	FINISH	MFGR	DESCRIPTION
1	READER ⁽⁴⁾ SCE			Mobile/Bluetooth Enabled Multi-Technology Reader BLK ⁽²⁾
1	1076 ⁽¹⁾			Door Contact
		TBD ⁽²⁾	SEN	
1 ⁽⁶⁾	PS906 4RL-FA ⁽¹⁾	N/A	VON	Power Supply
1	98/99 QEL WP-RX CON ⁽¹⁾			Electrified Exit Rim Device w/ Quick Connects
	TBD ⁽²⁾	VON		
1	PULL TRIM ⁽¹⁾			Pull Trim
		TBD ⁽²⁾	TBD	
1	EPT-10-CON ⁽¹⁾			Power Transfer w/ Quick Connects
	TBD ⁽²⁾	ALG		
1	112HDxEPT ⁽¹⁾			Continuous Hinge w/ EPT Prep
	TBD ⁽²⁾	IVE		
1	12E72S2RP			Rim Cylinder
	TBD ⁽²⁾	BES		
1	4642 REG ⁽¹⁾			ADA Door Operator
	TBD ⁽²⁾	LCN		
1	CON-38 ^{(1) (3)}			38" Quick Connect Device to EPT Harness
	N/A	ALG		
1	CON-192P ^{(1) (3)}			192" Quick Connect EPT to JB Harness
	N/A	ALG		
1	CE-916 ^{(1) (5)}			ADA Bollard
	DBZ	CUR		
2	I36 ⁽¹⁾			INGRESS'R Actuator
	TBD ⁽²⁾	WIKK		

- ⁽¹⁾ Exact part number TBD upon door survey
- ⁽²⁾ Finish TBD upon door survey. Preferred finishes are Satin Chrome or Dark Bronze.
- ⁽³⁾ Wiring harnesses are used to connect the door hardware (exit device) to the EPT and from the EPT to the junction box. Consult door manufacturer for harness length requirements.
- ⁽⁴⁾ Reader must be set to reader track 2
- ⁽⁵⁾ Bollard (if required) should be ordered without factory cutouts and must be field prepped.
- ⁽⁶⁾ Quantity TBD upon door survey

Notes:

- Opening shall receive all components necessary in order to electronically lock and unlock the door remotely and to allow entry with a valid Auburn University credential.
- Door Hardware shall allow free egress at all times.
- An access granted event using an Auburn University Mobile Credential will unlock the device and allow the actuator to be used to open the door.
- An access granted event using a valid Auburn University ADA Bluetooth Credential will unlock the device as well as activate the ADA operator to open the door.
- The status of the door shall be monitored via the existing access control software.

- The condition of the door shall be programmable within the software to lock and/or unlock according to the predefined time-zones within the software.
- Upon a forced door and/or door held condition the software shall initiate an alarm to alert the Auburn University Department of Campus Safety & Security of the condition of the door.
- The door must be capable of real-time remote programming and monitoring.

SET: ADA-03.00

Opening Type: Standard Single ADA Access Point

ADA entrance door with ADA actuator. Used as an ingress and egress point during both normal operational hours and afterhours access. Free Ingress at all times. Free egress at all times.

QTY	TYPE	FINISH	MFGR	DESCRIPTION
1	PUSH/PULL TRIM ⁽¹⁾			Push/Pull Trim
	TBD ⁽²⁾	TBD		
1	112HD ⁽¹⁾			Continuous Hinge
		TBD ⁽²⁾	IVE	
1	4642 REG ⁽¹⁾			ADA Door Operator
	TBD ⁽²⁾	LCN		
2	I36 ⁽¹⁾			INGRESS'R Actuator
	TBD ⁽²⁾	WIKK		

⁽¹⁾ Exact part number TBD upon door survey

⁽²⁾ Finish TBD upon door survey. Preferred finishes are Satin Chrome or Dark Bronze.

Notes:

- Opening shall receive all components necessary in order to allow the actuator to be used to open the door.
- This opening does not have locking door hardware.

SET: TS-01.00

Opening Type: Tornado Shelter – Single Door

Opening within the Buildings designated shelter with positive latching panic-device hardware. Used for emergency sheltering only. Free ingress at all times. Free egress at all times.

QTY	TYPE	FINISH	MFGR	DESCRIPTION
1	WS9957L-Fx996L-BE (#06) ^{(1) (4)}			Tornado Tested Three-point Latching Panic Device
	VON			
1	224XY	TBD ⁽²⁾	IVE	Continuous Hinge
1	4040XP ⁽¹⁾			Door Closer
	TBD ⁽²⁾	LCN		
1	SEM7800 ⁽³⁾			Electromagnetic Door Holder
	TBD ⁽²⁾	LCN		

⁽¹⁾ Exact part number TBD upon door survey

⁽²⁾ Finish TBD upon door survey. Preferred finishes are Satin Chrome or Dark Bronze

⁽³⁾ Reference AU Standards for Electrical and Fire Life Safety for specific Part Number and proper connection to the Fire Alarm System.

⁽⁴⁾ 06 Lever is preferred

Notes:

- Opening shall receive all components necessary in order for the door to be held open by the Electromagnetic Door Holder during normal operation.
- Upon a weather event the Electromagnetic Door Holder can be remotely released by the Auburn University Department of Campus Safety & Security and returned to normal operation once the event has ended.
- The door is not capable of being locked.

SET: TS-02.00

Opening Type: Tornado Shelter – Double Door

Double-door opening within the buildings designated shelter with positive latching panic-device hardware. Used for emergency sheltering only. Free ingress at all times. Free egress at all times.

