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UNIVERSITY OF CONNECTICUT

DESIGN GUIDELINES & PERFORMANCE STANDARDS Volume II

University Planning, Design and Construction
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11 Interior Building Guidelines

11.1 Guiding Principles

Designs must take into account maintenance factors. Any aspect associated with locating and specifying finish materials, equipment, fixtures and establishment of ceiling heights, shall be determined based local availability, access and annual maintenance requirements.

When design calls for a sloped floor, the slope shall not exceed the capability for service equipment to access the finish material, equipment, fixtures or established ceiling height for annual maintenance. It is the Designer's responsibility to coordinate with installers or other consultants providing elements of the design to ensure reasonable regular maintenance access.

Specify no products that contain asbestos, It is up to the Designer when selecting finish materials, equipment and fixtures that they review the SDS (Safety Data Sheet) for disclosure of any asbestos containing materials for each product specified. The Designer shall provide a statement that no asbestos products were specified. Note that many products may still contain asbestos because they were not included in the EPA's 1989 ban and phase-out and these include pipeline wrap, vinyl composite tile, millboard, corrugated and flat cementitious sheets, roofing felt, cementitious shingles, roofing and non-roofing adhesives, sealants, and coatings. The Consumer Product Safety Commission requires manufacturers to label products that contain asbestos, if a product.

Specify only low or no VOC contained finish materials, to minimize the curing time and to allow for ample ventilation of products and finishes especially within occupied buildings.

Minimize the use of fabric and other porous surfaces with little or no water repellency because these are apt to collect dust, harbor organisms, and are difficult to clean/disinfect once subjected to water or moisture.

Refer to other sections within these Design Standards and Appendix VII Accessibility Guidelines for more information.

11.2 Attic Stock

Generally, the University wants to limit the amount of attic stock provided for buildings. For large bulky materials, such as rolls of carpeting or millwork, do not specify any attic stock. For mass-produced common building components, such as ceiling tile, vinyl floor tile or carpet tiles, specify that only one standard box of replacement materials be provided to the University at the end of the project. For any project-specific specialty items, consult the University Representative in conjunction with FO as to whether any attic stock is required.

For interior lighting where the project scope includes new lighting, 85% of the specified lighting shall be LED

For paint materials, require that no attic stock or materials be left on the building site at the end of the project.

11.3 Acoustic Standards

Building Systems shall be designed to meet ASHRAE guidelines for indoor and outdoor sound power levels. Comply with the most current ANSI/ASA S12.60 standards for other acoustic standards.

Refer to Appendix VI University Classroom Standards for other areas where acoustic considerations are required.

11.4 Ceilings

Suspended Acoustic

Select ceiling tiles that provide the appropriate humidity resistance to withstand tile sag. Provide humidity resistant ceiling tiles in high moisture areas such as laboratories, kitchens, locker rooms, indoor pools and areas that are not air conditioned. These ceilings should meet industry scrub-ability standards. Tiles located at ceiling plenums in areas of frequent access, such as at corridors and other high use public areas must be surface scratch and impact resistant. There shall be no exterior installations of suspended ceilings.

Suspended ceiling systems shall have exposed grid, 2x2 acoustic tiles in public areas and 2x4 acoustic tiles in non-public areas. There shall be no hidden grid systems or custom tiles specified.

Drywall and Other Ceiling Finishes

For ceilings needing regular access, suspended ceilings are preferred. Drywall for edge conditions and soffits are preferred.

11.5 Interior Lighting

Lighting (general, theatrical or emergency) shall preferably be accessible by ladder with a height distance of no more than 9’ above finished floor for ease of maintenance. If the design demands cannot meet maximum height distance for ease a maintenance, design or specify a lighting system that can be mechanically lowered for maintenance service. Access to lighting systems by scissor lift, must provide for clear unobstructed access by a standard lift to get to the fixture and not require specialized equipment. For applications that cannot be accessed by a scissor lift, cat walks shall be incorporated for maintenance and access to lighting.

11.6 Interior Stairs and Hand Rails

All interior stairs shall be precast or pan with rubber or vinyl cover nosing. Handrails shall be simply designed and constructed of aluminum or brushed stainless steel, preferably non-painted. Should conditions warrant a coated handrail, factory powder coating shall be specified.

11.7 Wall Partitions

The Designer should incorporate the exclusion of foreign made drywall within the specifications. No less than 5/8” gypsum board shall be used for areas where vandalism and high impact resistance is not an issue. Double layer drywall is required in all corridors and areas prone to damage. Framing members shall be galvanized or provided with other corrosion resistant coating.

The Designer shall specify to allow for structural floor deflection by requiring deflection tracks for the top runner. The maximum deflection limit for gypsum board assemblies is L/240. Tile finishes applied to gypsum board assemblies require a maximum deflection limit of L/360.

Gypsum board finish levels shall be level four (4) minimum for all public area circulation walls and level three (3) for accessory spaces such as mechanical, electrical, janitor closets, etc. There shall be no level of finish less than level three (3) for any wall.

In wet areas such as shower rooms, wash rooms, kitchens and animal rooms, the use of glass-mat, fiber cement or paperless gypsum board tile backing or cementitious backer units with waterproof membrane shall be specified in lieu of moisture-resistant gypsum board (green board).

11.8 Corner and Wall Guards

In all service corridors, provide forty-eight (48) inch high vinyl or plastic corner guards at all exterior corners. Plastic or vinyl corner guards should not be utilized. On typical corridors, corner guards are not required.

In service corridors, provide a durable and projecting base and chair rail to keep moving items from contacting the wall. Infill between the base and chair rail, which should be forty-two (42) inch above the finished floor, with either diamond plate or FRP over plywood.

11.9 Wall Tile

The University prefers water barrier membranes to be incorporated within all bathroom and kitchen designs. Specify only glazed porcelain tile with non-stain additive to the grout.

All wet walls that comprise of sinks, showers and toilets, walls shall have full height ceramic tile. The remaining area walls in restrooms shall have a six (6) foot high wainscot of tile.

Under no circumstances shall the Designer specify tile that is imported, custom and/or not readily available.

11.10 Flooring

In general, flooring and base installation adhesives shall be low odor and low VOC. Ensure by checking the SDS sheet of the submittal on flooring material that the product does not contain any asbestos. Select appropriate flooring based on high static-load resistance to protect from indentation and for areas prone to chemical spills, chemical resistance.

All flooring material shall have a break transition at all door openings or corridor intersections, regardless if there is a change in material. Clean outs that are located within the floor area must have a decorative cover plate specified and shall be coordinated with the floor finish schedule to ensure that the clean outs do not get covered over. All floor material shall be scribed so that the material abuts cleanly around the cleanout cover.

Under no circumstances shall the Designer specify flooring material that is custom and/or not readily available. Wood or rubber flooring shall not be specified for any area (except athletic facilities).

Quarry Floor Tile and Ceramic Tile

Quarry tile shall be specified for all kitchen areas and have quarry tile base. Ceramic tile shall be specified for all bathrooms and food service areas and have ceramic tile base. Under no circumstances shall the Designer specify tile that is imported, custom and/or not readily available.

Stone Veneers and Terrazzo Floors

Stone and Terrazzo floors shall be specified for use at building entrances, lobbies and primary circulation areas only.

Vinyl, Resilient Flooring and Epoxy Floors and Wall Base

Solid vinyl tile, vinyl composition tile (VCT) and resilient flexible terrazzo tiles are acceptable flooring products for use in public spaces, such as secondary corridors. Tile size shall be 12" x 12" or 24" x 24" and shall have a 1/8" minimum thickness.

VCT shall be ASTM F 1700, Class 1 rated and shall be either monolithic in color or shall be from the manufacturer's standard color stock. Designer is responsible for ensuring that the color shall not be scheduled for discontinuation for a period of at least one year from installation.

Resilient stair flooring and trim shall be in utility stairs and other stairs not requiring special finishes. Specify heavy-duty, full tread width resilient flooring with integral nosing and tread edge abrasive strips. Epoxy flooring shall be UGL Drylock 1-part epoxy floor paint for interior/exterior concrete and wood surfaces with lower traffic areas. For high traffic areas on concrete slabs, use PPG Aquapon WB component A and component B, 2-part epoxy floor paint with skid additive (where needed) or approved equal. Grey is the preferred color (over a clear coat or other color). A minimum 10-year warranty should be specified

At non-tiled areas, wall base shall be rubber base, homogeneous, scuff and abrasion resistant. Use cove base at hard floors and straight base at carpet, 6" high minimum, 1/8" thickness, with pre-cut lengths of not less than 6' preferred. Outside corners shall be pre-molded and match straight sections in appearance. Do not wrap inside corners; cut and cope the base at inside corners.

The University generally does not use sheet vinyl flooring. If conditions warrant the use of sheet vinyl, the Designer should obtain approval from the University Representative in conjunction with FO , prior to incorporating into the specifications.

Carpeting

Minimize carpeting whenever possible, and opt for resilient flooring, VCT tile etc. If carpet must be used, consider modular systems (carpet tiles) with low VOCs using little or no adhesive for installation. Carpet shall be constructed of nylon level loop or frieze for all corridors and heavy traffic areas. Carpet shall have a minimum face weight of no less than 30 oz., have non-organic backer and preferably be solution dyed. There shall be no custom coloring or under lament. Carpet tile should be installed on a quarter turn.

Ensure Carpet Research Institute (CRI) approved materials (carpet, adhesives, and cushion), installers, and installation methods are used.

Do not install carpet in basements or slab-on-grade concrete without a proper vapor barrier assembly. In all cases do not use carpet in the following areas:

- Cafeteria or food preparation areas
- Main entrances and lobbies
- Laboratories
- Utility spaces

When specifying carpet, the following are minimum requirements that must be met:

- Not custom: On quick-ship program
- Warranty: 15 years unconditional (example – chair pads should not be required)
- Certified: CRI Green Label Plus
- Product components: No red listed components
- Product construction: Tufted textured loop
  Solution dyed
  Carpet tile
- Fiber type: Antron or 6.6 Nylon fiber

11.11 Paint, Primers and Caulking

The University requires low or no volatile organic compound (VOC) or formaldehyde-containing/emitting products which can be found in but not limited to; paints, epoxies, adhesives, fillers, glues, plywood, insulation etc. Specify no PCB-containing products.

There shall be at a minimum one primer layer and two finish layers of paint required of all wall conditions. All caulking should be specified as paintable.

The University's standard for typical paint finish applications are as follows:

- Flat finishes are preferred at gypsum board ceilings and soffits.
- Eggshell finish is preferred for walls surfaces
- Semi-gloss finish is preferred for all trim

11.12 Exterior Doors and Frames

There is a prominent westerly wind on the Storrs campus and heavy-duty hinges and closers shall be required. Oversized heavy-weighted doors create an issue for heavy duty hinges and closers. The Designer is responsible for carefully calculating the total weight load of the specified door including any glass which may be incorporated into the design of the door. Obtain fairly accurate wind loads at each exterior door location, document each directional open-door swing against the directional westerly wind anticipated to determine the appropriate hardware needed to withstand the weight of the door and wind force demands. Reduction on the steel frame shall not be less than fourteen (14) gauge.

When doors or frames are standard grade, a single typical size should be specified (shall not exceed 7-0' in height, 42" width per single door) and should be available on a quick ship program.

Doors

The University would prefer that frameless glass entry doors are not specified. Exterior doors shall be metal thermally insulated that will not settle, sag or hold moisture and material shall not be less than 14 gauge steel (aluminum is not allowed without prior written approval), with top and side channels that are no less than five (5) inch widths, solid without pockets and shall be reinforced with fire retardant material for products in use. Rim panic devices, electronic latch retraction with full mortise lock set, continuous hinges, through bolts (not self-tapped) and door closers, factory finished and pre-machined are to be specified hardware.

Exterior wood doors are prohibited with the exception of where they exist at historical buildings and will not be waived by the State Historical Preservation Commission. In such cases, doors shall be solid wood, and doors that are wood panel pieced together are not acceptable.

The University has determined the following Manufacturer(s) to be of acceptable quality for typical exterior metal doors include; Ceco, Curries, Pioneer or Steelcraft.

Frames

Exterior frames shall be welded, 12-gauge minimum, factory finished and pre-machined for the specified hardware. Where exterior double doors are needed, it is required to specify a removable heavy duty steel mullion, key controlled rather than a fixed and pinned leaf configuration. Do not specify surface or concealed vertical rod exit devices. All exterior doors shall have aluminum thresholds and weather-stripping on all sides.

Store front door systems shall not be specified to provide typical manufacturer's hardware, but shall meet the University's hardware requirements.

11.13 Interior Doors and Frames

Solid core wood 1 ¾" doors are preferred, with factory finished clear or stain and pre-machined for hardware. However, do not specify wood doors in areas prone to high humidity or wet areas, where vandalism or security is a concern, or in instances where daily abuse will quickly damage the door. In cases where security and abuse are high, steel doors are preferred.

Interior steel doors shall be no less than 16 gauge, factory finished and pre-machined for hardware installation. Specify factory-applied rust-inhibitive primer to doors and frames. Ensure product compatibility with the specified finish paint products.

Acoustical steel doors shall have perimeter sound-stripping and appropriate STC rating for assembly locations near or adjacent to noisy machine rooms, television rooms, audio rooms, and elsewhere where noise control is needed. Special applications may require higher STC performance.

Knockdown frames are acceptable in renovations. All surrounding walls to the opening shall be reinforced with fire retardant blocking where possible.

When specifying doors with view windows, a cost effective preference is to have wire glass as opposed to a proprietary glass. If the door is solid and in a stairwell, specify doors is reinforced with steel channels and 30" x 24" vision kits (allowable by code).

Provide push or protection plates on the push side of wood doors at corridors and other heavy traffic areas.

11.14 Access Doors and Panels

Locate access doors in drywall, plaster and other inaccessible finishes to provide maintenance access to valves, controls, junction boxes, and other maintenance and testing items which otherwise would be inaccessible.

For access to valves, controls, junction boxes, and other maintenance and testing items where their location is not easily accessible at the opening, a preferred minimum size for an access panel is 48" x 48" for full passage, 36" x 36" minimum for torso only access. However, access panels may need to be larger and shall be sized large enough for a person, equipment and/or material to easily pass through it for its intended maintenance work. Factory prime the access doors to match adjacent wall or ceiling

color being specified. In highly finished areas such as main lobbies or corrosive environments, special finishes such as stainless steel or bronze or finishes to complement the interiors should be specified. Doors should be equipped with screwdriver operated cam locks.

11.15 Service Doors and Security gates

All service doors shall be heavy duty industrial doors from a single manufacturer of both the door and operator application. Rolling service doors shall be 14 gauge minimum and shall be slatted. Overhead sectional steel doors shall be insulated with an R value of no less than 17. The University has determined the following Manufacturer(s) to be of acceptable quality for service doors and security gates include: Overhead Door Company or approved equal.

11.16 Door Hardware

In pre-existing buildings, identify make, model and finish of existing hardware, confirm if it is still being made and if so, specify the same make, model and finish for any new renovations. Specifying hardware by an allowance within the contract documents is prohibited.

Hardware sets shall be developed for each unique condition for the building. Due to high use, door hardware must be of heaviest duty and grade available with no plastic components within its mechanical use. All finish hardware shall be coordinated to match with existing hardware or in cases of all new hardware and shall be supplied as satin chromium plated (US26D) or satin stainless steel (US32D) unless specifically specified otherwise.

Hinges and Butts

All exterior doors must have electrified mortis continuous stainless-steel bearing-geared type hinges, tested for 1.5M cycles. The University has determined the following Manufacturer(s) to be of acceptable quality for hinges and butts include: Stanley, Ives, McKinney, and Markar.

Coordinators

Double doors shall be used in conjunction with key removable steel mullions and exit rim devices. Door coordinators are discouraged.

Exit and Panic Hardware

For applications where the exit is for emergency purposes only, panic hardware must be specified with a local audible alarm. All doors with exit devices shall be equipped with a keyed dogging device to hold the push bar down and the latch bolt in the open position, with the exception of fire rated doors and doors managed by access controls. Concealed or surface vertical rod-less bottom rod shall not be specified. Abide by all code requirements regarding delayed unlock requirements for any egress doors. All exit devices shall be a rim device unless otherwise presented and approved. The University prefers stainless steel brushed finish for all exit hardware. The University has determined that the acceptable quality level for exit and panic hardware shall be similar to the Sargent 16-8800 Series or Von Duprin 98/99 Series.

Cylinders and Locksets

There shall be no standalone locks without expressed written authorization from the University Representative in conjunction with University Safety. The Designer is responsible for the coordination of keying decisions with the end user and the University Locksmith together. Cylinder finish shall be US26D, unless otherwise approved by the University Representative.

Special Keying Requirements
Any room containing medium voltage equipment shall be secured by a high voltage electrician's key.

Interior:
Interior hardware shall have a lock button on the inside of each room, unless otherwise directed. Interior double door applications, it is preferred to be rim x rim x mullion. The University has determined the following Manufacturer(s) to be of acceptable quality for cylindrical locksets include Sargent 10 Series, Schlage Everest ND Series or Marks 295 series.

For Residential and Academic applications, mortise locksets shall be specified. The University has determined the following Manufacturer(s) to be of acceptable quality for mortise locksets include: Sargent 8200 Series or Schlage L Series.