QTY	TYPE	FINISH	MFGR	DESCRIPTION
2	WS9927L-Fx996L-BE (#06) ^{(1), (4)}			Tornado Tested Panic Device
	TBD ⁽²⁾	VON		
2	224XY			Continuous Hinge
		TBD ⁽²⁾	IVE	
2	4040XP ⁽¹⁾			Door Closer
	TBD ⁽²⁾	LCN		
2	137NA			Astragal
		TBD ⁽²⁾	NGP	
2	SEM7850 ⁽³⁾			Electromagnetic Holder
	TBD ⁽²⁾	LCN		

⁽¹⁾ Exact part number TBD upon door survey

⁽²⁾ Finish TBD upon door survey. Preferred finishes are Satin Chrome or Dark Bronze

⁽³⁾ Reference AU Standards for Electrical and Fire Life Safety for specific Part Number and proper connection to the Fire Alarm System.

⁽⁴⁾ 06 Lever is preferred

Notes:

- Opening shall receive all components necessary in order for the door to be held open by the Electromagnetic Door Holder during normal operation.
- Upon a weather event the Electromagnetic Door Holder can be remotely released by the Auburn University Department of Campus Safety & Security and returned to normal operation once the event has ended.
- The door is not capable of locking.

SET: GH-1.00

Opening Type: Unsecured interior passage

Push/Pull Hardware used on interior vestibules and public restrooms

QTY	TYPE	FINISH	MFGR	DESCRIPTION	
1	9190HD-24-0xNS ⁽¹⁾			Push/Pull Set	
	26D ⁽³⁾	IVE			
1	1461xREGxDELxFCxTBSRT ⁽¹⁾			Door Closer	AL
(3)	LCN				
3	3CB1HWx4.5x4.5 ⁽¹⁾			Butt Hinges	
	26D ⁽³⁾	IVE			

⁽¹⁾ Exact part number TBD upon door survey

⁽²⁾ Finish TBD upon door survey. 626 (Satin Chrome) preferred

Notes:

- Door is never locked
- Free egress at all times.

SET: GH-2.00

Opening Type: Secure Storage and Closets

Storeroom Function Mortise Lockset used in secure closets, custodial rooms, and storage rooms.

QTY	TYPE	FINISH	MFGR	DESCRIPTION	
1	45H-7D15H2626 ⁽¹⁾⁽²⁾			Mortise Lockset	
	626 ⁽³⁾	BES			
1	1461xREGxDELxFCxTBSRT ⁽¹⁾			Door Closer	AL
(3)	LCN				
3	3CB1HWx4.5x4.5 ⁽¹⁾			Butt Hinges	
	26D ⁽³⁾	IVE			

⁽¹⁾ Exact part number TBD upon door survey

⁽²⁾ 15 Lever is preferred

⁽³⁾ Finish TBD upon door survey. 626 (Satin Chrome) is preferred

Notes:

- Door is never unlocked
- Access by key from outside
- Free egress at all times

SET: GH-3.00

Opening Type: Private Restrooms

Privacy Function Mortise Lockset for private restrooms, mother's rooms.

QTY	TYPE	FINISH	MFGR	DESCRIPTION	
1	45H-0L15H2626 ^{(1) (2)}			Mortise Lockset	
	626 ⁽³⁾	BES			
1	1461xREGxDELxFCxTBSRT ⁽¹⁾			Door Closer	AL
(3)	LCN				
3	3CB1HWx4.5x4.5 ⁽¹⁾			Butt Hinges	
	26D ⁽³⁾	IVE			

⁽¹⁾ Exact part number TBD upon door survey

⁽²⁾ 15 Lever is preferred

⁽³⁾ Finish TBD upon door survey. 626 (Satin Chrome) is preferred

Notes:

- Lockable from inside only
- Visual indication of occupancy
- Free egress at all times

SET: GH-4.00

Opening Type: Office Main Entry Point

Office Function Mortise Lockset for office applications

QTY	TYPE	FINISH	MFGR	DESCRIPTION	
1	45H-7AB15H2626 ^{(1) (2)}			Mortise Lockset	
	626 ⁽³⁾	BES			
3	3CB1HWx4.5x4.5 ⁽¹⁾			Butt Hinges	
	26D ⁽³⁾	IVE			

⁽¹⁾ Exact part number TBD upon door survey

⁽²⁾ 15 Lever is preferred

⁽³⁾ Finish TBD upon door survey. 626 (Satin Chrome) is preferred

Notes:

- Access by key from outside
- May be locked from either side
- Maybe unlocked from either side
- Free egress at all times
- Door closer can be added as desired

SET: GH-5.00

Opening Type: Unsecured Closet

Passage Function Mortise Lockset for use in unsecured closet applications

QTY	TYPE	DESCRIPTION	
		FINISH	MFGR
1	45H-0N15H2626 ⁽¹⁾⁽²⁾		Mortise Lockset
	626 ⁽³⁾ BES		
1	1461xREGxDELxFCxTBSRT ⁽¹⁾		Door Closer
(3)	LCN		
3	3CB1HWx4.5x4.5 ⁽¹⁾		Butt Hinges
	26D ⁽³⁾ IVE		

AL

- (1) Exact part number TBD upon door survey
 (2) 15 Lever is preferred
 (3) Finish TBD upon door survey. 626 (Satin Chrome) is preferred

Notes:

- Door is never locked
- Free egress at all times.

SET: GH-6.00

Opening Type: Dormitory Suite Main Entrance

Dormitory Function Mortise Lockset for entry into main door of dormitory suite.

QTY	TYPE	DESCRIPTION	
		FINISH	MFGR
1	45H-7TD15H2626 ⁽¹⁾⁽²⁾		Mortise Lockset
	626 ⁽³⁾ BES		
1	1461xREGxDELxFCxTBSRT ⁽¹⁾		Door Closer
(3)	LCN		
3	3CB1HWx4.5x4.5 ⁽¹⁾		Butt Hinges
	26D ⁽³⁾ IVE		

AL

- (1) Exact part number TBD upon door survey
 (2) 15 Lever is preferred
 (3) Finish TBD upon door survey. 626 (Satin Chrome) is preferred

Notes:

- Access by key from outside
- Door is never unlocked
- Free egress at all times

SET: GH-7.00

Opening Type: Unsecured Stairwell Passage

Stairwell Passage Function Panic Hardware for unsecured stairwell access point applications

QTY	TYPE	FINISH	MFGR	DESCRIPTION	
1	98L-BE-Fx996L-BE (#06) ^{(1) (2)}			Rim Exit Device	
	26D ⁽³⁾	VON			
1	4040XP ⁽¹⁾			Door Closer	AL
⁽³⁾	LCN				
3	3CB1HWx4.5x4.5 ⁽¹⁾			Butt Hinges	
	26D ⁽³⁾	IVE			
	⁽¹⁾ Exact part number TBD upon door survey				
	⁽²⁾ 06 Lever is preferred				
	⁽³⁾ Finish TBD upon door survey. 626 (Satin Chrome) is preferred				

Notes:

- Door is never locked
- Door is positive latching at all times
- Free ingress at all times
- Free egress at all times.

SET: GH-8.00

Opening Type: Single Corridor – Smoke/Fire Panic Hardware

Single Corridor Door – Smoke/Fire Panic Hardware

QTY	TYPE	FINISH	MFGR	DESCRIPTION	
1	9849Fx996L-BE (#06) ⁽¹⁾ ⁽²⁾			Exit Device	
	26D ⁽³⁾	VON			
1	4040XP ⁽¹⁾			Door Closer	AL
⁽³⁾	LCN				
3	3CB1HWx4.5x4.5 ⁽¹⁾			Butt Hinges	
	26D ⁽³⁾	IVE			
1	SEM7800 ⁽⁴⁾			Electromagnetic Door Holder	
	TBD ⁽³⁾	LCN			

⁽¹⁾ Exact part number TBD upon door survey⁽²⁾ 06 Lever is preferred⁽³⁾ Finish TBD upon door survey. 626 (Satin Chrome) is preferred⁽⁴⁾ Reference AU Standards for Electrical and Fire Life Safety for specific Part Number and proper connection to the Fire Alarm System.

Notes:

- Opening shall receive all components necessary in order for the door to be held open by the Electromagnetic Door Holder during normal operation.
- Upon a Fire Alarm event the Electromagnetic Door Holder will release automatically.
- Door is never locked
- Door is positive latching at all times
- Free ingress at all times
- Free egress at all times.

SET: GH-9.00

Opening Type: Double Corridor Door – Smoke/Fire Panic Hardware

Double Corridor Door – Smoke/Fire Panic Hardware

QTY	TYPE		DESCRIPTION	
	FINISH	MFGR		
2	9849Fx996L-BE (#06) ^{(1) (2)}		Exit Device	
	26D ⁽³⁾	VON		
2	4040XP ⁽¹⁾		Door Closer	AL
⁽³⁾	LCN			
6	3CB1HWx4.5x4.5 ⁽¹⁾		Butt Hinges	
	26D ⁽³⁾	IVE		
2	SEM7800 ⁽⁴⁾		Electromagnetic Door Holder	
	TBD ⁽³⁾	LCN		

⁽¹⁾ Exact part number TBD upon door survey⁽²⁾ 06 Lever is preferred⁽³⁾ Finish TBD upon door survey. 626 (Satin Chrome) is preferred⁽⁴⁾ Reference AU Standards for Electrical and Fire Life Safety for specific Part Number and proper connection to the Fire Alarm System.

Notes:

- Opening shall receive all components necessary in order for the doors to be held open by the Electromagnetic Door Holders during normal operation.
- Upon a Fire Alarm event the Electromagnetic Door Holders will release automatically.
- Doors are never locked
- Doors are positive latching at all times
- Free ingress at all times
- Free egress at all times.

SET: GH-10.00

Opening Type: Dormitory Bedroom Entry

Dormitory Function Cylindrical Lockset for individual bedrooms

QTY	TYPE	DESCRIPTION	
		FINISH	MFGR
1	93K7A15DS3626 ⁽¹⁾ ⁽²⁾		Cylindrical Lockset
	626 ⁽³⁾	BES	
3	3CB1HWx4.5x4.5 ⁽¹⁾		Butt Hinges
	26D ⁽³⁾	IVE	