For classrooms, doors shall have the ability to be locked and secured from the inside of the classroom.

Exterior:
All exterior door hardware applications shall provide for key override from the outside for emergency purposes and have an electronic latch retraction. Exterior doors, which are not the main access point(s) to the building and non-residential buildings, shall be keyed exit only.

Exterior locksets shall require electronic controls and not be supported by batteries. The University has determined the following Manufacturer(s) to be of acceptable quality for cylinders and locksets which include; Sargent 8800 series or Von Duprin 98/99 series.

Exterior double door hardware shall be controlled by two rim devises and have a center mullion with cylinder key lock for release.

Security and Access Controls
Should the University determine the need for controlled access and surveillance to specific areas of the building, the Designer shall coordinate and adjust hardware specifications to list those manufacturers with products that are compatible with the specified security control system platform.

To ensure that the building envelope is secured at all times, the exterior egress doors shall be specified with card access exit device or mortise electronic lockset. Door status monitoring, latch bolt monitor request to exit sensor and electric latch retraction shall be included and will report back to the Police station.

Electrified hinges are preferred with compatible hardware that controls exterior doors, verses electronic strikes. There shall be no standalone electronic access control devices specified, including wireless systems. Power over Ethernet (POE) shall not be specified for locks.

Refer to Appendix X – Physical Security Systems Standards for details on security and access controls.

Door Closers
Provide heavy duty cast iron, continuously adjustable, surface mounted parallel arm closers. Closure durability must be rated for 10M full load cycle rated, 30-year full warranty. Closers must feature

separate adjustment for latch speed, general speed and back-check. Hydraulic fluid shall require no seasonal adjustment. Specify through-bolting door mounted components. Floor type and overhead-concealed closers are not acceptable. Do not under any circumstances specify in-ground closures. The University has found the quality level of the door closers should be similar to the LCN 4111, LCN 4040 XP or Sergeant 281 Series with 30-year warranty.

Automatic Door Openers Systems and Hold Opens
A presence sensing type device shall be installed and wired into the door opening system in lieu of an approachable safety mat. A push-plate switch shall be installed and wired into the system inside the building, and located near the entryway to permit operation of the door from both inside or outside the building. Operator and presence sensors shall be adjusted to allow sufficient timing delay of closing to permit wheelchair access. No in-ground door openers/closers operators shall be specified.

The University has determined the following Manufacturer(s) to be of acceptable quality for automatic door openers; Stanley, Nabco (Gyrotec), LCN or Assa Abloy.

See Appendix VII Accessibility Guidelines for additional requirements for automatic door openers on exterior doors, restroom doors and corridor doors.

Door Trim Units
All mop and kick plates shall be 2" less than the width of the door. The University has determined the following Manufacturer(s) to be of acceptable quality for the door trim units include Hager, Ives, and Trimco or approved equals.

Thresholds
The University has determined the following Manufacturer(s) to be of acceptable quality for thresholds include; Hager, National Guard, Pemko, Reese or approved equal.

Weather-stripping
All exterior doorways, enclosed loading docks and hatches shall be provided with weather-stripping. The University has determined the following Manufacturer(s) to be of acceptable quality for weather stripping include; Zero, National Guard, Pemko, and Reese or approved equal.

Door stops
Floor mount door stops are preferred, however in conditions where floor mounts are not conducive, wall mount stops are acceptable only if blocking has been installed behind the gypsum wall board.

11.17 Millwork and Finished Carpentry

Fabricators and installers of all millwork type products shall have current AWI certification.
When choosing wood for cabinets, millwork and finish carpentry, generally choose species that are native to the United States and are readily available. Exotic species should be avoided. Always specify low formaldehyde and low VOC materials in millwork and carpentry. Wood veneer products are acceptable; however, durability is a primary concern for the University and the Designer should be selective as to where veneers are utilized. Laminate finishes are generally acceptable to the University.

11.18 Countertops

Work surfaces shall be sized to permit safe access to utility outlets, and within easy reach of storage units located above the work area. The standard work surface depth is 2 feet. Deeper surfaces may be

necessary to support large equipment. Counter heights should generally be 36", with a section lower to meet accessibility and code requirements.

11.19 Waste Containers

Generally, all buildings shall be designed to accommodate space in various areas within the general circulation of the building for trash and recycling containers. Such containers shall hold a minimum 23-25-gallon disposable bag. Gray with a swing lid for trash/waste and blue with a comingle lid for recycling. The University has standardized on Rubbermaid Slim Jim containers or equivalent.

Generally, all personal work spaces shall be designed to accommodate trash and recycling containers. Such containers shall fit a 7-gallon disposable bag. Gary for trash and Blue for recycling.

Designated trash and recycling areas which are desired to be obscure, shall be designed to accommodate both trash and recycling containers sized for a 44-gallon disposable bag. The enclosure design shall be simple, made from durable material and provide easy removal of the trash and recycling containers for emptying.

11.20 Bathroom Accessories

Paper dispensers are preferred over electronic hand dryers. Toilet and paper towel dispensers shall be high capacity dispensers and be extremely durable. Toilet paper dispensers shall be able to easily accommodate twin 9" diameter rolls. Paper towel dispensers shall be able to easily accommodate an 8" diameter hardwound roll with a lever controlled dispense and stub roll transfer features. Acceptable manufacture of paper towel and toilet paper dispensers is Tork, color black/gray.

Soap dispenser shall be wall mounted liquid refillable. Acceptable manufacturer of soap dispensers is GOJO, color black. Confirm with the University Representative in conjunction with FO prior to final specification in the Construction Documents.

11.21 Toilet Partitions and Screens

The University prefers to have the toilet partitions posted from floor to ceiling where practical, made of solid 1" minimum high-density polyethylene with continuous plastic wall brackets, solid plastic shoes and latch strike hardware. University has determined that the quality level provided by Santana Products or approved equal are acceptable.

11.22 Lockers and Benches

Lockers should generally be metal and should not be wood or plastic. For most applications, 12" wide stacked lockers are preferred. If used in an athletic facility, lockers should also be vented.

Benches should generally be affixed to the structure with a minimum of two legs. Standard benches are 6' long. Benches may have wood seats or plastic laminate seats.

11.23 Window Treatment

Typically, manual vertical blinds are provided in the buildings on all windows. Some applications and building types require black-out shades, and these should be provided in addition to the vertical blinds. Should conditions require the use of electronic shades, the Designer must seek prior approval from the University Representative and FO prior to specifying. Specifying film applications on windows is prohibited, with the exception of new residential bathroom window applications.

11.24 Building's Interior Directories and Signage

All signage shall be static and shall not be specified to be electronic unless specifically requested by the University Representative.

The University's primary color palette is as follows;

Navy Blue – Pantone 289C, C10 M76 Y12 K70 RO G14 B47
White – Opaque White, CO MO YO KO R255 G255 B255
Grey – Pantone 430C C33 M18 Y13 K40 R124 G135 B142

Building Directories

Building directors are to be provided within the main entrance area of all buildings. Design of the directory shall be pre-approved by the University Representative in conjunction with the Sign Committee Representative.

Interior Signage

All interior signs shall meet Green Building Focus Materials (GBFMs) requirements. Require that the Contractor provide mock-ups for University approval prior to installation of same

The University requires the following special warranties for interior signage: Manufacturer shall agree to repair or replace components of signs that fail in materials or workmanship including but are not limited to: 1) deterioration of metal and polymer finishes beyond normal weathering; 2) deterioration of embedded graphic Image colors and sign lamination. A five (5) year unlimited warranty must be provided on the signage materials.

All identification, directional and informational sign applications shall be cast acrylic sign panels. The faceplate panel shall be laser cut from 1/16 in. clear, cast-acrylic and finished with a 3/8 in. subsurface opaque color border. The faceplate shall be permanently bonded to a black acrylic back plate allowing for changeable message. Permanent room identification and/or ADA compliance shall be achieved with a photopolymer acrylic faceplate. Photopolymer ADA faceplates shall provide 1/32 In. raised tactile graphics, and Grade II braille. This faceplate shall provide for permanent messages and optional subsurface applications. Provide paper or polystyrene inserts to allow for changeable message Inserts that can be easily updated as required. Signs shall be wall mounted or flag mounted to any surface using selected fasteners, brackets and adhesives recommended by the sign system manufacturer.

Informational and identification signs shall be 9 in x 9 in. x 1/16 in. in dimension with 9 in x 6.5 in. being white in color and 9 in. x 2.5 in. being blue in color. Office signs shall be 9"x 6.5" x 1/16" in dimension with 9 in x 4 in. being University white in color and 9 in. x 2.5 in. being University blue in color. Tactile Characters and Grade 2 braille raised 1/32 inch (0.8 mm) above surface with contrasting two colors.

The University has determined the following Manufacturer(s) to be of acceptable quality for signage include; APCO Graphics, Inc., ASI-Modulex, Inc., and Kroy Gemini Incorporated.

12 University Safety Systems Guidelines

12.1 Guiding Principles

Providing buildings and sites that are safe is one of the primary tenants of the University. Proper design and constructability of Infrastructure Security Systems for new construction and renovations at the University is paramount. The University has adopted the Crime Prevention through Environmental Design (CPTED) philosophy and requires the Designer to take into account such philosophy in the positioning of a new structure, landscape and building design. Every building on campus has a unique purpose, therefore safety and security design shall be specific for each building. Design an appropriate physical protection system that utilizes building occupants and technology that will protect the assets accordingly.

The Designer shall incorporate existing systems when applicable, to ensure a seamless co-existence of new installations. Only certified professionals knowledgeable in the systems shall perform such designs.

Design documents shall provide details of all fire protection and security systems. Before finalizing the intended design within the Design Development phase on any University owned property, the Designer shall obtain confirmation from the University Representative in conjunction with DUS that all details concerning public safety have been covered and are acceptable. Such details shall also include the preliminary site logistics plan which shall reflect site and building access and egress paths by the public and occupants.

For many projects, DUS will have jurisdiction over the review and approval of the design plans as they relate to permitting responsibilities. However, if the project exceeds the State's Threshold Building Limits, the Office of State Building Inspectors has jurisdiction and review authority over the project. The Designer is required to meet all requirements of the Office of State Building Inspectors, as well as, all University Standards for Threshold projects.

12.2 Automatic Exterior Defibrillator (AED)

All new buildings and major renovations to existing buildings shall incorporate an AED installation. The AED shall be located at a minimum in main entry/lobby of the building. Such installation package shall include a an AED device with 2 electrodes, charging unit, protocol card and program, implementation starter kit, carrying case, ambulance rescue kit(reusable mouth barrier mask with valve and filter, 2 sets of gloves, vionex wipes, scissors, disposable razor and carrying case), wall decal, inspection tag, AED cabinet with audible alarm, projected wall sign and basic bleeding kit vacuum sealed (1 – CAT tourniquet, 6"emergency trauma dressing, 2-NAR compressed gauze, 2-Pair bear claw nitriale gloves and NAR 7.25 trauma shears). The University has determined the following Manufacturer(s) to be of acceptable quality for AEDs: LifePak CR Plus Auto Physio or approved equal.

12.3 Infrastructure Security System

Guiding Principles

All designs shall ensure clear sightlines and adequate lighting for safety and surveillance to protect the assets within the building and campus grounds. The Designer is responsible for coordinating the security system with any landscape design for review with the University Representative in conjunction with DUS and University 's Landscape Architect.

A well-designed infrastructure security system shall be included in the program to identify what needs to be protected and provides four groups of security components: deterrence, detection, delay, and response. These four items in addition to what type of work is being performed in the building or space as well as equipment housed shall be the basis of need.

Deterrence – to prevent unwanted visitors from gaining access to school grounds or buildings, and deterrence to avert the impact of natural threats that could result in potential harm to students, staff and property.
Detection – to quickly locate, identify and contain the movement of an unwanted party who has gained unauthorized entry to the building.
Delay – to impede, isolate and forestall the movement of an unwanted party within a building; to prevent access to classroom areas and common gathering points within allowing adequate time for a public safety response.
Response – to ensure that coordinated, interactive and reliable communication system and procedures are in place to facilitate an immediate and effective response from public safety and medical agencies.

The design shall allow for the monitoring of points of entry/egress by natural and/or electronic surveillance during normal hours of operation and during special events.

For new construction or renovations to existing buildings, if the building has occupancy that requires access after normal hours, design shall identify one key entrance to be designated as an "afterhours" entry point to the building. Such entrance shall be clearly identified as such with a sign at the entry door. Where feasible, incorporate into the design for an afterhours space that can be segregated in such a manner that the rest of the building can be secured.

Signs identifying the designated after-hours access entrance shall following the sign standards and shall state: "After Hours Entrance". Follow sign requirements within subsection on Way finding, Informational and Directional Exterior Signage.

Public Areas consist of areas made available for use by the public, including but not limited to, campus grounds, parking areas, building exteriors, loading docks, areas of ingress and egress, classrooms, lecture halls, study rooms, lobbies, theaters, libraries, dining halls, gymnasiums, recreation areas, and retail establishments. Areas in which persons would not have a reasonable expectation of privacy, but to which access is restricted to certain University employees, such as storage areas, shall also be considered public areas.

Private Areas consist of areas in which a person has a reasonable expectation of privacy, including but not limited to, non-common areas in residence halls, residence hall corridors, bathrooms, shower areas, locker and changing rooms and other areas where a reasonable person might change clothes. Additionally, areas designed for the personal comfort of University employees or the safeguarding of their possessions, such as lounges and locker rooms, and areas dedicated to medical, physical or mental therapy or treatment shall be considered private areas.

Generally, at a minimum, all buildings shall include card key access control, alarm notification and camera(s) to all entrance and exit points.

The security management system control panel shall be installed in the main telecommunications distribution closet. Ensure that there is two (2) dedicated data connections and two (2) dedicated isolated power outlets where the control head end unit will be located. The Designer is responsible to coordinate the control hardware with the standard doors and frames. The Designer shall clearly have defined pathways and identify them in the as-built drawings. IP address will be coordinated with the University.

12.4 Emergency Blue Telephone

Any project that entails work outside of a building that impact or add sidewalks shall take into consideration the requirement of moving or adding an Emergency Blue Telephone. Designer shall review with the University Representative to determine if an emergency telephone is required. The spacing of these telephones shall be such that from any location on the site, at least one emergency telephone can be seen.

See Appendix IV - Telecommunications Design Guidelines and Performance Standards for further information and details about emergency call box requirements.

12.5 Central Fire Command Station

At Regional Campuses, stand-alone structures and other areas off of an existing campus network, the communication system from the building alarm system to a receiving station shall be based on compatible technology. Due to concerns over key holder contact, repair contracts, cost of monitoring, and potential delays in transmission of non-priority alarms, the University Storrs 911 center shall be the first choice alarm receiving center and use of third party receivers (i.e.; ADT, Brinks, etc.) shall only be used when the existing network cannot be extended and found to be the only practical solution.

On the Storrs and Depot campus phone networks, the system shall be provided with a fully networked communication process, to be connected to the existing campus Network Command Center (NCC) by Siemens or the Central Station Fire Alarm System 4120 network True Site Work Station (TSW) by SimplexGrinnell. Both are located in DUS Building in Storrs. The network interface shall provide and be programmed to use the following minimum capabilities:

- Graphic screens shall be programmed at the TSW or NCC (head end receiver) that depict an actual representation of the building floors, annunciating all alarm points in the building. These points shall be programmed to change color depending on their state of activity (red for alarm, green for normal, etc.).
- The network interface shall provide to the TSW or NCC:
    - Control of the remote panel allowing the operator to acknowledge devices individually or in groups.
    - The ability to silence signals and reset the remote panel.
    - Set-host service functions which will allow remote node data access including reports on all individual initiating devices.
    - Programming and diagnostics capability of the remote node.

Compatibility and Age/Versions

The University has standardized critical life safety infrastructure for reliability and compatibility of operating systems, as well as consistency of parts stock, technician and user training and testing protocols. All primary (panel, programming, network interface, etc.) fire alarm equipment and programming shall be manufactured by SimplexGrinnell or Siemens. Secondary components and some

communications equipment may be from other manufacturers if compatible with the SimplexGrinnell or Siemens alarm receiving system and is approved by the University Representative in conjunction with the Fire Chief as an equal. Examples include, but are not limited to Vesda detection systems, interface or control modules, dialers for non-networked locations, etc. Packaged off brand, devices such as duct detection packaged with air hander units will not be accepted, as they create compatibility problems with the main panel and require special parts stock. Prepackaged devices must of the same brand (or accepted by the manufacturer) as the fire alarm panel in the building or must be replaced with same brand equipment unless technically impossible.
With renovations, the age of the existing system components should be taken into consideration when specifying the re-use of existing system components in conjunction with additional new system components being added to the overall system. The Designer is responsible for investigating the existing system being impacted and confirming with the University Representative in conjunction with UDPS the strategy for utilizing existing versus new components. Investigation should not be left to the Contractor or third-party supplier.

Fire Alarm Control Panel and Annunciation Configuration
The building's main fire alarm control panel shall be located at or as close to the main entrance of the building as possible. The location of this panel shall be approved by DUS designee. In cases where, due to existing wiring infrastructure or other factors that necessitate locating the main fire alarm control panel in a location that is not near the main entrance, a fire alarm remote control-capable annunciator with voice controls and microphone-if applicable) shall be installed at the main entrance. Remote annunciator panels shall be configured to match appearance and function of the main panel within the limits of the equipment. A minimum 80-character alphanumeric display shall be mounted at 5'6" to the center of display above the floor.