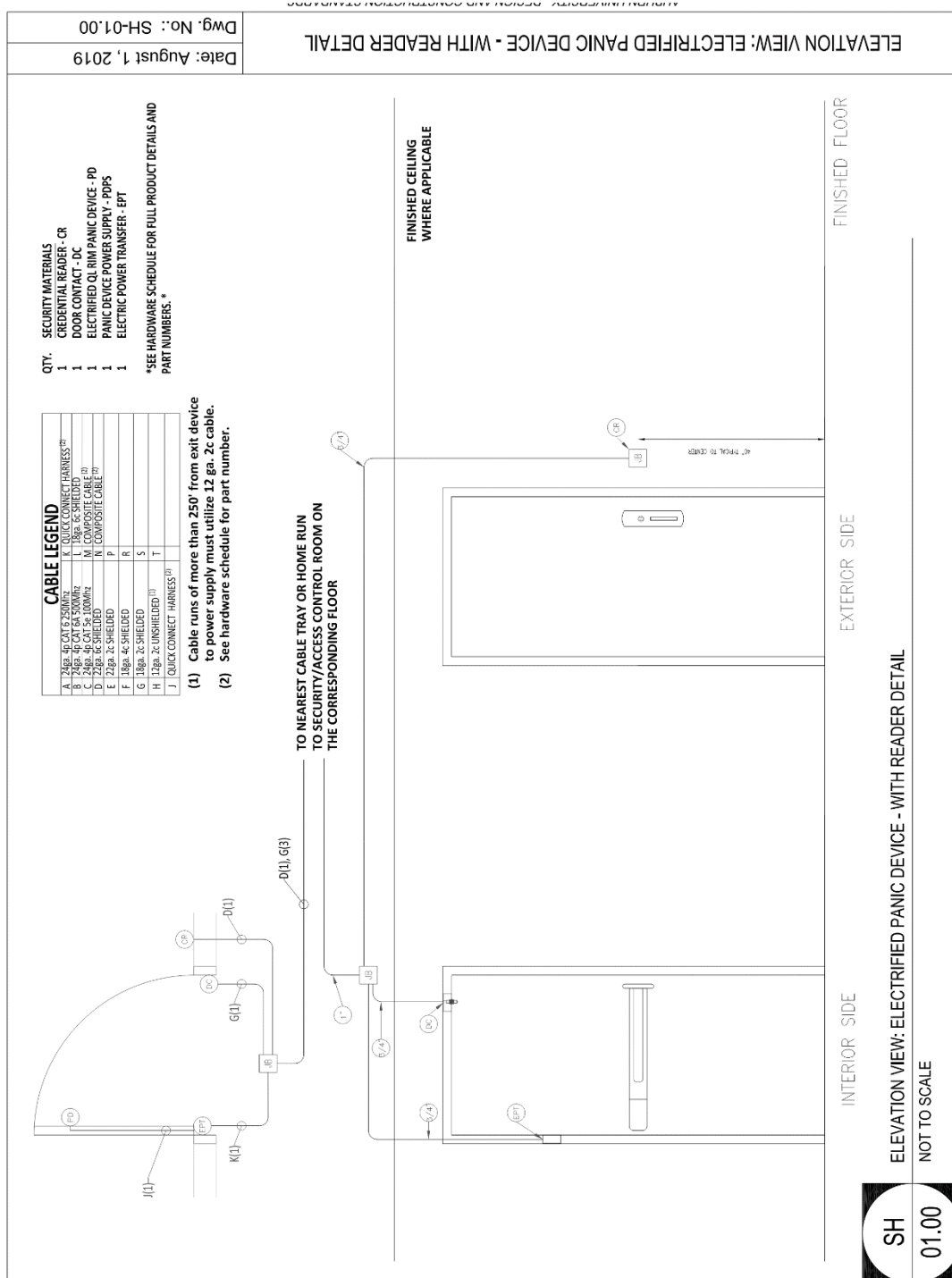
(1) Exact part number TBD upon door survey