Fire protection releasing functions should be included in the main fire alarm panel whenever possible, removing any secondary releasing panels from the design.

Notification
Voice capability may be specified in areas where not required, but deemed by the fire department's designee as appropriate for occupant emergency alerting and/or notification purposes.
The operation of the "hot" or "soft" keys shall be password protected to prevent unauthorized control of fire alarm functions. Capability of one stroke key control or hot key button control (after password access) and includes the following disabling features:

- All audible and visual signals, while only generating one (1) trouble transmission, shall be provided.
- The automatic release of magnetic door hold open devices and fire shutters, while only generating one (1) trouble transmission shall be provided.
- The elevator bypass feature, while only generating one (1) trouble transmission shall be provided.
- The interconnect feature with other fire alarm panels/systems within the same building, while only generating one (1) trouble transmission.
- Other control by event features such as air handling unit shut down and activation of smoke control systems, while only generating one (1) trouble transmission for each group of like features being disabled.

Backup Power

For secondary power supply and back-up battery capacity, regardless of the presence of an emergency generator, provide a minimum of 24 hours standby and 15 minutes of alarm time capacity.

Labeling of Fire Alarm Components
The fire alarm panel shall be labeled with the following information:

- location of the battery charger panel
- location of the battery box
- location of any Notification Appliance Circuit (NAC) panels
- location of the AC power supply overcurrent protection device (OCPD) for that panel
- a contact number for the fire alarm service provider (if the system is not being monitored and serviced by the University)
- the alarm transmission method (fiber network, dialer, etc.)
- the account or node identity at the receiving location shall also be described

If the panel is located in an area that is controlled and not publicly accessible, such as a locked and dedicated fire command room, the labels may be on the exterior of the panel enclosure, otherwise it shall be on the interior of the panel enclosure.

The labeling shall be of a pre-manufactured or site produced label and shall not be hand written. Labeling shall be located in an area such as on the inside surface of the panel door or similar that would be protected but readily visible to authorized users.

Power Supply
NAC, PAD etc. panels shall also have a label indicating battery location and designed size, as well as, the AC power OCPD location. The inside of the battery box shall be labeled with the amp hours rating of the batteries required by the fire alarm design. Battery system and charger system shall be readily accessible to the satisfaction of DUS Representative for normal testing and maintenance.

Initiating devices shall be labelled clearly with the device number that appears on the annunciating display(s). The label shall be positioned to face the direction of travel from the door of a space and/or the direction of travel from the alarm panel toward the device. The label should be visible from the floor level and shall be of a pre-manufactured or site produced label and shall not be hand written.

Fire Alarm Excess Capacity
A minimum of 20% excess cabinet/rack space above that required by code shall be incorporated into the original design and configuration of the fire alarm system. It is preferred that the excess space be within the main fire alarm panel, however if in order to achieve such excess space a separate panel is required, it shall be mounted immediately next to the main fire alarm panel.

For addressable circuit (ID Net/DLC loop. Etc.) addresses, provide a minimum of 20% excess addresses for each ID net circuit or card utilized above that required by code for the original design and configuration of the fire alarm system on the day that the Certificate of Occupancy (CO), Temporary Certificate of Occupancy (TCO) or Certificate of Approval (CA) is issued.

For notification appliance circuits, provide a minimum of 20% excess notification circuit capacity in addition to 20% excess signal circuit capacity on each signal circuit card utilized in the system than required for the original design and configuration of the fire alarm system on the day that the Certificate of Occupancy (CO) or Certificate of Approval (CA) is issued.

When a project is renovating a space, the Designer can utilize the excess capacity in existing fire alarm panels and does not need add new panels or capacity unless it utilizes greater than 95% of the existing panel capacity. If less than 5% capacity remains, the Designer shall provide an increase in panel, ID net addresses and power supply capacity to the requirements herein.

Fire Alarm Initiating Devices
The Designer shall be responsible to ensure that all initiating devices are placed in locations that are readily accessible for routine maintenance and testing. Duct detection that cannot be readily accessible shall eliminated from design wherever code allows. If detection devices must go in areas that are hard to access, they will be reviewed with the fire department or designee during design and shall be provided with readily accessible remote alarm/test/reset switches, appropriately labeled. All initiating devices shall be addressable and clearly labeled with their device number. The label shall be clearly visible from floor level and from the typical direction of travel into and through the protected building from the direction of the main Fire Alarm Control Panel (FACP). All FACP pre-programmed keys, zone labels, function keys, instructions and initiation device labels shall be typed.

Devices in locked rooms such as high hazard or medical procedure areas, shall be located such that they can be observed from the corridor or have a remote LED display in the corridor in order to view the status of the devise.

Description of device location shall be geographically driven and landmarked to room numbers. The list of the point descriptions shall be submitted and approved prior to final acceptance by DUS designee.

In addition to any specific detection devices required by the State Building Code, Connecticut Fire Prevention Code and/or the Connecticut State Fire Safety Code, automatically addressable detection shall always be provided unless this requirement is waived by the fire department designee. Conventional (non-addressable) detection may be acceptable in locations such as extreme temperature, low risk, low occupancy, etc.

Exit Signs
Designer shall not specify tritium exit signs.

Smoke and Heat
The preferred installation of smoke and heat detectors is on the ceiling with sidewall installation will only be accepted as a contingency.

Activation of any single heat detector, water flow sensor, special hazard detector (flame, explosion, etc.), or pull station in any occupancy class shall activate the general evacuation signals, as well as, transmit a fire alarm signal to DUS TSW/NCC, or other approved reception point.

It shall be the responsibility of the Designer and installer to verify the use of all spaces and equipment within the space to determine the proper type of initiation device and to provide proper coverage, to reduce the number of nuisance alarms. Areas that contain environmental conditions which would likely cause false alarms may require the use of heat detection or smoke detection with a Carbon Monoxide sensor as an example.

The fire alarm system's response to the activation of smoke detector(s) shall be based upon the following:

- **Elevator Recall**
  Smoke detectors that serve as area detection and elevator protection/control shall operate as noted in sections below, along with the code required elevator control functions. Smoke detectors that are dedicated to elevator protection/control only shall perform required elevator control functions, as well as, transmit a fire alarm signal to DUS TSW/NCC. Local annunciation shall not be required. Activation of heat detection, even if dedicated to elevator functions, shall activate the general evacuation signals as well as transmit a fire alarm signal to DUS TSW/NCC.

- **Residential Spaces**
  Activation of any one (1) dorm/sleeping room smoke detector in which only 1 smoke detector protects that compartment shall result in local annunciation in that compartment and connected compartments (i.e. suites, etc.), and the transmission of a fire alarm signal to DUS TSW/NCC but shall not result in the activation of a general evacuation signal in any other part of the building.

  Activation of any two (2) or more smoke detectors in dorm/sleeping rooms (or suites of sleeping rooms) shall result in the transmission of a fire alarm signal to DUS TSW/NCC and activation of the general evacuation signals.

  Activation of any one (1) common area or mechanical space smoke detector shall result in the transmission of a fire alarm signal to theDUS TSW/NCC and activation of the general evacuation signal.

- **Business, Assembly, Mercantile, Storage and Other Occupancies**
  Activation of any one (1) area smoke detector, which shares air/compartment space with other smoke detectors, shall result in the transmission of a fire alarm signal to the DUS TSW/NCC and but shall not result in the activation of the general evacuation signal.

  Activation of any two (2) or more common area smoke detectors that share the same air or compartment space shall activate the general evacuation signal as well as transmit a fire alarm signal to the DUS TSW/NCC.

  Activation of any one (1) smoke detector, in which only 1 smoke detector protects that one compartment, shall result in the transmission of an alarm signal to the DUS TSW/NCC and shall activate the general evacuation signals.

Carbon Monoxide (CO) Detection
CO detectors shall be installed where only required by code. The fire alarm system's response to the activation of the Carbon Monoxide detector shall be based upon the following:

- **Residential**
  Activation of any 1 Carbon Monoxide sensor in dorm /sleeping rooms (or suites of sleeping rooms) shall result in that device sounding locally and throughout any connected rooms of an individual suite, the transmission of a priority 2 alarm to the DUS TSW/NCC but shall not result in the activation of a general evacuation signal in any other part of the building.

Activation of any 2 or more dorm/sleeping room Carbon Monoxide sensors shall cause those devices to sound locally and throughout any connected rooms of an individual suite, the transmission of a Priority 2 alarm to the DUS TSW/NCC and shall activate the general evacuation signals.

- **Business – Assembly – Mercantile – Storage – Health Care – Educational – Detention**
  Activation of any 1 common area Carbon Monoxide sensor shall result in the transmission of a priority 2 alarm to the DUS TSW/NCC but shall not result in the activation of the general evacuation signal.
  Activation of any 2 or more common area Carbon Monoxide sensors shall result in the transmission of a priority 2 alarm to the DUS TSW/NCC and shall activate the general evacuation signals.

Manual Pull Stations
Manual pull stations shall be of a key operated type, not requiring tools such as hex keys, screw drivers, etc. The key type shall match the typical for the brand of the system in that location (ie; B key for Simplex and T45 for Siemens).

Speaker Strobe Units
Where required, speaker strobe units shall be installed onto common circuits and appropriately activate via programming with standardized fire evacuation messages.

Flow Devices
If any device is activated on a wet sprinkler system or dry suppressor system, the emergency evacuation alarm should sound on a building-wide basis, and notification sent to the DUS TSW/CNN/NCC.

Sequence of Operations
All initiating devices that cause any sequence of further operations such as releasing, elevator recall, smoke control, verification, etc must be provided with documentation and training prior to acceptance that details the sequence(s) and all related/connected devices and systems.

12.6 Fire Protection/Extinguishing Systems

All student residences larger than single family homes shall have fire protection systems. It is preferred that all new construction projects include a fire protection or suppression system. Renovations to buildings that do not already have sprinkler coverage in the building shall be reviewed on a case by case basis with the University Representative and the DUS designee.

Black iron or CPVC shall be used in ALL fire protection system piping. Galvanized piping will only be accepted in drain piping, unless specifically approved by the fire department designee. Black iron piping 2.5” and larger shall be Schedule 10, black iron piping 2” and small shall be Schedule 40.

Branch and main piping for dry/pre-action/deluge/fixed extinguishing systems will be labeled to the approval of the fire department designee to allow easy identification in the field.

For new construction, ITS closets or rooms with a significant amount of equipment, a dry/pre-action system shall be incorporated into the design. For renovations, the need for a dry/pre-action system in

an existing ITS closet will be determined on a case by case basis with the University Representative in conjunction with ITS.

All piping in wet spaces such as crawl spaces, tunnels, attics etc shall be provided with corrosion protective coatings (minimum: rust preventative paint) and shall be Schedule 40 piping. In non-heated spaces where sprinkler lines are intended to be installed, such lines shall not be wet systems and shall be insulated.

Flow Switches
Sprinkler flow switches shall be equipped with an integral time delay device which shall be able to provide a delay of no less than 25 seconds from the time water begins to flow to the activation to the time of the alarm or as close to that value as can be adjusted in the field. In no case may the delay be programmed greater than 40 seconds.

Drains
It is preferred the main drain for the sprinkler system to be piped directly to the outside of the building, with provisions made to prevent soil erosion during testing. If the main drain is interior to the building, a large basin shall be provided to accommodate the volume of water required to drain the system. The drain room shall also have a floor drain, however the sole reliance on the floor drain to drain the sprinkler system is prohibited.

All low point, drum traps, and similar drains shall be piped to place the valve in heated spaces. This is required to prevent freezing of drain water between maintenance visits.

Power Monitoring
Power status for jockey pumps and compressors shall be monitored by the fire alarm system.

Accessibility
All risers, valves and appurtenances shall be readily accessible for fire department control, normal or emergency maintenance, and resetting. Zoning of the sprinkler system should be reviewed with the University Representative and the DUS designee during the Design Development phase and should not be finalized until approved by both. Shut off valves shall be provided on each floor and for each zone and shall preferably be located in stairwells.

Control valve height shall not exceed seven feet (7') from the walking surface, unless approved by the DUS designee. The control valve indicator shall be readily accessible and visible from the floor without the use of a ladder. If the valve height exceeds seven feet, it shall have a chain-equipped handle. The control valves shall be equipped with "break away" locks (keyed as Cat 83 and does not capture the key) and a chain or cable.

Each control valve shall be labeled to indicate areas covered. Individually addressable sprinkler flow switches and addressable control valve tamper switches shall be provided for each control valve and inspectors test valve on all sprinkler systems, including limited area sprinkler systems.

University Ownership of Equipment

All sprinkler equipment required to service and maintain the system shall remain the property of the University. For renovations of existing systems, unused or replaced equipment shall be kept or discarded at the discretion of the FO.

Training and Documentation
The Designer shall require the sprinkler system installer to provide full overview training of the new system, which shall include field review of the locations of all new components of the system with FO and Fire Department designees. Electronic as-built drawings (with a copy of the valve lists) shall be provided to the FO and shall contain the location, area/function served, and "normal setting" (open or closed) for each valve. Documentation shall also include plans of all device locations back to the riser, riser diagrams, and current hydraulic calculations.

12.7 Fire Department Connection

For buildings at Storrs, the University's standard fire department connection (FDC) is a 4" Storz type connector. For buildings at the regional campuses, the type and size of the FDC shall be determined by the local fire department. The location and number of FDC's required for a project should be reviewed and approved by the DUS designee early in the project design, but in no case shall there be less than one FCD per building.

12.8 Fire Extinguishers and Cabinets

The goal is to provide sprinkler coverage throughout buildings, and thereby minimize the number of fire extinguishers in the building. Fire extinguishers are still required for certain uses in the building, such as chemical laboratories, and the appropriate type of extinguisher should be provided for each special use. To allow quick response and replacement, fire extinguishers should be installed on brackets and not in cabinets. This will minimize wall damage and intrusion on wall fire ratings. All fire extinguishers shall be Buckeye Brand or approved equal.

12.9 Emergency Services Apparatus Accesses

Service road access for rescue and firefighting apparatus shall be provided to all four sides of the building and courtyards, if possible and practical. The largest fire truck serving the Storrs campus currently is the 1994 Aerial Truck (also known as a "Tower 122"). The inner turning radius is 30' and the outer radius is a minimum of 53'. The stabilizing jacks require a solid (paved or compacted) surface of 18' wide by 50' long minimum. If service road access cannot be provided on all four sides of the building, the Fire Department designee shall approve the access provided.

Mountable curbs and raised/ramped roadways must accommodate fire department access for types of responses deemed appropriate by the fire department designee. Access may be require for lower vehicle such as ambulances.

12.10 Fire Hydrants

Fire hydrants shall be located to allow ready access in proximity to the intended center location of the fire department operations, and preferably within close vicinity to the front of the building. However, the hydrant location must be far enough from the building to keep firefighting apparatus and personnel out of potential collapse zones. The area around a hydrant shall have a minimum of a 3' radius of paved or hard area around the hydrant on all sides to allow for the turning of the valve stem. The area between the hydrant and the apparatus shall have a minimum of 10' clear of width (5' to each side of the hydrant) to allow for hose line placement and working area.

DUS shall be consulted regarding acceptable types of fire hydrants. Gate valve shall be a left open valve. Fire hydrants shall be painted red, unless the hydrant is on a high-pressure line, in which case the hydrant shall be painted orange.

12.11 Fire Water Lines

It is preferred that new buildings have a separate domestic water service and fire water service. Where feasible, and for buildings exceeding 250,000 square feet, provide a redundant fire service (ie. three services).

The pressure of the fire loop in the vicinity of the University varies between 120 psi and 140 psi. Prior to commencing the design, it is the Designer is responsible to have a pressure test conducted by an independent third party at the nearest fire hydrant to the project. Such testing cannot commence without first notifying and obtaining an approval to proceed with the testing from the of the University's Fire Department prior to conducting the testing.

12.12 Key Securing Systems

All building projects, new construction and renovations will include a Knox Box key storage device to interface with the Knox Rapid Access System implemented and maintained by the University fire department. The Knox box is a safe-like enclosure and can be either surface or flush mounted outside the building. The location of the box shall be approved by the DUS designee. If an alternate key securing system is proposed, it shall be compatible with the existing University system and also subject to approval by the Town of Mansfield (for Storrs based projects).

On the Storrs and Depot Campuses, the Knox box shall be equipped with the option that allows the box to be monitored by the building fire alarm system and shall be designed to tie into the system. If a fire alarm system is not available to monitor the box, a security alarm shall be used. If neither exists, the DUS designee shall approve alternate security procedures.

Control of Keys

On the Storrs and Depot campuses, the University fire department will maintain the Knox access key. At other facilities and branch campuses, the Knox box shall be keyed to the local fire department (if a system is already in place) or coordinated with the local fire department to register for a new Knox box system.

12.13 Communication

Radio Amplification System

For any new building or addition to a building that exceeds 10,000 square feet, the radio amplification system shall be checked and verified that receiving and sending coverage meets the following, including below grade spaces:

- A minimum signal strength of one (1) microvolt (-107 dBm) available in 90% of the area of each floor of the building, including below grade where applicable, when transmitted from DUS Dispatch.

- The frequency ranges, which must be supported, shall be in the 800 MHz range for the University's Police Department and UHF for the University's FO Operations Department; with a 100% reliability factor. Frequencies shall be determined by the designer/vendor conducting the

required research at time of system design to assure compatibility with existing communications.

Any radio communication boosters, repeaters, etc. required to be added to meet the coverage requirements will be of the same capability and quality as the existing public safety radio systems in areas such as radio identifiers, trunking, digital protocols, etc.

Amplification System
Building and structures which cannot support the required level of radio coverage shall be equipped with an internal multiple antenna system with FCC-accepted dual frequency range bi-directional UHF and 800 MHz amplifiers. Frequencies shall be determined by the Designer conducting the required research at time of system design to ensure compatibility with existing systems.

If any part of the installed system or systems contains an electrically powered component, the system shall be capable of operating on an independent battery and/or generator system for a period of at least twelve (12) hours without external power input. The battery system shall automatically charge in the presence of an external power input. The amplification system, if powered, will be monitored by the building fire alarm system. If the system shifts to auxiliary power as stated above, the buildings fire alarm system will indicate trouble for that dedicated zone or addressable monitoring device when the building uses an addressable fire alarm system.

For new buildings, the Designer shall provide two (2) raceways in the walls into which the cable could be laid. Such raceways shall include an opening in the roof, which allows for replacement of an exterior antenna, and access to each floor.

Acceptance Testing Procedures
When modification or enhancement to an in-building radio system is required, and upon completion of the installation, it will be the Designer's responsibility to ensure that the radio system has been properly tested and witnessed to ensure the two-way coverage on each floor, including below grade, of the building.

Each floor of the building, and below grade, shall be divided into a grid of approximately twenty (20) equal areas. A maximum of two (2) non-adjacent areas will be allowed to fail the test. The test shall be conducted using a Motorola MTS2000, or equivalent, portable radio, talking through the University radio system and conducted under the supervision of the University's Communications Manager. The center of the grid area will be located for the test. The radio will be keyed to verify two-way communications to, and reception from, UCPS Dispatch.

The gain values of all amplifiers shall be measured, and the test measurement results shall be provided to the DUS designee and the University's Communications Manager.

Qualifications of Acceptance Test Personnel
The Designer will be responsible to require the Contractor to perform all tests associated and that the test shall be conducted, documented and signed by a person in possession of a current FCC license, or a current technician certification issued by either the Associated Public-Safety Communications Official International (APCO), the Personal Communications Industry Association (PCIA), or the National Association of Business and Educational Radio (NABER).

13 Plumbing Guidelines

13.1 Guiding Principles

The Designer is responsible for coordination of all building systems involved within the project and to minimize the number of joints within the run and cross connections. To that means, include language within the specifications that any unnecessary short pipe runs will be replaced at the Contractor's expense.

All piping layouts, directional flows and shut off valves shall be included in the Contractors field red line plans. The Designer is responsible for incorporating such field installs are incorporated into the record set of documents.

13.2 Steam and Condensate Piping

Interior steam piping shall be A53, Grade B, ERW, schedule 40. Condensate piping shall be A53, Grade B, ERW, schedule 80.

13.3 Domestic Water Supply and Systems

The Designer is responsible for individual sizing of all backflow preventers when they are required. Review design parameters with the University Representative in conjunction with FO when backflows are normally required to ensure unnecessary redundancy. Strainers shall be specified with every service entry. Design work performed on new or existing service entries must specify a minimum of a 60 minute flush of the entire system once it is turned back on.

The University has determined the following Manufacturer(s) to be of acceptable quality for backflow Preventers greater than 2" in size are: WATTs Series 709 / Watts 757 or approved equal. For backflow preventers equal to or less than 2" in size, acceptable quality products are WATTs Series 909 or Wilkinson.

In laboratory areas must specify a double check valve in lieu of a backflow preventer. The University has determined the following Manufacturer(s) to be of acceptable quality for double check valves are: WATTs 757 series.

Hot Water Systems

The use of plastic and iron pipe is prohibited. Recirculating hot water distribution systems shall be used to maintain proper supply water temperature. Heat tracing is not an acceptable solution in maintaining proper water temperature. Design tempering domestic hot water with digital mixing valves as opposed to mechanical.

The number of fixtures shall be designed for the full peak load, and diversity factors can only be applied when all points in the system are 100% controlled.

The University has determined the following Manufacturer(s) to be of acceptable quality for:
Digital mixing valves: Armstrong or Powers.
Mechanical mixing valves: Acorn, Halsey and Simmons

It is preferred that hot water heaters are not utilized in any design if there is already a hot water distribution system in the building or just outside the building. However, should existing conditions only

allow for individual water heaters the following manufacturers have been determined to provide the quality, reliability and performance required by the University:

Steam fired water heaters - Armstong, Ace and PK
Electric water heater - State, HTP and Bradford white
Gas fired water heaters - State, AO Smith and HTP

Instantaneous point of use heat exchangers shall only be specified for apartments and dorms and shall be stainless steel and not copper.

Cold Water Systems

Under no circumstances shall domestic water be used for process cooling. Where required variable speed pumps are required and not fixed speed booster pumps. The use of plastic and iron pipe or valves are prohibited. Pex tubing is acceptable for secondary lines in residential applications only.

13.4 Water Piping and Insulation

The University prefers the use of copper L piping with minimum one (1) inch armaflex insulation. Do not specify steel or PVC or CPVC plastic piping.

Viega Pro-press or Victalic grooved mechanical joint couplings are acceptable pipe connections. No type F piping shall be specified. Insulation is required for all chilled water and domestic cold pipe and any ball values must have an extension and must have a split cover and seal terminators on either side of the split cover.

13.5 Sanitary and Vent Piping

The University prefers only cast iron for waste piping, however PVC may be acceptable. For vent pipes, PVC plastic or copper pipes are acceptable.

When adding to an existing waste pipe or tapping into an existing waste pipe, the Designer is required to verify existing conditions of the impacted lift station and perform calculations for the additional flow and its impact on the existing lift station, prior to completion of Design Development. All calculations shall not rely on assumptions or verbal response of existing conditions and calculations shall be presented for review and further direction by FO prior to proceeding with the intended design.

13.6 Pipe and Valve Identification/Labeling

To the extent possible, the same color scheme should be used for utilities and services inside and outside the building for labeling piping. Each system or service type should have a different color. Within a room of a building, the labeling of all pipes should be observable from the floor and should have an arrow attached to each showing the direction of flow. Potable and non-potable water must be clearly labeled.

Valve charts shall be required for any large renovation and/or new construction. Valve Chart should reflect location, type, size, what does it isolate, hot/cold and the number for reference.

Isolation and Shut-Off Valves

The Designer shall be responsible to plan and outline the location of all isolation valves. Each floor of a building shall have at least one isolation valve controlling each utility service for each floor and the

location shall be clearly marked and accessible in a pipe chase. The designed location of the access panel shall be coordinated with the furniture plans to ensure that the access panel will not be blocked.

13.7 Floor Drains

All floor drains shall be self-primed and have a continuous waterproofing flash membrane that carries up perimeter wall finishes. The University has determined the following Manufacturer(s) to be of acceptable quality for floor drains is: Zurn, JR Smith or Josam.

Cleanouts

The Designer is responsible to detail in the finish specifications an unobstructed access of the cleanouts. Preference would be to place them in the floor.

13.8 Pumps and Ejectors

Sewer Ejector/Grinder Pumps

The Designer shall not design for the use of sewer ejector pumps in support of new kitchen or bathroom locations where there is not existing plumbing and waste line available. The University has determined the following Manufacturer(s) to be of acceptable quality for sewer ejector pumps include Zoeler and Liberty or Weil.

Ground Water Pumps

The University has determined the following Manufacturer(s) to be of acceptable quality for ground water pumps include Zoeler, Liberty or Weil.

Domestic Water Booster Pumps

Booster pumps shall be variable speed drives. Isolation valves shall be all bronze (ball valves) or cast iron body with bronze internals, utility grade materials & construction. The University has determined the following Manufacturer(s) to be of acceptable quality for variable speed drive booster pumps include: Gould's or Grundfos.

13.9 Exterior Wall Spigots

All buildings shall be designed with exterior wall spigots at a minimum at each corner of the building. The Designer is responsible to work with the University Representative to locate the spigots. Specify only frost proof spigots with a vacuum breaker.

13.10 Gas Piping and Systems

Only the use of black iron piping on the gas mains is acceptable. From the isolation valve, concealed flex pipe is not acceptable on secondary gas pipes.

13.11 Plumbing Fixtures

Flush Valves and Toilets

The University prefers where practical the installation of automatic flush valves designed with piston actuation and rechargeable 5-year warranty lithium-metal batteries for self-generating hydropower, with a true manual override. The University has determined the following Manufacturer(s) to be of acceptable quality for flush valves; Toto TET1LA32#CP or approved equal.

The University has determined the following Manufacturer(s) to have acceptable quality toilets; Kohler, American Standard and Gerber.

Sinks/Lavatories
The University prefers where practical for restrooms the installation of an integral sink with the counter top.

Faucets
The University prefers the use of automatic battery faucet sensors in all public bathrooms on the campuses. Fixture shall have water conservation aerators and self-generating hydro power sensors. Under no circumstances shall washer faucets be specified unless in a kitchen or laboratory application. The University has determined the following Manufacturer(s) to be of acceptable quality for pressure independent control valves are: Toto TEL 105, Simons and Chicago.

Drinking Fountains – Bottle Filling Stations
The University has adopted a program to incorporate Bottle filling stations at all drinking fountain locations. The University has determined the following Manufacturer(s) to be of acceptable quality for bottle filling stations as Halsey Taylor, Murdock or Elkay. Ensue the fixture specified will meet handicap accessibility requirements.

14 Mechanical Guidelines

14.1 Guiding Principles

It is the required that all project work where there are Building Systems being impacted, they be designed to the highest efficiency possible. All systems design and equipment selection shall be determined by life cycle cost analysis including first, operating, and maintenance costs.

Wherever possible and where there is adequate capacity, connect the new project to the existing central steam and chilled water systems. If an individual centralized building system must be constructed, design sufficient space for the redundancy of the systems. Locate central systems (chillers, pumps, air handling units, etc.) in the basement and/or penthouse mechanical rooms.

In mechanical rooms that have the potential for releases of refrigerants, alarms or emergency signals shall be included to alert building occupants of releases.

Unoccupied areas such as mechanical and electrical rooms shall be automated ventilation and heat to 50°F for temperature control and shall be connected to the building controls system. See Section-Building Planning Guidelines for more requirements on Mechanical Rooms.

Locate motor control centers and panel boards directly servicing the Mechanical equipment within the mechanical room and size them to accommodate expansion or temporary bypass of normal equipment electrical protections when servicing normal breakers or starters. Keep the controls and boards apart from plumbing as much as possible. Due to the hostile temperature and humidity environment often found in mechanical rooms, variable frequency drive (VFD) controllers shall be located outside of the mechanical rooms. In cases where controllers must be installed within mechanical rooms. adequate protected from temperature and humidity fluctuations must be taken included in the design to protect the VFDs.

When designing for new heating or cooling systems, whether it be new construction or renovation, the Designer must review with the University Representative in conjunction with FO the options for the systems before establishing the construction cost estimate and proceeding with the design. Do not automatically assume in the case of a renovation that the existing systems will be added to or utilized.

Design equipment and controls for the different types of occupancy and schedules within the building. Provide setback temperature controls, with manual override, for nights, weekends and holidays. HVAC equipment, including individual electrical components as well as electric motors, shall be UL certified and stamped at the manufacturer's facility prior to shipment.

Specify rotating equipment for 200,000-hour minimum L50 bearing life or more, if readily available.

Maintenance of mechanical equipment is a high priority with the University. Design for easy service access to the equipment and all components of the HVAC systems, especially mechanical parts and filters. Provide access doors, inspection plates, etc. and include piping unions for equipment replacement. With each decision on placement of a piece of equipment, include and meet manufacturer's recommended procedures for maintenance, clearance and accessibility.

When locating equipment, avert fall protection concerns by orienting the equipment such that access points are facing the center of the roof area and not the roof edge. On flat roofs, install rooftop equipment no less than fifteen (15) ft. away from roof edges. Any equipment installed less than fifteen (15) ft. from a roof edge must be guarded with passive fall protection devices, such as a guardrail system or horizontal lifelines.

All electrical for any roof top equipment when fed from below, shall be run through the curb connections. First elbow shall be 1.5R with the duct liner of hospital grade non-fibrous insulation.

The Designer shall take into consideration how the Contractor will be heating and/or cooling the space during construction and prior to occupancy. If it is determined that utilization of new and/or existing equipment is needed, the Designer will be responsible for ensuring that new filters are specified at acceptable intervals and at the time of turnover.

System filters should be high efficiency air filters (meeting ASHRAE 52.1-1992 Dust Spot 40% or greater), such as extended surface types (pleated, bagged, enhanced media). Supplement with lower efficiency pre-Filters if possible.

14.2 Heating Systems

Plant steam (when available and access is within close proximity) shall be used for heating a building. If there is no plant steam, natural gas shall be used for any major equipment. Where both plant steam and gas are not available, propane shall be used.

Due to the University's Environmental Title V permitting requirements, care must be considered when specifying fuel burning equipment on the campus. Where possible, centralized steam solutions should be considered to allow metered and diversified loads to meet the code required load calculations and actual conditions. Generally, if a decentralized stand-alone heat source is utilized, natural gas units are preferred

The University prefers a four pipe system in all buildings or mixed use floors. The Designer shall provide a life cycle cost analysis to install a 2 pipe system for review with the FO prior to any value engineering initiative.

With the exception of vestibules, electric should only be used for heating if no other energy source is available.

14.3 Cooling Systems

Central Utility Plant provided chilled water is preferred where assessable and available for building air conditioning and process chilled water requirements. If it isn't available, then a centralized chilled water system would be the preferred means for HVAC needs and for process cooling for equipment. If chilled water systems are used for process cooling or other year round cooling applications, then provision for economical winter chilling should be provided. If the centralized chilled water system is not readily accessible, the University's secondary preferred method of cooling is direct expansion or unitary chillers.

The University prefers outside air economizer systems while promoting energy conservation for building cooling when conditions permit.

All AC condensate drains shall be trapped with adequate depth for system pressure differential and have attached cleanouts.

When designing for roof top air handlers, minimize the length of exterior duct work. All exterior ductwork must have a pitch to it to prevent water puddling. If duct runs are going to impede access ways, the Designer must design bridges overs them to protect the ducts from damage and to ensure ease in accessing other equipment and areas on the roof.

14.4 Ventilation Requirements

Consider heat recovery and free cooling systems to maximize delivery of outside air while promoting energy conservation.

If gas lines are installed, locate vent pipes away from air intakes and up to the roof line, including purge lines from boilers, etc.

All ventilation systems shall have the capacity to meet cooling and ventilation requirements with enthalpy based economizer control.

Intake Air

The Designer is responsible for ensuring that the air intake vents are not in close proximity to other potential pollutant sources, e.g., loading docks, dumpsters, cooling towers, exhaust fans, vent pipes, etc. Ensure bird screening and other bird roosting deterrents around and near air intakes are clearly specified. Ensure air intakes account for snow fall and subsequent melting to prevent moisture from entering the building. Do not rely on loading dock open area as the intake air. It is desirable that the intake be located a minimum of 10 feet above grade. Design to ensure that the air intake is conditioned before being released inside. Designer to ensure that intake air is equal to building/space exhaust air requirements to avoid negative pressure in the building.

Make-up air or 100% outside air systems that use water for heating or cooling must use inhibited propylene glycol at a burst protection concentration of -10F° (28%) to protect the coils.

Ensure during the planning process a minimum, turndown ratio (minimum air flow) is specified to meet the minimum ventilation requirement for the occupants, so that variable air volume (VAV) terminal units provide ample fresh outside air per person to meet ASHRAE 62- requirements. For adequate turndown control of modulating minimum outdoor air and modulating 100% economizer functions, it is desirable to provide two separate control dampers, each sized for the range of airflow for each application.

Return Air
For sound mitigation, the University prefers ducted returns rather than open plenums. The Designer is to ensure that return air and/or exhausts are not within close proximity of the intake air. Specify power open and spring close for all louvers.

Laboratories
Ventilation systems for laboratories containing hazardous chemicals (i.e., physical hazards, health hazards, simple asphyxiants, combustible dusts, pyrophoric gases, or hazards not otherwise classified) must be designed for single pass air. No recirculation or reuse of laboratory exhaust air is allowed

14.5 Ductwork and Air Distribution

General Requirements
Design systems to maximize flexibility to accommodate future changes and renovations. This should include future additional capacity and room to add additional components. Design duct and piping systems for a minimum of 100% design flow, including foreseeable immediate future loads.

All duct work shall be exterior insulated and have access cuts with clear markings on locations. Interior insulation/lining of HVAC systems is not recommended. If sections must be lined for acoustical reasons, use non-porous or low-porosity, durable materials that do not support microbial growth.
Maximize individual environmental control through enhanced zoning, i.e., systems that allow occupant adjustment of temperature and airflow.

Design for no more than four feet in length of flex duct, fully supported and stretched. Ensure that no more than one and half (1.5) radius turn, where a diffuser box is desirable.

In critical areas, minimize the number of individual systems but provide cross connections for redundancy wherever possible.