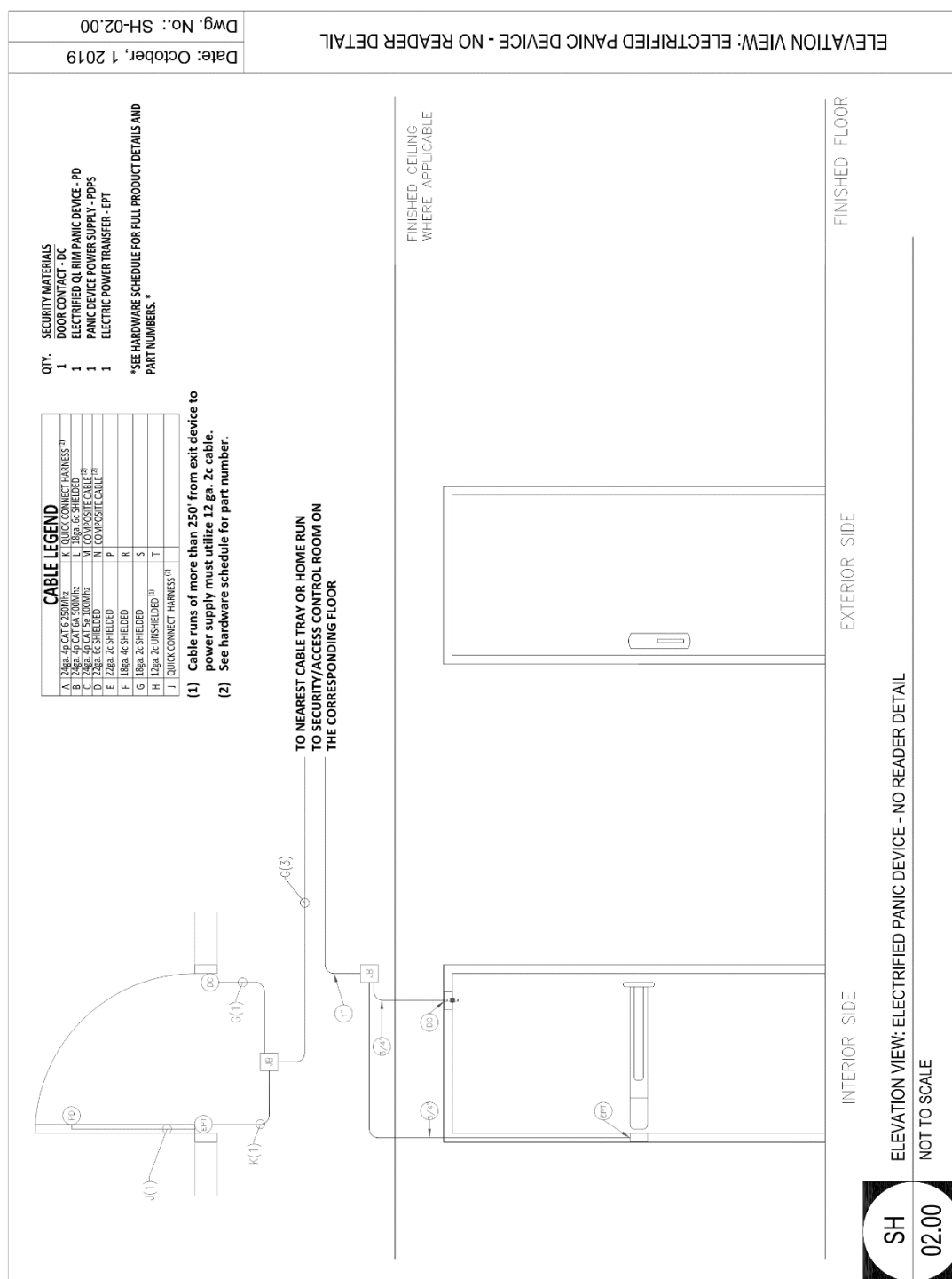
(2) 15 Lever is preferred

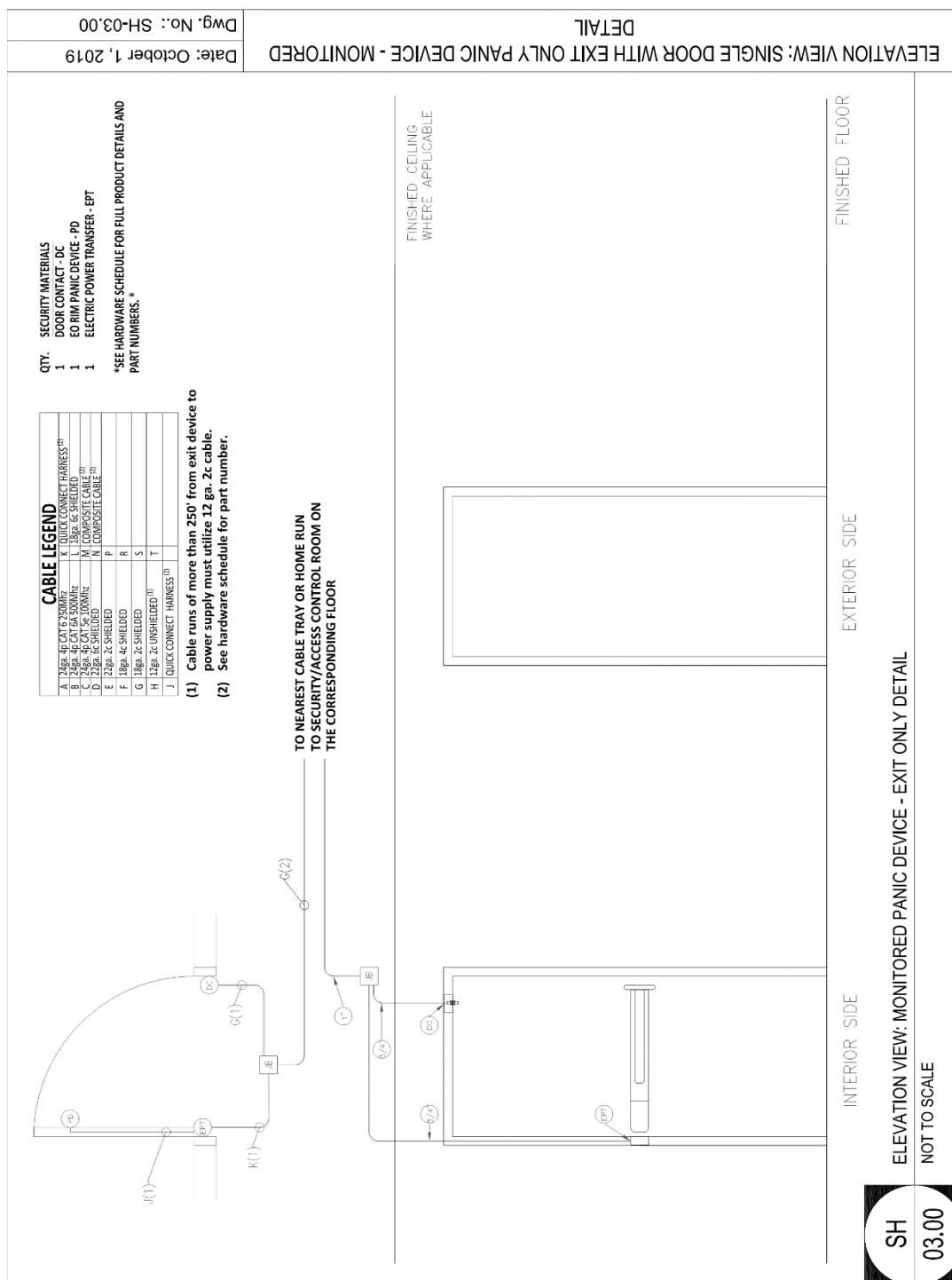
(3) Finish TBD upon door survey. 626 (Satin Chrome) is preferred