14.6 Control Dampers and Control Valves

The University has determined the following Manufacturer(s) to be of acceptable quality we expect for control dampers; Tamco or Belimo.

The University has determined the following Manufacturer(s) to be of acceptable quality we expect for control valves; Belimo, Flow Control or HCI.

14.7 Humidification

If humidification is required, it shall be via clean steam, steam HX, or canister steam systems using chemical-free, demineralized water to maintain optimal indoor air quality. The humidifier section must be downstream of heating coils. Any porous duct liner/insulation must be located at least fifteen (15)

feet downstream of the humidifier section. Adequate access for inspection and maintenance must be available for the humidifier section. It is the responsibility of the Designer to take into consideration the water condition when humidification is required.

The University has experienced a number of valves being installed above humidifiers, which cannot be accessed, so the Designer is responsible for the coordination of where valves are to be placed to ensure easy access for maintenance purposes.

14.8 Pumps

Centrifugal Pumps

Preference is to use centrifugal "smart" pumps where applicable. Larger pumps shall be based mounted, direct coupled and shall include suction strainer with turning veins as supplied by the pump manufacturer. Pump motors shall be selected with the highest NEMA nominal efficiency available. Ensure that the specifications outline that the listed manufacturer's installation requirements shall be strictly followed.

The University has determined the following Manufacturer(s) to be of acceptable quality of centrifugal pumps: Grundfoss, Bell & Gossett, and Taco.

Ejector Pits and Pumps

If there is a need for an ejector pit for a building, it shall always be designed outside of the building with ready access for service vehicles and shall be designed equivalent to a lift station with submersible grinder/chopper pump. Pumps shall be hydromatic. The University has determined the following Manufacturer(s) to be of acceptable quality for ejector pumps are: Liberty, Ghoulds and Weil

14.9 Isolation Valves

All isolation valves shall be selected for their design duty. Locations shall be in close proximity and accessible to the utility or equipment being serviced. Isolation valves 2 ½" in diameter or larger installed in an inaccessible location, shall provide chain operators.

Steam valves greater than two and half (2.5) inches in size shall be stainless steel triple offset butterfly valves. Steam valves less than or equal to two and half (2.5) inches in size shall be ball valves with extended stems to facilitate insulation. Butterfly valves greater than eight (8) inches on steam valves shall have gear operators and electrical actuators. Ensure if electrical actuators are specified, that the electrical drawings identify power it. The University has determined the following Manufacturer(s) to be of acceptable quality for steam valves are: Quadex, Watts and Vannesa

Water valves greater than three and half (3) inches in size shall be iron butterfly valves. Water valves less than or equal to three and half (3) inches in size shall be ball valves. Butterfly valves greater than eight (8) inches on water valves shall have gear operators. The University has determined the following Manufacturer(s) to be of acceptable quality for water valves are: Apollo, Viega and Watts.

Condensation isolation valves shall be located before the strainers and after the trap.

14.10 Fan Coil Units

Units shall be selected with premium high efficiency ECM motors. The University prefers units that have a sloped top to prevent storage use. Ensure that the selected unit has disposable filters for efficient maintenance.

14.11 Ventilation Hoods

Kitchen Exhaust Hoods

All kitchen ventilation should be provided to eliminate odors to the building maintain the building at neutral or positive pressure. An 80%/20% split of makeup air should be provided for the hood/space.

Fume Hoods

All fume hoods shall be designed to act as a constant air speed fan. Unless project requirements deem otherwise, each hood shall be supplied with its own fan unit. Each hood shall be provided with an airflow indicator and electronic controls to adjust the air velocity at any given sash height. Audible (horn, buzzer, or bell) and visual (RED light) alarms shall be provided to indicate when air velocity is outside the acceptable range.

If allowing for exterior flex coupling connections, the Designer is responsible for ensuring that the pipes are shielded from the UV light.

For new building construction, avoid exterior duct work, unless conditions deem otherwise. In such cases the duct work shall be stainless steel properly supported.

When program calls for multiple fume hoods, the hoods shall be monitored and controlled. The University has determined the following Manufacturer(s) to be of acceptable quality of monitoring and controls system: Accuspec or Phoenix.

14.12 Hydronic Piping

The design of chilled water systems in buildings is dependent on chilled water supply conditions and desired return conditions. Chilled water will be supplied from the plant at a temperature of 42°F and pressure ranging from 50 to 100 psi.

The available differential pressure, which varies throughout campus ranges from I0 psi to 50 psi depending on the proximity of the building to the Central Utility Plant (CUP).

The University prefers that a plate and frame heat exchanger be used in new buildings to separate building loop from campus loop. Pressure independent control valves should be installed at every cooling coil.

The University has determined the following Manufacturer(s) to be of acceptable quality for pressure independent control valves are: DeltaPValve, Bell and Gossett, Armstrong.

Pot feeders and filtration shall be provided with all hydronic heating and cooling loops to allow for chemical treatment and sampling. The system shall be initially treated and chemical control established prior to turning the piping over to FO.

For hydronic systems using glycol, means shall be provided for adding glycol to the system.

For all hot water heating systems pumping shall be away from the heat source and the no-pressure change point and on the suction side of the pump. The expansion tank, air elimination and makeup water valve shall be on the suction side of the pump. Pressure and temperature gauges (with shutoffs) shall be provided on the supply and return to provide for operator monitoring.

14.13 Cooling Coils

Chilled water coils should be designed for a delta-T of l 6°F or greater. Therefore, chilled water should be returned at 58°F or higher. Cooling coils must be certified according to AHRI 410: 2001 Standard for Forced-Circulation Air-Cooling and Air-Heating Coils. Furthermore, cooling coils shall be designed and specified to minimize water pressure drop, minimize air pressure drop, and minimize the potential for moisture carryover.

14.14 Cooling Towers

All cooling towers shall be stainless steel design and shall include sand filters. Cooling towers shall be installed with factory controls and sump heaters. Capacitance controls for water makeup. All fan motors shall be outside the air stream and direct drive or gear driven with VFD's. Access platforms, ladders and motor davits shall be provided.

The University has determined the following Manufacturer(s) to be of acceptable quality for water treatment of cooling towers: Dolphin Systems or approved equal.

14.15 Building Distribution Systems

Air Distribution

Size and locate VAV boxes to be no greater than 50' apart. There shall be no take-offs after the VAV. The University has determined the following Manufacturer(s) to be of acceptable quality for VAV boxes; Bellmount or approved equal.

Adjustment on the diffusers and perforated diffusers shall not be specified. Remote control adjuster diffusers are preferred.

When conditions require interior air handlers, such units shall not exceed eighteen (18) inch above the ceiling grid. If access to the unit is in excess of fifteen (15) ft. above the finished floor, a hoop air handler is required.

14.16 Piping Prohibitions

Include within the Demolition section of the specifications for any gas pipes being altered or removed, the Contractor must cap/seal the ends of the removed gas pipe with duct tape to contain the off gasses coming from the pipe.

If gas lines are installed, locate vent pipes away from air intakes; this includes purge lines from boilers, etc.

Hot, chilled and condenser water lines shall not be installed over or near electrical switchgear, motor control centers, transformers, nor in elevator machine rooms and shafts.

Type-F pipe shall not be used in any application on campus.

14.17 Testing and Balancing

Testing and balancing of all VAVs and systems is required on all projects, and all testing and balance reports should be submitted to both the Designer and University Representative for confirmation of operating results.

14.18 Testing and Commissioning

All mechanical and plumbing systems projects require commissioning of some level. Enhance commissioning shall be considered by the Designer and University Representative. The commissioning agent shall be hired directly by the University and shall be engaged in design review with the Designer prior to the start of the Design Development phase. The Commissioning agent shall work with the Designer to identify and define the level of commissioning needed on a project by project basis.

15 Electrical Guidelines

15.1 Guiding Principles

Prior to starting design, the Designer shall visit, review conditions, measure and document existing conditions for any and all projects that require new additions or replacement of any electrical equipment and system. Designer is expected to perform their own coordination of the various new system installation with existing conditions to ensure the design is feasible to be achieved by the Contractor.

Projects shall not eliminate, substantially change, nor alter any available circuit switching capabilities of the primary electrical system in any renovation, addition, demolition, or new building project. Design teams shall endeavor to fortify switching capability, resiliency, and reliability of the primary electrical system their project is powered by factoring isolation points, such as compact pad-mounted MV switchgear, for any new services.

The University generally desires a single service solution within all projects, and that the main service be provided at 480/277V with 208/120V sub services as required. In cases where the size and load profile will work with less transformation, HVAC equipment at 208/120V may be provided. Single phase services shall be avoided when connected to University distribution equipment, and are generally not acceptable to the University; but may be provided in parts of the campus served solely by Eversource. The Designer shall determine the most practical utilization voltage during schematic design and present it to the University Representative in conjunction with FO for review and acceptance.

All buildings require life safety systems to back-up the code-required egress and evacuation elements. The back-up power can be in the form of a local generator, connection to the University's central emergency power loop (4160) when available, a central inverter system, or in rare occasions unit equipment. Some existing buildings have unit battery pack emergency lighting systems, and in such buildings continued use of that equipment may be required. Projects should look to eliminate the individual unit equipment for a central inverter scheme whenever possible if the building requires only emergency lighting. Unit battery equipment should not be utilized in new construction, except where requested by the University, or otherwise required by Code. Some form of battery backed lighting should be provided in main electrical rooms, especially emergency electrical rooms, where servicing may be required with no building power available, small inverter schemes are preferred.

Residence Halls, Dining Halls and Research Buildings are required to have additional Stand-by Power systems to continue to allow these types of buildings to fully operate during an extended period of lost primary power ("shelter in place" provisions). Stand-by power for these types of buildings can be either on a local generator or on the University's 4160 back-up loop. In some cases, it may be prudent to have a small central inverter for the emergency lighting system to allow egress if the emergency system fails, and shelter in place is no longer an option. Buildings with Stand-by provisions should utilize load shedding ATS schemes to ensure standby power usage does not interfere with code required emergency systems. Depending on criticality of the standby load, more than one standby ATS should be considered, to prevent generator(s) from being sized unreasonably large.

In addition to life safety and stand-by power requirements, provisions should be made for connections of an alternate power source for each building or integral resiliency of the normal power service. The resilient power shall be a main-tie-main lineup, sized so that each half of the lineup feeds no more than 45% of the building load including the Standards required growth capacity for the building under Design; and individually can carry that entire load from either source. Where available a primary tie provision between the primary sources of a main-tie-main shall be provided to allow upstream feeder maintenance without service interruption. This tie shall be comprised of a fused switch in one side of the primary loop switches, and a disconnect on the other set of loop switches; and, shall be rated to accommodate 600A E-Class fuses, and smaller. The preferred method of this scheme would be implemented with Vacuum Breakers and Protections Relaying using PLCs to allow automated rollover of the primary sources. Design of the building should include loop-fed primary feeders and an exterior low voltage panel box located in a secondary area, such as a loading dock, for easy connection of the alternate power source (such as a mobile generator). Kirk key interlock schemes to project Staff and the Public should be designed and approved by the University Representative, and shall only be established for the utilization voltage equipment. The connection point shall use Cam-Lok or equivalent lugs for quick connection of the generator, and generally should be designed to provide generator grounding from this connection point. The connection point shall include a phase rotation meter, and this meter shall be commissioned to indicate the normal power service rotation for ease of future connections by the University. No interlock schemes shall be provided for any primary equipment.

If an emergency system exists within a building, it should be utilized after determining sufficient capacity exists.

Emergency systems shall be metered at the source of power and on the load side of the transfer switch with a Powerlogic compatible system. Meter type shall be approved by the University Representative in conjunction with FO prior to incorporating into the Construction Documents. Automatic transfer switches shall be tied into the fire alarm system to report switch status, and generator failure as a trouble signal.

As-builts and Record Set Drawings: Designer shall ensure that the final documents reflect all existing path ways from device to device and the home run. Require Contractor to provide redlines of all runs and pathways, circuits and wires and label all devices in an organized fashion to ensure that circuits are utilized resourcefully. Any and all panel schedules shall be included in the as-built file documents.

15.2 Medium Voltage Utility Power

Primary electric service shall be designed on a project by project basis and must meet or exceed the primary feed standards of the local public utility, Eversource. All electrical design distribution shall be approved by the University Representative in conjunction with FO.

All primary and secondary power are to be installed in underground duct banks where they are sized to allot sufficient empty conduit for future expansion, and encased in concrete. All medium voltage designs shall be to 95 kV BIL minimum design.

In new construction or major renovations, it is required that locations for primary service, new medium voltage switchgear, and transformer locations be established during schematic design. This will allow sufficient time to review the plan to minimize the prominence of utility services and review screening options and give the Designer direction as to if the primary cabling will be provided and installed by the local utility company or included with the bid documents for award to the Contractor. Installation of unit-substation equipment is allowed within the University, but given the fire rating requirements may only prove to be practical in new or major renovations of buildings.

When there is insufficient space within an existing electrical room to add medium voltage components, a 3-hour fire rated enclosure shall be provided. The system shall be designed so that the medium voltage feeder is never considered the primary buildings service. In the event where this 3-hour vault houses a unit-substation, it shall have secondary fusing and be regarded as the first means of disconnect.

The Designer shall be responsible to clearly establish the required electrical scope for the project. In most cases scope will include extension of medium voltage feeders through new/existing manholes to establish a loop feed configuration; connection to the system via new/existing medium voltage switchgear; utilization voltage transformation for the project; and, all downstream electrical components within the building. The medium voltage feeder source shall never be assumed to be the nearest available feeder, and in order to get the electrical capacity for the building, the project may require extension of a medium voltage feeder beyond the boundaries of the project limits.

The Designer shall consult with the University Representative in conjunction with FO to confirm the source of power for any particular location. The primary or main distribution service voltages utilized at various Campus installations are as follows:

Avery Point Campus: Source is an 8.32 kV, 3-phase radial feed underground distribution system by Groton Utilities. The University of Connecticut takes secondary service at various voltages: 4160Y/2400V, 480Y/277V, and 208Y/120V.

Depot Campus: Source is supplied overhead from Eversource at 13.8 kV.

Downtown Hartford Campus:
38 Prospect Street: Is fed via street ties from a manhole located on Prospect directly to the main switch. These cables are 216 volts.

10 Prospect Street: Eversource transformer Pad#2635 and Pad#2634 are 1500 kVA each (23kV to 480V) fed from switchgear on Front Street.

Both are underground services from the substation.

Law School Campus: Source is from a University radial and/or loop underground system supplied from a 23,000-volt grounded system. The 23-kV service is provided by Eversource. The Law Library building,

which is off the 23-kV service, is a 480 Y / 277V system. Building unit substations transform and distribute power within each building. The University shall be consulted regarding power source at this location.

Stamford Campus: Source is from a University 13,200-volt 3- phase loop. Power supplied at 23 kV from local utility supplier.

Storrs Campus: The University's primary source of power comes from the University's CoGen plant which is interconnected with a utility substation on North Eagleville Road at the northwest corner of campus. Distribution from the substation consists of 13.8 kV Multi Ground Wye (MGY) feeders. Typically, the 13.8 kV system is a campus loop feed underground distribution system. While portions are overhead, the long-term strategy is to relocate all primary feeders underground. Portions of the campus not near the core campus and along Hillside Road extension are serviced by Eversource. In all aspects of primary service design, Eversource will be utilized by the University as our third-party consultant to review all primary service feed designs and installations proposed. However, the Designer remains responsible for all aspects of the electrical requirements not limited to; specifying and detailing of the primary and secondary services, transformers and switchgear, inclusive of appropriate grounding.

Torrington Campus: Source is from Eversource at 13,200 volt with a 3-phase underground radial distribution system.

Waterbury Campus: Source is from Eversource supplied by two, 13.8kV feeders (one preferred and one alternate) with an underground distribution system.

Other Remote Locations: The University's Representative shall be consulted regarding power source, location and characteristics for any remote locations.

15.3 Electrical Service Metering

Within the majority of the Storrs Campus, the University owns its transmission lines and provides its own power. There are areas that power is supplied by Eversource. Designer is responsible for coordinating with the University and Eversource when adding to an existing system or designing a new system.

All electrical meters shall be Powerlogic 10 Amp input metering minimally, (20 Amp ION 7650s and others when available, here-in referred to as Class 10 & 20 per typical utility company designation for such current input ratings) with no equal. The meters and Instrument Transformers shall be utility revenue grade accurate or better and installed with current transformers (CT) in a cold sequenced manner and hot sequenced potential taps (PT) via lockable current limiting breakers installed exterior to the gear for isolation. In this context revenue grade shall mean those CTs typically marketed and sold to Utility Companies for use in regulated revenue metering applications for the purpose of billing customers. In most cases Potential Transformers shall not be selected for regular utilization voltages seen on the campus. Sub-Sub meters may be installed entirely cold sequenced on the CT and PT. The relative ANSI revenue class is dictated by the specific meters installed and is described below. PT leads to the meter shall be protected by 5A fast blow Class J or similar fuses installed after the test switches. New meters shall be configured for local logged mode during startup. Configurations solely based on PC logging mode are not acceptable, unless approved during design utilizing power metering electronic trip circuit modules. Startup and integration services shall include installation into the Powerlogic Server, ION Setup configuration tool, setup for 15-minute interval energy and logged data with Modbus

communications enabled. For major ITS loads, Simple Network Management Protocol (SNMP) profiles may be enabled as well in coordination with ITS and FO Metering Department.