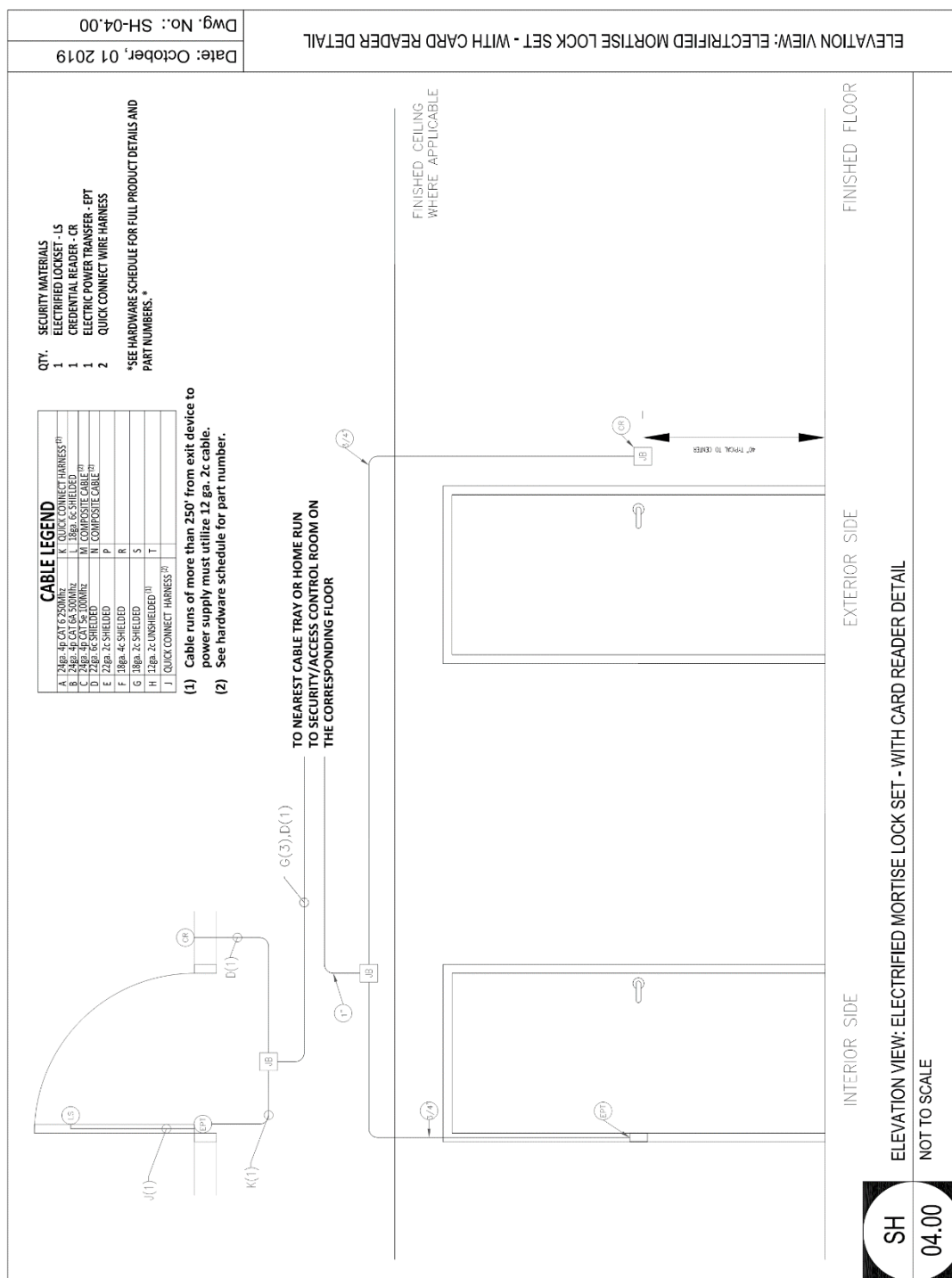
Notes:

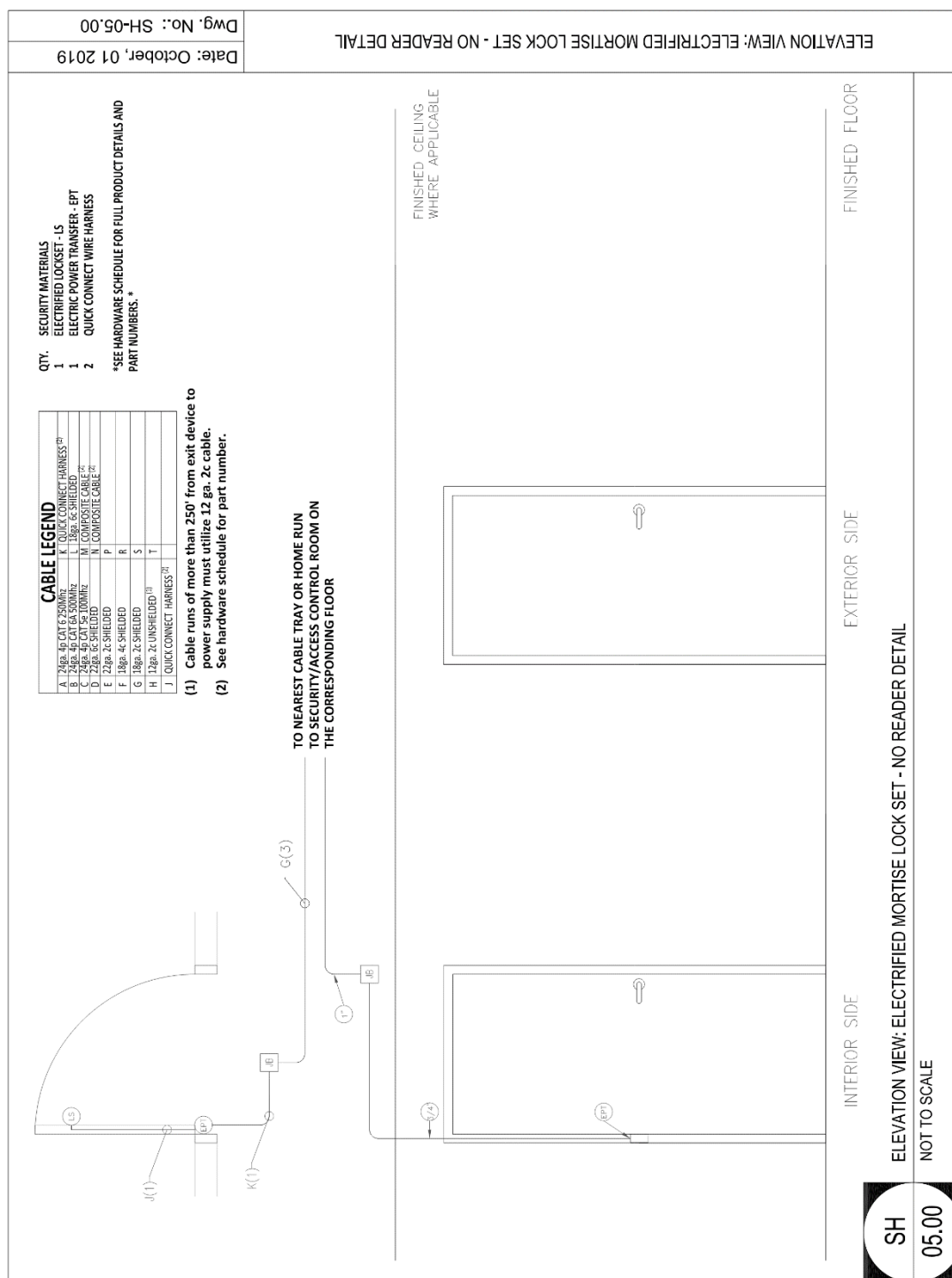
- Access by key from outside
- May be locked by turning the inside button
- May be unlocked by turning the inside button
- Free egress at all times