All Eversource Meter sockets shall be installed outside the building, with raceway to the building phone system for future meter communications. Coordinate further if a building's load is anticipated to be scheduled for a time of use rate by Eversource.

All primary meters shall be located at the exterior building service entrance and installed external to the load monitored unless approved by FO. Metering shall be connected to TCP/IP and may utilize Schneider Modbus gateway devices or approved equal to daisy chain multiple meters to common gateway. Baud rates shall be set at maximum rates for increased responsiveness. Where available Power over Ethernet drops shall be used to provide power to gateways.

All meters shall have independent voltage and current references and not by utilizing the PT tap. Current transformers shall be accessible behind hinged cover, inclusive of neutral CT. Potential transformer taps (PT not explicitly required unless >600V) shall be protected by Current Limiting circuit breaker with pad lock on/off provisions. Instrument transformer polarity shall be clearly indicated, and in proper sequence. ; Instrument transformer wiring shall be terminated to test block with barriers, CT shunting, and PT disconnects similar in construction to Milbank device with provisions for Neutral CTl. Communications wiring is not acceptable.

Meters shall be configured for local logged mode during startup, solely based on PC logging mode is not acceptable. Startup shall include installation into the Powerlogic Server, ION Setup configuration tool, setup for 15 minute interval energy and logged data, with Modbus communications enabled. For UITS loads, SNMP profiles may be enabled as well. Phase voltages and currents in averages and LL, LN measurements shall be provided; Real and Reactive power & energy shall be recorded; True Power Factors shall be recorded; Frequencies, harmonic disturbances, and transient waveform captures shall be enabled. In many cases the default parameters of modern ION series meters may be adequate

Meters shall support minimally RS-485 Modbus connections to gateway connection to the University network. When communications cards are furnished with meters, they shall retain the RS-485 port and include Ethernet provisions only, no additional serial connections nor modems.

The Warranties of Powerlogic meters shall not begin until they have been fully commissioned into the Power Monitoring Expert (PME) System by Schneider Electric Metering Technician as well as being fully programmed into the GE IFIX SCADA metering platform by the Meter information system integrator.

Meter Types

Meters are generally determined based on the use of building. Highly analytic functional meters are utilized in buildings with loads that are susceptible to transients, or poor quality of power. ION 7650 Meters, with 512 sample/cycle resolution to the 63rd harmonic, 5 Megabyte internal memory, with display screen, 0-20A (Class 20 meter) 5A nominal range. Generally for Data centers, research, utility plants/stations, lab buildings, academic buildings not dedicated to Classroom use.

- PM8240 Meters, with 256 samples/cycle resolution, display screen, Class 20 meter. Sub-metering is acceptable after an ION 7650, or for building main's having less sensitive equipment such as, residence halls, non-lab oriented Instruction, certain pump stations.
- PM5000 series meters, may be utilized for non-critical sub-metering applications such as lighting panels necessary for LEED verification and similar purposes.
- Meters shall be revenue grade accurate, and installed in a cold sequenced manner.

Approval of any meter type shall be obtained from the University Representative in conjunction with FO prior to the end of the Design Development Phase.

The Designer shall include within their specifications commissioning requirements including ensuring a Factory technician is required to program meter devices, provide phasor print from ION Setup confirming proper metering, and printout from Powerlogic system confirming all logged parameters are registering over a 4-interval window of time. In programming devices, there are project specific naming conventions and alarm parameters which the Factory technician must obtain from the University prior to installing the devices. A formal submittal for approval must be required and provided to the University Representative for review and approval from FO Operations. Work performed prior to approval of the naming conventions and alarm parameters, is at the Contractors risk.

The University has standardized on the Powerlogic ION series metering, no other meter manufacturers are acceptable.

15.4 Labeling of Electrical and Low Voltage Equipment

Proper labeling of devices and raceway in the buildings and infrastructures is critical to the University. This is especially true when all spaces, inclusive of vestibules and corridors, within a campus building are assigned room numbers. All breakers shall be labeled with the type of load and area served in all cases. Schedules shall by typed, or utilize printed labels or signage. Use of pencil, pen, or permanent marker is not acceptable to the University. Reasonable abbreviations are acceptable if more definite information is provided, such as. "Receps HW-104 by RM-110". Any level of renovation updates shall be required to follow these same requirements. Ensure that all equipment labeling shall be identified and included on the approved sets of drawings and that the Electrical Contractor is responsible for affixing them to the gear.

Raceways

Raceways shall be labeled in regular intervals along a span with a printed label secured to the raceway via clear shrink wrap in new, and mechanically fastened for rework. The label shall indicate the origin of the feed by way of room number of panel and panel designation and the destination room and device along with the voltage and system type, i.e. normal, emergency, standby etc. A label shall be affixed where a feed enters or exits a junction box common with multiple circuits. Any rise from a concealed condition or through floors shall be labeled.

Conductor

Shall have printed plastic tagging installed within panelboards, junction boxes, and at final termination point indicating circuit number. When more than one neutral is run in common raceway it shall be tagged with the circuit it is acting as the grounded conductor for.

Enclosures
Enclosures shall have printed labeling installed on the cover and matching label on the interior surface similar to raceway. For gang junction boxes containing wiring devices such as receptacles or light switches this is especially important even for switch legs. It should be readily apparent which panel serves the device so that resetting tripped breakers, or isolating devices for work is not burdensome for the maintenance staff.

Fire Alarm Systems
Fire alarm system components shall be likewise labeled and tagged consistent with general electrical systems. Refer to Section on DUSfor specific naming conventions to utilize for Fire Protection circuiting and signaling.

Less than 1000V Panelboards and Switchgear
Panelboards and Switchgear shall have printed labels installed indicating load served and location. The source information shall be provided at the main means of disconnect or next to the panel designation for main lug only panels. Breakers in panels and switchgear shall have ampacity information on the operating handle, or the entire breaker manufacturers tag shall be exposed. If the manufacturer's cover designs do not provide this information ampacity shall be included within the labeling. Where the gear is installed with breakers having trip setting adjustments a log book shall be installed on the outside of the gear in a clear sheath, with all finalized and commissioned settings for each breaker of the assembled board. This log book shall be a college ruled, bound, composition style book, with ample capacity to record future changes by others. Inspection window shall be installed in all main switchgear.

13.8kV Equipment
13.8kV Equipment shall be SF6 gas style switches, motor operated and shall be automated and SCADA system compatible. Designer shall include two 2" minimum conduit and control wiring to support connection to the SCADA system.

The Designer is responsible to include the University nomenclature on the design documents for proper switching and taggingon the equipment. We follow Eversource procedures for switching and tagging so their employees can be kept safe in a known manner while working on the campus. Nomenclature will be provided to the Designer by the University Representative in conjunction with FO on all new switchgear. This nomenclature generally includes a switch designation and labeling of all switch and fuse cubicles for PMH style gear. Gear must be compatible with local automated controls and compatible with SCADA management systems.

For transformers the nomenclature is assigned based on the feed source. In all cases the Designer shall document the nomenclature on drawings and specify the labels shall be installed prior to energizing equipment. Failure to provide proper nomenclature may cause undue delays on other projects.

Each cable within a manhole shall have a punched copper tag affixed to the cable with no fewer than two mechanical band fasteners. The tags shall include the source manhole or device immediately upstream, the destination, the phase, the date of install, the company doing the work, and the splicer making the connections or their immediate supervisor responsible for the work. Ensure within the design documents that final installation shall include a service loop (excess cable) at all termination locations.

4160V Equipment
4160V Equipment similar to all requirements of 13.8kV equipment with the exception of the University being the sole owner of all cabling and equipment on the system.

Color coding of Conductors

Phase	208/120V	480/277V	4160V	13.8kV/7967V
A	Black	Brown	Green	Green
B	Red	Orange	Blue	Red
C	Blue	Yellow	White	White
N	White	Grey	NONE; Z Grounded	Bare
Ground	Green	Green	Bare	Concentric
Isolated Ground	Green w/ Yellow Stripe	Green w/ Yellow Stripe	NA	NA

15.5 Grounding

Identify all systems that need to be bonded to the grounding electrode system in new and especially renovation projects.

In new steel framed construction, a #4/0 AWG bare copper grounding ring shall be installed around the perimeter of the building to allow bonding of building steel, and other items as required by the Code. Any concealed grounding connection shall be made via permanent cadweld, and any exposed grounding shall be made via a listed connection. For other construction types a counterpoise ground may be utilized, and during renovations it should be decided during schematic design as in some cases a full ring is warranted.

No grounding system shall rely solely on the conduit as an equipment grounding conductor. Grounding shall be carefully designed to avoid parallel path situations for proper clearing of L-N versus L-G faults.

15.6 Transformers

Except where for technical reasons other windings are required, all transformers shall be Delta Primary, Wye Secondary; and be installed to create separately derived electrical systems in all cases with a fully rated neutral connection. Any exception will need written approval from the University Representative in conjunction with FO. All new transformers shall include arc free oil sample port (petcock).

Under no circumstances shall oil filled transformers be designed and specified for installation within a building or enclosure. Nor be allowed to remain where the main service is part of a project's scope. Under no instance shall a project enclose as existing oil filled transformer as part of its design. Oil transformers are for exterior applications only.

All transformers shall have viewing windows for inferred inspections

Oil filled transformer 13.8 kV

Oil filled 13.8kV transformers shall utilize flame resistant dielectric oil, be dead-front, and include thermostat, pressure gauge, pressure relief valve, test/drain petcock, fluid level gauge, and tap changer for minor voltage adjustments. They shall have loop and radial disconnects, with unused bushings terminated with elbow lightning arrestors. Cores shall utilize copper windings. They shall always be installed on a transformer vault meeting current Eversource specifications and the appropriate precast pad. Primary service shall enter on the left of the vault, and secondary on the right relative to the doors. Primary shall have one loop around the vault minimally for service and replacements of elbows. In all cases enough primary and secondary conductors will be within the vault to extend six feet above the pad to accommodate future transformer replacements from other vendors. Bayonet fusing may be required depending on if external fusing is available on the project. Secondary links, and immersed primary fusing, surge arrestors, etc. not accessible from the enclosure shall not be designed.

Oil filled transformer 4160 V

Oil filled 4160Vtransformers shall meet the same requirements as the 13.8 kV transformers with the following exceptions: a) radial disconnects and loops switches shall not be utilized, only straight A to B loop bussing shall be used; b) bayonets and secondary links should not be utilized; and c) PMH-19 switchgear and type 6F SF6 interrupters shall be placed ahead of the switchgear to serve as primary protections and feeder loop switches.

Dry-Core Medium voltage Transformers

Dry core medium voltage transformers shall be copper wound, with provisions for cooling fans, with primary and secondary protections in the Unit Substation lineup. Temperature monitoring devices shall be installed and integrated with the building controls system. Loop switches on the primary may be required, but two available feeders shall be brought in and arranged to service the transformer core so cable failures can quickly be resolved. Cores shall be fully rated for intended load without the use of supplemental fans.

Dry-Core Transformers Less Than 481V

Dry core transformers less than 481 volts shall be designed and specified as copper wound, high efficiency cores, and Energy Star rated minimally. Primary and secondary protections shall be included with the secondary protections installed as close to the transformer as practical, or directly into the panelboard served within distances per code. K-Rated transformers shall be utilized for non-linear loads established during a project. Transformers shall be ventilated with outside filtered air, heating provided, and fire protection monitoring similar to the medium voltage requirements. Single large dry core transformers are preferential to multiple transformers throughout the building space. It is preferred that transformers only be installed where accessible by riggers without architectural modifications to accommodate servicing. Transformers shall have Class 220 or better insulation and be NEMA TP1 or better with ventilation being the only openings in the enclosure.

Buck-Boost Transformers

In some instances, it is practical to utilize buck-boost configurations for matching voltages to specific pieces of equipment. When designing entire laboratories or when multiple pieces of equipment use a non-standard University voltage and a common solution using adjustable output line-conditioning equipment or transformation should be implemented. Consult further with the University Representative prior to finalizing the design. These devices shall only be utilized for specific end devices, and never for building system components. All building system components shall utilize standard University voltages and power systems unless approved in advance by the University.

Transformer Room Requirements
The rooms housing transformer equipment shall be sized to accommodate removal and service to cubicle sections without architectural modification, i.e. proper sized doors, hatches, etc. to facilitate rigging and rigging equipment. Transformers shall be placed on housekeeping pads, and shall utilize top entry of secondary conduit to facilitate cubicle replacements. Provisions for placing workmen's grounds within the medium voltage sections are required.

Cores shall be selected to be the highest efficiency possible, and shall minimally be Energy Star rated. Filtered outside air shall be used for cooling these spaces, and heat shall be supplied to provide 50-degree F. Core temperature shall not be factored as a heating source for the purpose of heating the space.

Where containing wet fire protection systems supervised isolation valving and temperature monitoring of the fire protection space shall be provided and integrated with the building controls system and a trouble alarm on the Fire Alarm Control panel to protect against freeze damage. Electric unit heaters in place of hydronic systems shall be acceptable. Temperature monitoring shall be provided and integrated with the building control systems. Air Conditioning shall not be used to cool these spaces. Transformers shall have Class 220 or better insulation and be NEMA TP1 or better with ventilation being the only openings in the enclosure.

15.7 Trip Breakers

Any design employing adjustable trip breakers shall have proven coordination by the Design Development phase with the basis of design components. Coordination of power systems is critical. AIC ratings for gear shall be selected utilizing the infinite bus method, however arc flash labeling shall never be assigned using infinite bus.

15.8 Distribution Equipment

Downstream low voltage (< 1000V) distribution equipment, if fused, shall be fully coordinated with the unit-substation main, or isolation disconnects. Coordination with available fault current and arc flash capacity shall be considered when designing the distribution.

Low Voltage Less Than 1000V Distribution
Low voltage distribution shall be all copper bussed or equal, aluminum is not considered equal with bolt-on circuit breakers. All panels shall be braced with appropriate AIC ratings available at the mains, series ratings are not acceptable. Panels installed within spaces not designated and secured as electrical rooms shall have hinged covers with provisions for locking. Larger frame panels within secured areas may not require hinged doors. No individual panel shall exceed forty-two (42) poles, and all panels shall be listed for service in the space installed. Exterior panels shall have provisions for thermal management to prevent frost or excessive heat. Panels shall be a complete dead-front listed assemblies of sheet steel, with steel trim, rear access to bussing shall not be provided. Boxes shall be constructed with lapped and screwed, or welded corner construction. Gutter space shall be provided as code dictates but not less than 4 inches on the side and 6 inches at the top and bottom. Multi-section boards shall have a minimum gutter space of 8 inches at the top and bottom. Coordinate number of spare breakers with FO needs, with a target of not fewer than 30% spare spaces. Feeders to a panel shall be rated to carry the rating of the panel, and conduit shall be sized to accommodate the frame capacity, or not less than one and half (1.5) inch conduit. Manufacturers shall be selected that allow full view of the labeling and trip

dials of all breakers. Manufacturers that require removal of covers to view circuit breaker information shall not be specified nor accepted.

Medium Voltage 1000V Distribution

Metal-clad switchgear shall not be installed outside, nor in any space containing any mechanical piping. A full rigging path into the room will be maintained during any project, and the room will be secured with a high-voltage electrician's lockset. Feeders shall enter into a disconnect from the bottom, so a main device and fusing can protect the energized top bus and individual distribution cubicles can have the bottom bussing/terminations de-energized to protect against dropping items into live bussing. Provisions for workmen's grounds shall be available across all the cubicles. Fusing cartridges shall be selected to hold E trip curve fusing and be one man serviceable. Porcelain shall not be utilized for any component, modern insulating thermoplastics, etc. shall be specified. To offer the campus better metering and support for planned microgrids, switchgear using vacuum interrupters with dielectric gasses such as SF6 should be considered during design. Current and potential transformers for these devices shall monitor all 3 phases independently; open-deltas will not be acceptable for protections. They shall be utilized for metering feeders as well, and integrated into SCADA, PI system and in some cases Powerlogic. Specific metering requirements shall be finalized by end of DD phase for acceptance by the University Representative in conjunction with FO. See Appendix V Building Automation Standards for more details on controls.

For exterior applications utilize PMH style equipment with fixed fusing, live front terminations rated for 600A. Cases shall be stainless steel with factory powder coat finishes. Interlock mechanisms shall not be specified for these devices. Gear shall have standard grounding bars for workmen's grounds. All PMH gear shall be installed on proper vaults with windows sized for such application to meet Eversource requirements. PME style gear with hinged fuse compartments shall not be acceptable for use on the University campus. The most used configuration on campus are the PMH-12, PMH-9, PMH-5, and PMH-3 with some PMH-6 & PMH-19 for looping radial circuits. Gas insulated switches are available in configurations mirroring PMH style gear, and so the term PMH is meant to include SF6 gas insulated breakers and switches, and gas insulated shall include epoxy Insulated equipment when suitably rated. New equipment shall be SF6 gas style switches, motor operated and shall be automated and SCADA system compatible, programmed for parallel allowed operation, and configured for feeder metering on all breaker ways. Designer shall include two 2" minimum conduit and fiber optic control wiring to support connection to the SCADA system, coordinated with the University Representative in conjunction with ITS for private network connection point. Gas switches will utilize SEL-451 bay automation controllers for protections and controls with ability to program synch check protections. Air insulated equipment may be utilized if approved by Electrical Operations, but shall not be utilized for feeder tie situations between substations. Air insulated switches shall be provided with SCADA capable motor operators and status monitoring, unless waived by Electrical Operations. Under no circumstances shall mechanical interlocks of any kind be installed on PMH switchgear, in the event equipment is supplied with interlocks it shall be substituted for equal equipment approved by Electrical Operations at no additional cost to the University.

Please refer to manufacturer's literature for schematics as required. Feeder ties will no longer be allowed on a single PMH-9, ties shall be made with a PMH-9/PMH-12 pair to allow fusing for protection of the tied circuits and inadvertent trip of both feeders due to animal activity shorting on open switch blades. Vault windows shall have protective shields installed to prevent animals from entering the PMH switch from the conduit system. All switchboards shall have viewing windows for inferred inspections.

Switchboards
Designer shall be responsible for all coordination study models and providing same to the University in a SKM PTW32 V7.0 compatible format as a closeout document inclusive of all custom libraries utilized or created for the model.

The switchboards shall be copper bussed or approved equal with bolt-on circuit breakers, or factory provided tap lugging. When in excess of 600A, or any multiple feeder situations, they shall be draw out type. Breakers shall be fully coordinated with adjustments for instantaneous, short-time, and long-time adjustments minimally. Fuses should not be utilized in switchboards unless, based on available short circuit current, they are absolutely required. Ground fault protections should be considered and provided in addition to requirements for the main, depending on loads serviced. All switchboards shall be installed on a housekeeping pad, be bottom fed, and have suitable crown boxes for distribution to occur from the top to facilitate cubicle replacements or additions. All switchboards shall have viewing windows for inferred inspections.

Switchboards shall allow full view of the labeling and trip dials of all breakers. Manufacturers that require removal of covers to view circuit breaker information are not acceptable, with the exception of draw out breakers. Coordinate spare breaker requirements with FO, but target approximately 30% spare breaker space. Switchgear is not meant to be used as a panel board, therefore single pole breakers or breakers less than 200AF shall not be contained within a proposed or specified piece of switchgear. Sufficient space shall be reserved to easily allow power factor correction capacitors to bolt onto the main bussing, this is especially important in large mechanical projects.

Load shedding transfer switches should be discussed with the University Representative to determine what level of controls and the priority of switching that is required for each project.

15.9 Wiring and Conduit – Electrical and Fire Alarm

Medium Voltage
Taped splices shall never be utilized on the University campuses. Medium voltage cabling shall be XLP or EPR MV-105 cable having 133% insulation, and bare copper neutral. Finalize the required provisions by the end of the Schematic Design phase.

Raceway
In slab conduit shall be PVC or fiberglass piping schedule 40. All metallic conduit or sheaths shall be steel, except when providing protection to Grounding Electrode Conductors with non-ferrous metallic conduit.

Power Wiring
There shall be no type NM used for power cabling, also known by the Trade Name “Romex” or equal. Power cabling shall be in conduit with individual conductors, or of type AC & MC depending on service use and listing requirements. Less than 1000 Volt Grounds shall be insulated for feeders and branch circuiting whenever possible.

Fire Alarm
In new construction/major renovation conduit or MC/AC fire alarm cabling shall be specified.

15.10 Light Fixtures

Generally, the look and finish of luminaries shall be proposed by the Designer, however all new lighting fixtures shall use LED drivers on the campuses and shall be selected from the Design Lights Consortium (DLC) or Energy Star Product List for all Lighting retrofits or rehabilitations. The Designer shall limit the selections in the specifications to three compatible manufacturers for each designated fixture. When selecting lighting using replacement bulbs in locations where LED products are not available, the project shall utilize common bulb types. Installation of external drivers or ballasts shall only be specified with prior written approval from the University Representative in conjunction with FO.

Projects where existing lighting is being replaced, the Designer shall not to assume the number of existing fixtures will meet the current lighting levels outlined within the design standards or current code requirements. Designer shall design the new lighting layout based on the design standards range of lumins for the new configuration and occupancy of the space. Confirm any existing lighting controls and include within the specifications whether it is to remain or be replaced with a compatible product.

Provide one-foot candle minimum at exit discharge locations with power supplied from two independent sources.

The color temperature for all light fixtures within the building should be the same. The color temperature goal is 3200-degree Kelvin for interior fixtures and 4000 degrees Kelvin for exterior fixtures. Color temperature range of 3000-3500-degree Kelvin is acceptable as long as all of the fixtures are the same. Such fixtures shall be tied into the lighting control system.

The following illumination levels are recommended by the University. Illumination levels referenced are maintained levels measured at a 30" height from the floor or at an actual work surface and represent an average level for the area. Levels as given are a general guide only and deviations and special applications shall be discussed during program sessions and shall comply with latest IESNA standards.

Area/Room Name	**Control Strategies** V – Vacancy Manual O - Occupancy Auto S – Switching M – Multi Level D - Dimming	**Maintained Foot Candles**
Offices & Secretarial Areas	V, D	20-30
Laboratories, teaching and research	V, D	65-75
Scale-Up Laboratories	V, D	40-50
Critical work areas such as tissue labs, Culture plate areas, instrument rooms, etc.	O, M	80-100
Animal Holdings	D	30/75/10 (red)
Study Areas & Classrooms	V, D	30-40
Conference Rooms & Meeting Rooms	V, D	30-40
Lecture Halls, Multi-Purpose/Auditoriums	V, D	25-30
Corridors & Stairwells	O, D	10-15
Cafeteria	O, D	15-20
Lobbies, Lounges/Receptions	V, D	15-25
Mechanical, Electrical, Telephone & Elevator Machine Rooms	O, S	20-30

Receiving Areas	V, S	20
Storage Areas	V, S	20
Restrooms & Locker Rooms	O, S	10
Entry to a Building	S	5
Temporary site lighting for security	S	1-2
Walkways for pedestrian security	S	2-2.5
Parking Lots	S	1-1.5
Parking Decks/Garages	S	5

15.11 Lighting Controls

Occupancy or vacancy controls shall utilize dual technology, single technology devices shall not be specified. Daylight harvesting shall be implemented in areas where natural lighting is available. Lighting controls shall be specified for all interior areas of the campus, unless there are special circumstances or conditions which prohibits their use. The Designer shall obtain, prior to specifying, acceptance of the special condition from the University Representative in conjunction with FO. The use of manual sliding dimmers will not be acceptable for locations that require less than (6) six luminaries.

Specify an add alternate cost for an LED lighting fixture with its own on-board occupancy sensor and daylight harvesting controls in lieu of the specified fixture without.

Specialized lighting systems for classrooms, lecture halls, dining halls, sports facilities etc. shall be presented on a case by case basis for review and acceptance prior to specifying. Such systems shall be web based accessible, provide off site password protected accessible control without a subscription fee.

The University has determined that the following manufacturers provide the performance criteria desired for lighting control systems: Lutron, Sensor Switch or Enlight

See additional details pertaining to Classroom within the Section named Classrooms.

15.12 Emergency Lighting

The Designer shall provide proper illumination for all egress paths within a project. The design shall be photo metrically proven using a computer modeling software such as AGI32 using vendor supplied luminaire models and the calculated values from the least performing specified equal shall be shown on the construction drawings in 1-foot by 1-foot grid along the egress path.

Unit battery pack equipment for emergency lighting systems shall be avoided in major renovations and shall not be utilized in new construction except: in electrical rooms, especially ones serving the emergency system and where code otherwise requires. Where generation is not provided, utilize central inverter systems to provide emergency power to the normal lighting fixtures.

For ease of maintenance and security of buildings, the University's preference is for emergency lighting circuits to limit switching and keep a night lighting path on at all times within a corridor egress path. Offices, classrooms, and other programmatic spaces shall be switched where emergency lighting is installed if the space classification allows such under the Code. Mechanical rooms, electrical rooms, and telecommunication rooms shall not provide occupancy controls for any lighting.

15.13 Exit Signs

See Section 12.5 for information on exit signs.

15.14 Automatic Transfer Switches

When generation is provided it should be tiered as 1, 2, and 3 as required by the NEC via multiple automatic transfer switches. When connected to the central 4160V alternate service system the building must use tiered transfer switches compatible with the existing ASCO Power Quest paralleling 4160 system gear. Since the University has significant investment in the ASCO Power Quest system, the Designer shall not specify any other manufacturer other than ASCO switches.
All transfer switches shall be specified as 4-pole devices, and all power systems entering a building shall be designed as separately derived systems. In some cases, the University may accept 3-pole transfer devices where the building is not anticipated to be connected to the ASCO 4160 system or other similar regional system. Care must be taken in existing buildings and renovations not effecting existing electrical distribution to determine existing bonding configuration. When re-using existing distribution, ensure raceway integrity and grounding exists. It is prudent to specify new feeders to distribution equipment in the event panels are reused in a major renovation, or to carry suitable allowance for their replacement. When relying on legacy distribution equipment, construction documents shall require contractor to verify integrity of feeders and overcurrent devices.

15.15 Emergency Generators

Due to our Environmental Title V permitting requirements care must be considered when specifying generating equipment on the campus. Generators shall have a #4/0 AWG bare copper ground ring around their base, cadwelded to perimeter copper ground rods. Grounding whips shall be extended from this ring to provide equipment grounding and neutral bonding at the overcurrent protection device on the generator.

Generators shall utilize polling controllers that detect failed sensors versus failed or trouble within the generator and status shall be monitored by the building controls system or SCADA system, coordinate with FO through the University Representative. Utilize soundproof enclosures with access doors on both sides of the generator minimally or utilize hospital rated mufflers. Options should be selected to accommodate minimally a 5-year manufacturer's warranty.

The Designer must incorporate all manufacturer equipment specification and performance data sheets for the engine and generator set including emission rate data representing operations at maximum (100%) operating load conditions. Emissions information representing average emission levels over a pre-defined duty cycle, such as required for EPA certification, will not be sufficient. The emissions data at maximum operating load should include emissions data for NOx, Sox, CO, volatile organic compounds (VOC), and particulate matter (PM10 and/or PM2.5, if available). If emissions data are available for partial load operation (e.g., 75% and 50% load), those data should also be provided. A copy of the EPA emissions certificate, showing that the engine complies with EPA's non-road emission standards or with 40 CFR Part 60, Subparts IIII or JJJJ, as applicable, should additionally be provided.

If an underground storage tank is being contemplated, consult with the University Representative in conjunction with ORP/EHS-E and FO prior to proceeding with the design. Underground tanks are not desired in most applications. Should the University agree with the installation of an underground tank, ensure in the specifications that the Contractor complies with the Underground Storage Tank regulations (Section 22a-449(d)). Electrical Metering Requirements

The University utilizes the Square D Powerlogic system for metering buildings throughout campus and any new electric metering shall be compatible with same. For main service meters a CM4T series and for sub-meters a PM8 series is utilized. The main service metering should have instrument transformers to allow transient and sub-cycle metering available on the CM4T services to function. These meters shall be installed remote from the gear in a suitable enclosure with provisions for shunting the CTs for maintenance operations. The University generally prefers to use split core CTs so they can be easily serviced, however PTs are required for services 480V and below, when it is after an Eversource meter. PTs are required for services 480V and above. The instrument transformers should be high accuracy, but not necessarily requiring revenue grade, unless operated immediately downstream of an Eversource meter. All metering should be done cold sequenced to allow local isolation of potential sources for major repairs to metering equipment. Meters shall be daisy chained together using RS485 to a common Ethernet gateway device. The gateway is usually the EGX100, but in some cases where local users may have a need for building load information an EGX300 with integral webserver may be selected. For the cases where Eversource metering is required, the Powerlogic system components shall be downstream of the revenue metering equipment, with all instrument transformers in a separate compartment from the Eversource revenue equipment. These meters shall be specified with factory startup services. .

15.16 Lightning Protection

The Designer shall provide consideration of a lightning system in new construction projects at the University. Systems will be designed to all relevant UL and NFPA standards (UL 96/96A & NFPA 780 inclusive of all cited references). If existing lightning protection systems are in place, the Designer shall be responsible to keep the system functioning anytime a roofing or similar system modifies the existing installation, and report to the University any found deficiencies of the existing system. The University will provide the consultant with direction to implement all or some of the identified corrections to deficient components.

Consideration should be taken in bonding piping, such as fire protection risers, to adequately discharge high frequency electrical disturbances such as lighting. This may require oversizing bonding conductors to account for skin effect impedances. New buildings and major renovations shall have a lightning protection consultant review bonding detailing.

15.17 Building Automation and Utilities Management Systems

The Designer is responsible to fully design the environmental monitoring and distributed control system inclusive of all accessories required for the data collection, control and monitoring of the mechanical, electrical, water or other systems unless specifically exempted.

BAS (Building Automation System)

The current monitoring platform for building automation systems is Andover Controls, Continuum. However, for any new construction or buildings that require a complete upgrade to the existing BAS, the University has determined the following Manufacturer(s) to be of acceptable quality for monitoring platforms; Andover Controls, Continuum or Automated Logic Corporation's WebCTRL.

See Appendix V – Building Automation System for additional information and requirements.

SCADA System

The University has standardized on the SCADA Management System for monitoring and reporting of external lift and pump station motors, electrical and pumping levels.

A fiber optic loop provides monitoring of all utility infrastructures. OsiSoft PI is the data reporting historian and central control is fed back to the Water Pollution Control Facility. Depending on the utility being monitored, measurements can be on flow level, temperature, pressure, and/or conductivity. Consult with the University Representative in conjunction with FO on the data points required for monitoring.

- The following are areas that SCADA is connected to:
- Water Pollution Control Facility
- Reclaim Water Facility
- Central Utility Plant
- Lift/Pump Stations
- Steam and Condensate Lines
- Storm Drainage
- Electrical Service for 13.8KV systems that involve two circuits
- New power sources

Power Logic monitoring system
The University currently uses PowerLogic to monitor consumption, power quality, demands, as well as other variables of our electrical systems.

Veeder Root
The University currently uses Veeder Root to monitor in-ground and above ground propane or oil tank, the tank monitoring system shall be a Veeder Root monitoring system.

15.18 Electric Charging Stations

The University is committed making electric vehicle charging capacity conveniently available on each of our campuses. To that end, electric vehicle charging stations will be included in any new or reconstructed parking lot, unless such requirement is waived in writing by the University Project Director.

The Designer familiarize themselves with CT DEEP's ***Guidelines for the Installation of Electric Vehicle Charging Stations on State Property*** and incorporate accommodations and provisions of electric vehicle charging on state property.
https://portal.ct.gov/-/media/DEEP/air/mobile/EVConnecticut/GuidelinesfortheInstallationofElectricVehicleChargingStationsatStateFacilitiespdf.pdf

The Designer shall include within the design and specifications following information for one, two or more dual-head, Level II electric vehicle charging stations.

EV Charger Requirements

- Latest dual-head model (currently 3704) having the following features:
  - pole mounted – 2 EV stations per pole
  - automatic retractable charging cable
- Gateway Module, each must have the following features:
  - be capable of communicating with up to 32 EV chargers using Zigbee Mesh protocol;
  - be compatible with Open Charge Point Protocol (OCPP) charger networks;

- provides Open Charge Point Protocol (OCPP) enables cooperating 3rd party vendors to provide and manage charging fee payment options;
- connectivity to and communicate with the University's network via ethernet, if ethernet be impractical or unavailable, cellular data connections must be specified; and
- be DHCP enabled

Network and Electrical Requirements

- Ethernet data connection for each Gateway Module
  - outdoor rated CAT6 Ethernet cable with design not to exceed 100 meters (328 feet) between switch/router and gateway;
  - must be terminated to a "biscuit" type data jack inside pole of the EV charger that has the Gateway installed; and
  - include that an IP reservation on VLAN 497 is required from ITS once the MAC address of the devise is known.

Electrical for each Charging Station

- Power Input: 7.5 kW
- Voltage Input: 208-240 VAC, Single phase, 50/60Hz
- Current Input: 40A
- Breaker: 50 2-pole breaker, Non-GFCI on a dedicated circuit

The University has determined the following manufacture as providing the quality, reliability and performance the University expects from an electric vehicle charging station: EVSE LLC – Division of Control Module Inc.

16 Telecommunications

The Designer is responsible to have a competent certified sub-consultant in the field of telecommunications design. At the request of the University Representative, the sub-consultant must provide evidence of a BICSI certified Registered Communications Distribution Designer (RCDD) or equal and licensed professional with the State of Connecticut (i.e. PE or TLT). The University reserves its right to request another consultant with the experience and expertise required should the University believe such sub-consultant does not have the qualifications.

See Appendix IV – Telecommunications Design Guidelines and Performance Standards for requirements.

17 Audio Visual

17.1 Guiding Principles

When required in a program, the Designer is to provide adequate and dedicated space for a complete high-performance audio video system for classrooms or conference spaces. Designers shall include within your overall services, an independent specialty consultant for Audio Visual design, in support of any project that includes classrooms, lecture halls, and conference rooms. Such consultant shall not be affiliated with or is a representative of any manufacture of any type of audio-visual products. Nor shall the consultant to the Designer use the services of a sub-consultant tier who is affiliated with or is a

representative of any manufacture of any type of audio-visual products to avoid conflict of interest. All designs shall be reviewed and accepted by the University Representative in conjunction with University ITS/AV Technology and incorporated into the design before the completion of the design development phase.