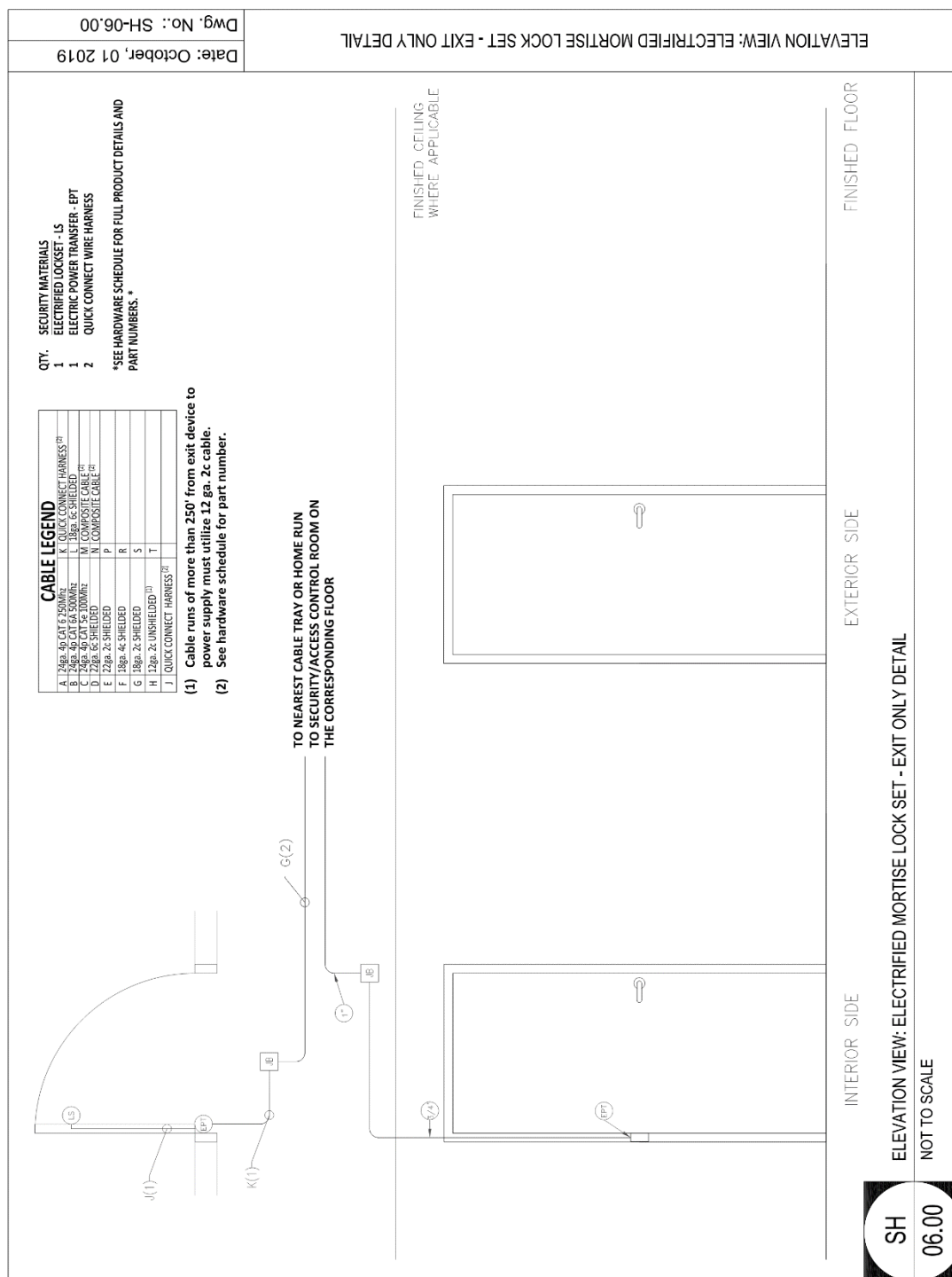


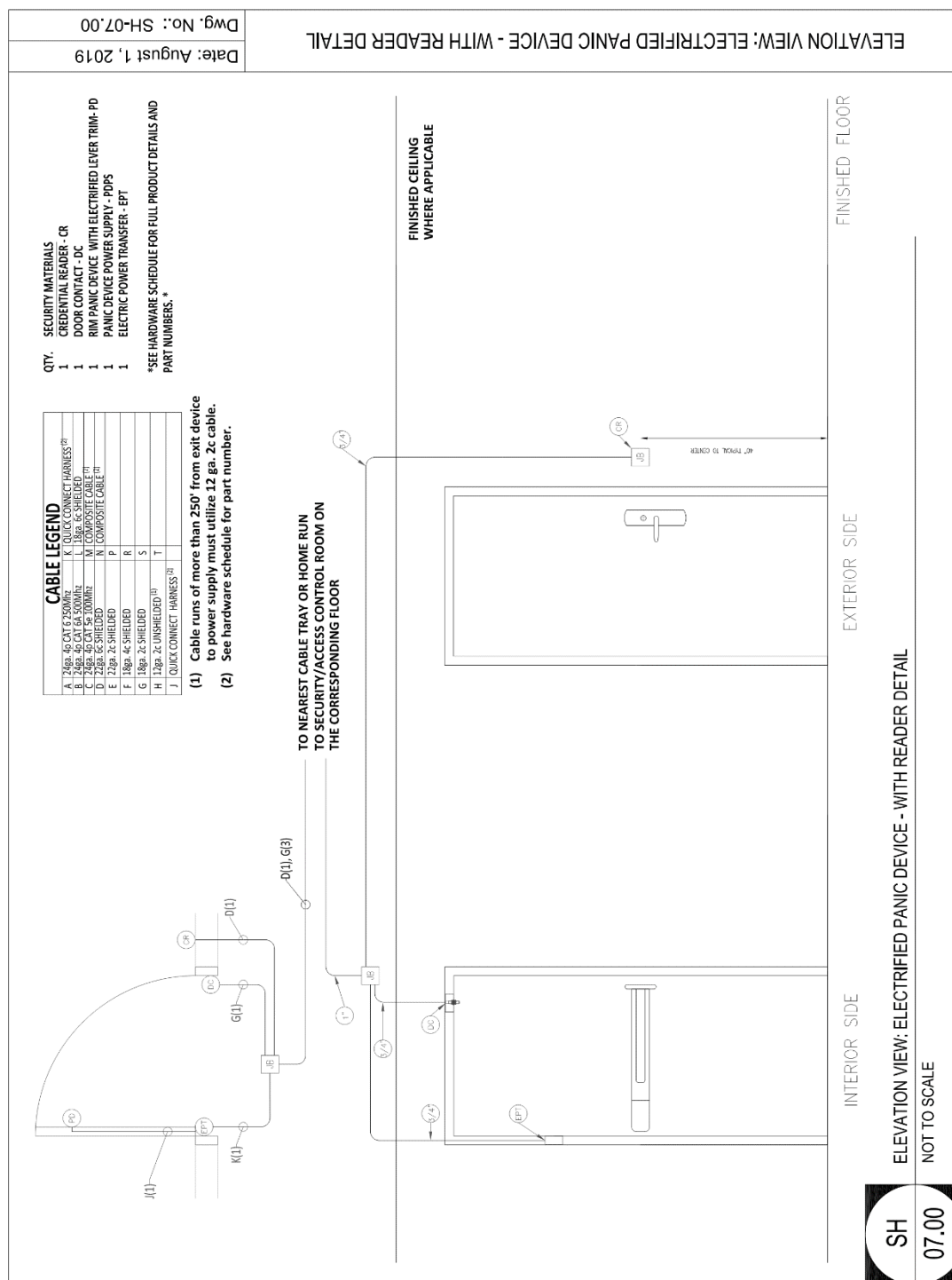


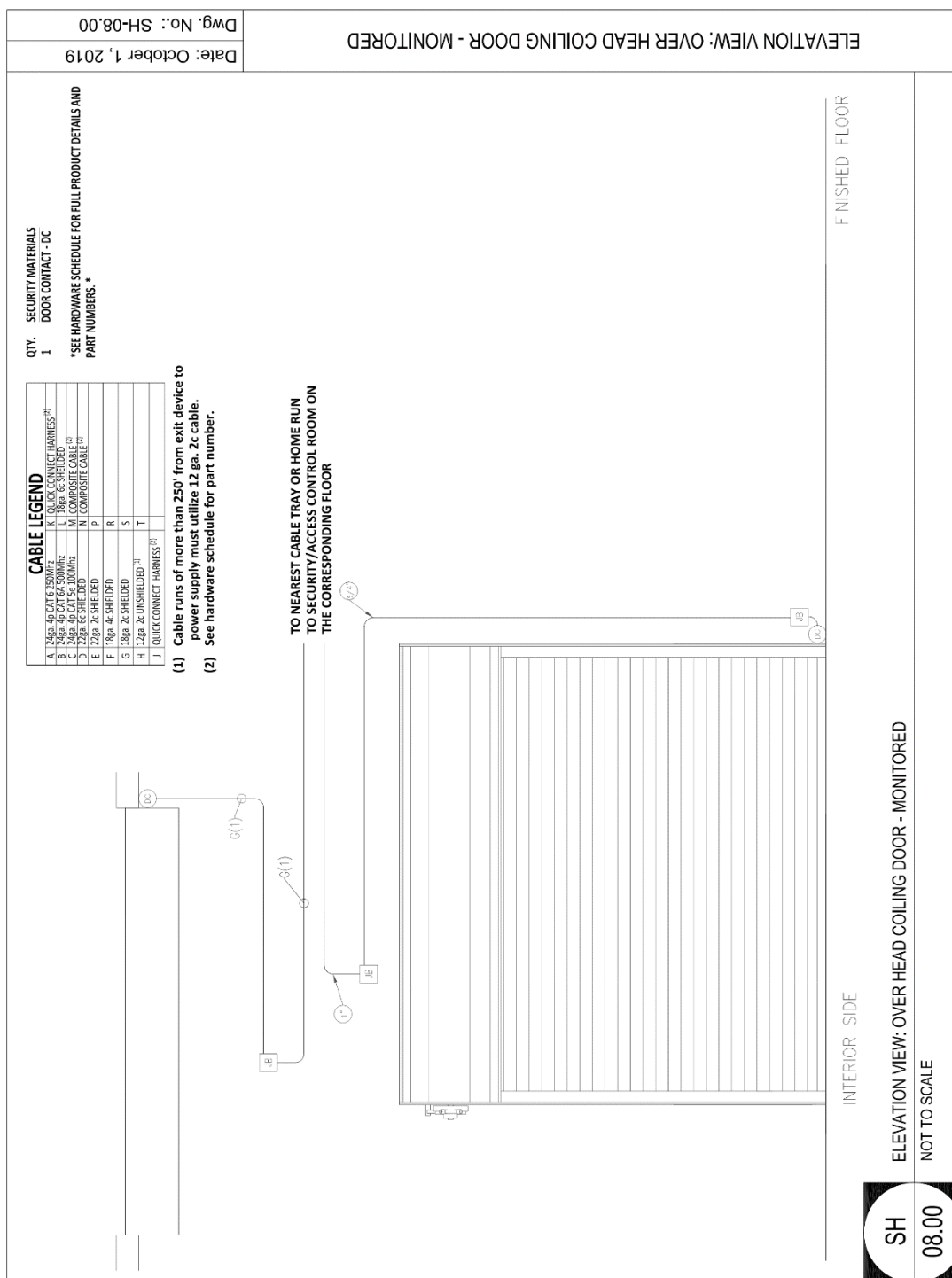












Document Revision History

Version	Section	Summary of Change	Date