When video conferencing is required, the video conference system shall be a video-based system (SIP) that uses a hardware-based video conferencing codec. Web conference software-based collaboration solution shall include Microsoft Teams or WebEx and have the ability to simultaneously connect to more than one video conference participant.

See Appendix VI – Classroom Design Guidelines for design criteria for various levels of Classrooms
See Appendix VIII – Audio Video Equipment Standards

17.2 Conference Rooms

Conference rooms should be designed based on what level of audio-visual requirements will be required for the conference room. The University Representative in conjunction with UITS/AV Technology will advise on what level of audio-visual capability the conference room(s) should be designed to.

- Video conference: A standards-based system (SIP) that uses a hardware-based video conferencing codec
- Web conference: A software-based collaboration solution including Microsoft Teams, Google Hangouts, and WebEx
- Multisite: The ability to simultaneously connect to more than one video conference participant

Basic Conference Room

Shall be designed to be a cost-effective system, which allows for both video and web conferencing. The system will also function in a local presentation capacity, where conference room attendees can view content from a laptop computer. This system will be controlled by A rubber button control panel. This type of system will include:

- A wall mounted smart monitor appropriately sized based on room specifications (e.g., viewing distances, available space, and other environmental factors).
- Share laptop, PC or WePresent content Share.

VTC Conference Room

Shall be designed to support most audio/video conferencing needs, be intuitively operated, and also function in a local presentation capacity. This system will be controlled by a combination rubber button/touch panel system, which enables functions such as turning on the monitor, selecting the correct input, and connecting a call.

The following options shall be made available to further enhance the functionality of the system:

- a dedicated computer;
- multisite conference hosting; and
- an integrated telephone conferencing.

This type of system will include:

- a wall mounted smart monitor appropriately sized based on room specifications (e.g., viewing distances, available space, and other environmental factors);
- an option to have a permanent computer installed in the room system;

- ability to videoconference to internal and external VTC equipped conference rooms and readily available desktop VTC applications. This will enable participants to:
    - Host a conference with multiple participants
    - Share laptop content through VTC
    - Share room-based PC content through VTC (if equipped);
- ability to videoconference to internal and external web clients using software on user supplied laptop. A fixed USB camera and microphone will be provided to connect to the laptop. The remote participants will be seen/heard via the monitor;
- option for audio only and mixed audio/video participation;
- ability to display laptop video (HDMI) and audio on monitor without using VTC; and
- ability to control the entire system through a single source (e.g., touch panel, control panel).

Audio Visual Equipment

Projection screens mounted above the marker board must clear the board's marker (chalk) tray. The projection screen in its lowered position must not cover light switches and outlets. Ceiling-mounted or wall-mounted projection screens should not conflict with the lighting fixtures or access to lighting fixtures for changing lamps. Lighting fixtures should not wash out projected content. Lighting controls will be accessible near the instructor console, but not integrated with the AV system.

See Appendix VIII – Audio Video Equipment Standards

18 Elevators/Lifts Guidelines

18.1 Guiding Principles

The desire of the University is to encourage “walk-up” as the primary transportation for at least the first three stories of any building, and to have mechanical lifting systems as the secondary means of transportation for most building occupants. Vertical transportation systems need to be designed around accommodating the capacity for all possible uses of the building. The Designer should pay particular attention to the University’s scheduling in choosing the number of elevators or lifts, since normally large volumes of students, staff and faculty utilize vertical transportation over very short times at the beginning and end of classes. The University highly discourages the use of escalators in buildings.

18.2 Passenger Elevators

Separate passenger elevators should be provided for any building over three stories in height and as required by code. Hole less hydraulic elevators are preferred for low-rise and mid-rise applications.

At least one cab shall be able to accommodate an ambulance stretcher. The cab finishes shall generally be durable, with plastic laminate wall panels being preferred. A mid-rail should be provided on the walls. Glass, mirrors and high-end wall finishes are prohibited. The flooring shall be tile in most buildings, except residential buildings, where the flooring shall be carpeting. All passenger elevators shall have 8’ clear ceilings and should have LED lighting with protective covers.

Emergency contact buttons should be tied into the DUSSystem as the primary responder. Additionally, all elevator controllers shall be required to send a malfunction signal to the BAS system. No security cameras are required in the elevators. The University generally utilizes Otis controllers that tie into the University’s BAS system, so it is preferable to specify equipment compatible to same. Regardless, if the

elevator controls include a microprocessor, the University shall receive all equipment and information to reprogram the equipment including software source codes.

The University has determined the following Manufacturer(s) to be of acceptable quality for elevators include Otis, Schindler and Theissen Krupp.

18.3 Freight Elevators

Each building should have at least one freight elevator that serves all floors, even if it is a combined passenger/freight elevator. The freight elevator capacity shall be 4,000 lbs. minimum, and the platform shall be at least seven (7) ft. x nine (9) ft. wide. All elevators shall have ceilings that provide eight (8) ft. clear height.

Where there are dining services being supplied, deliveries or operations are on two separate levels, a freight elevator shall be located within a reasonable distance from the kitchen. Such freight elevator does not have to be designated to Dining Services, however other user access must not have to enter the kitchen for use.

Freight elevators shall have stainless steel walls and doors, with a diamond plate steel floor and a removable rubber mat. All freight elevators shall have a railing at the base of the walls and at 3'-6" above the elevator floor to protect the walls. The elevator should be provided with hanging points and protective mats on three sides of the elevator. Ceilings should also be stainless steel and should have LED lighting with protective covers.

18.4 Elevator Floor Identification

A number system is preferred for the elevator buttons that identify the stops. The numbers should follow the floor labeling standard outlined in Appendix II - Electronic Document and Plan Submission Requirements. The floor designation shall be provided adjacent to all elevator buttons in braille, regardless of the type of elevator.

18.5 Elevator Pits and Shafts

All elevator shafts shall have sump pump pits. However, it is the University's preference that the sump pump not be permanently installed. A removable pump shall be provided to the University for the building. The designer shall provide a storm drain connection at a nearby location with a removable cover in the case of emergency. If a permanent sump pump is provided, then the drain for the pump will need to be piped to an oil water separator.

All elevator pits shall have oil/grease interceptors included into the design.

Provide adequate lighting and power in all elevator pits, and at least one 120V outlet on the inside of the elevator shaft at mid-height. It is preferred that all elevator shafts be built of six (6) inch masonry block. Elevator pits deeper than 3 feet shall have fixed ladder access with "pop-up" safety grab bars or stair access.

The Designer shall incorporate into the specifications and closeout requirements that there be an oil analysis performed before the installation of the hole on the soils by an independent third party. Include that if the Contractor fails to perform such test that they are accepting the soils as clean from contaminates. Should the analysis reflect oil residual within the soils, the Contractor must find and fix

any leaks and abate the contaminated soil. Warranty period shall be extended consecutively every 6 months with initiation of additional oil analysis and abatements until analysis reports no residual oil leakage.

18.6 Elevator Machine Rooms

Elevator equipment rooms shall be constructed with curbs to contain any hydraulic oil spill. Sufficient acoustic dampening shall be provided in the elevator machine room such that the operation of the equipment cannot be heard from outside the room. All elevator machine rooms shall have mechanical ventilation and adequate supply air.

18.7 Elevator Maintenance and Service

The specifications shall include the requirement for the elevator installer to provide 100% of the elevator maintenance and service for the first year after substantial completion of the building. Service shall require a response time of a maximum of four hours from the request. In addition, the elevator equipment shall have a minimum warranty on capital repairs for a period of not less than 12 months. After ten (10) months from substantial completion, the elevator installer through the Contractor of record, shall provide an analysis of the hydraulic oil showing there are no contaminants in same or shall replace it prior to turn-over.

18.8 Lifts and Dock Levelers

Where possible, install ramps for ADA compliance rather than lifts. See Section on Docks and Service Areas in Volume One.

19 Space Planning Guidelines

See Appendix III – Space Planning Guidelines

20 Chemical Storage Guidelines

20.1 Guiding Principles

When requested, provide an area for chemical storage where incompatible chemicals can be segregated according to their class, e.g., oxidizer, reactive, corrosive, and flammable, etc. Racks should be securely anchored to walls, and shelves built with a ¾-inch lip on the edges. The storage area should include:

An approved, corrosive storage cabinet (if needed); an NFPA/OSHA/FM-approved, non-vented flammable liquids storage cabinet(s); a ventilated cabinet for the storage of highly toxic/carcinogenic or odorous materials; and an NFPA-approved flammable liquids refrigerator (if needed). Flammable storage cabinets need to be designed to protect the contents of the cabinet from a room fire. All solvent storage units should be electrically grounded.

When required by the program, a compressed gas cylinder storage system ensuring rigid and secure supports for gas tanks in use; segregated and labeled locations for full and empty cylinders in storage shall be provided. Full cylinders should be stored in a mechanically ventilated storage area with separation between incompatibles (e.g., O2 and flammables).

Emergency information shall be on a yellow card, posted on the exterior of doors; the information should be clearly visible from the hallway and include:

- The department's name

- room number
- faculty member(s) responsible with office phone number(s)
- laboratory occupant(s) name(s) and home/cellular phone numbers(s)
- emergency phone numbers for fire/police/ ambulance, FO (Work Order Control), Environmental Health and Safety, and the Student Health Services.

Laboratories

Ventilation systems for laboratories containing hazardous chemicals (i.e., physical hazards, health hazards, simple asphyxiates, combustible dusts, pyrophoric gases, or hazards not otherwise classified) must be designed for single pass air. No recirculation or reuse of laboratory exhaust air is allowed

21 Furniture Fixtures and Equipment Guidelines

Furniture, fixtures and equipment (FF&E) will be unique to each project, however the selection of the FF&E should emphasize durability with a minimalistic approach. All FF&E is required to be commercial grade. Limit the number of different types and colors of FF&E, and emphasize consistency between rooms and finishes, to maximize the flexibility and interchangeability for the University to relocate FF&E between spaces. Consider storage requirements of FF&E in the design to assure that rooms can be completely emptied.

Modular system furniture and paneling shall accommodate the University's specific IT materials and do not require the use of proprietary cabling components. They shall have integral raceways that conceal telecommunication cables without distorting or damaging them or compromising cable bend radius requirements. System furniture raceways shall have metal barriers to separate telecommunication cables from power cables. Outlet shall be terminated in adapters designed to fit the factory cut outs of the furniture raceway.

Refer to Appendix IV Telecommunications Design Standards for details.

22 Classroom and Lecture Hall Guidelines

See Appendix VIII Classroom and Lecture Hall Guidelines

23 Athletic and Recreational Space

The University fields 24 NCAA Division 1 teams and requires first-class athletic facilities. The University is part of the American Athletic Conference (AAC) in the majority of its sports (i.e. Hockey East in men's and women's ice hockey). The Designer should identify which sports are being served by the athletic facility and must attain and comply with the latest NCAA and Conference requirements for each sport. The University's Division of Athletics currently manages at the Storrs campus the Greer Field House, Guyer Gymnasium, the Climbing Center, racquetball courts, fitness center Wolf Zackin Natatorium Pool, all practice and athletic game fields, Harry A. Gampel Pavilion, the Werth Family Basketball Champions Center, George J. Sherman Family Sports Complex, Burton Football practice facility, J.O. Christian Baseball Field, Morrone Soccer Stadium, Burrill Family Softball Field, Frietas Hockey arena, the University tennis courts, and other recreational spaces. Recreation manages the two outdoor softball fields located in the Agricultural area as well as in North campus. Residential Life is responsible for

managing the outdoor volleyball and basketball courts. In addition, Recreation currently operates and manages the Outdoor Adventure Center as a satellite facility in the Student Union.

Interior Spaces

When designing interior space for an athletic facility, consider the following:

- Having sufficient lighting, and access to lighting for the maintenance of same via catwalks, is extremely important in the design of athletic facilities. All lighting should be high efficiency and dimmable, and a lighting control system should be provided, such as Musco, Hubbel or approved equal. For competition venues, must meet NCAA standards.
- Athletic facilities require the appropriate support facilities for the sports to be included in the design, such as fitness, training and weight rooms, warm-up facilities and space, home and visitor's locker rooms, maintenance and office facilities for coaches and staff. Include at least one conference room in the facility.
- Flooring types will vary based on type of facility and usage. All bare concrete should be sealed.
- Mechanical systems need to be efficiently designed and scalable, able to maintain the building during unoccupied buildings with minimal energy use but have the capacity to heat or cool for large attendance events. Humidity control and demand ventilation are required.
- Individual spectator seating is preferred in most athletic facilities, however when more practical, aluminum bench seating is allowed. Individual seats should be plastic laminate, and not wood. Type and variety will depend on facility type.
- Electronic scoreboards and digital displays should be included in all athletic facilities, such as display systems by Daktronics or approved equal

Timing systems should be provided in all athletic facilities, such as those by Colorado Time or approved equal.

Athletic facilities should include the infrastructure (conduit, cable, and power) for television, satellite hook-ups and cell and internet service within the buildings. Most athletic buildings will need a separate internal repeater for large traffic volumes on the cell and internet systems.

Provide at least one oversized, roll-up door at grade in order to transport large pieces of equipment into or out of the building.

Signage should be considered within the design of the building, including directional signs, static permanent signage, and locations for banners, which should be provided in all buildings. A legacy area should be included in the design and located near the main entrance to the facility.

Include space and facilities in the design for a press box in all athletic competition venues.

In locker rooms, individual showers are preferred over gang showers.

Exterior Spaces

The University has a wide variety of field surface types but is generally utilizing natural turf for new outdoor fields. Assure that outdoor fields have adequate underdrainage systems and are slightly crowned for storm water run-off.

Exterior lighting is generally required for all outdoor fields and spaces, to a level that the sporting event can be undertaken during the evening, competition venues must have field lighting which meets or exceeds NCAA guidelines.

24 Laboratory and Research Space

The Designer shall review specific laboratory and research space requirements with the University Representative at the outset of any project that includes these types of spaces.

See Mechanical and Electrical Sections for details on all MEP equipment and systems.

25 Residential Space

25.1 Guiding Principles

The Division of Student Affairs is committed to providing housing that allows students the opportunity to experience the best of campus life. Recent renovations have focused on code compliance, fire protection, and enhancing the appearance of existing facilities. The construction of new residence halls will provide opportunities for greater interaction among students to enrich their out of classroom experiences and ultimately add to their academic personal success.

The preference is to have ten (10) ft. finished ceiling heights for all residential complexes. However, should financial constraints prohibit such a height, a minimum finished ceiling height of nine (9) ft. is required.

25.2 Exterior Building and Grounds

When designing a new or renovation to an existing residential facility, consider shall be given to the overall approach to the building. Create landscaping and roadway systems around the complex to provide for proper flow of people and goods - especially during opening and closing of the residence halls. Provide vehicle access to drop off and pick up areas for opening and closing of the residence halls that are barrier free and level to the entryways for pedestrians while controlling vehicular access. Take into consideration effective methods of pedestrian flow to and from the residential area to dining halls and other areas of campus. Incorporate lighted pathways, parking lots, recreation areas and seating areas with benches and bike racks that create a social conversation area.

The building envelop design should be appealing while functional for maintenance. Create a central, highly recognizable single "main entry" to the building(s). Design to incorporate card key access hardware and security cameras at all entrances utilizing the standards established. Install window screens on all windows and impose window stops to minimize access through the windows. Create a functional, hidden service area and entrance with a concrete slab for a 30-yard dumpster (used at opening and closing of the semesters). Provide energy efficient double hung sash windows with integral insect/security screens.

25.3 Entrances and Common Areas

It is preferred that all main entries have a vestibule with adequate heating and ventilation. Entry doors should have automatic door openers with the card access systems.

Consider locating a formal lounge adjacent to the main entrance/lobby with a small public bathroom and drinking fountain. Adjacent to the main entrance create a front desk area that includes offices, a Resident Assistant duty area, meeting space and an enclosed storage space for supplies.

Central gathering spaces such as meeting rooms, student lounges and studies rooms do not necessarily have to be located on the main floor of the building. In situations where the top floor of the building provides for a nice view of the area vistas, consider placing such common areas on the top floor of the building.

25.4 General Mechanical, Electrical, Plumbing, Telecommunications and Fire Life Safety

Interior surfaces, systems, and fixtures must be made of vandal resistant materials, ensuring long-term wear and ease of maintenance while providing aesthetic appeal. All wiring, conduit, pipes, etc. shall be enclosed within wall cavities, do not allow for exposed conduit or wiremold.

Mechanical and Plumbing

For residential applications, any exhaust, water and drain piping shall be run in vertical chases and branched off within the walls as opposed to running horizontal in the corridor ceilings. The vertical chase must remain accessible for the corridor.

It is preferred that each bedroom, suite or apartment have individual HVAC room controls to allow for adjustment of the temperature by 3-5°F.

Electrical

In each Student room, provide a duplex electrical outlet every 5 ft. on center on side walls only and have each room on its own circuit breaker. Provide duplex outlets at a minimum every 20 ft. in all other areas including corridors within the Resident Halls.

Backup power shall be incorporated in all new residential building designs. Backup power shall support all fire life Safety systems and also allow the building to marginally function for occupancy during an extended outage. The University must continue to house and feed students during emergency events and the back-up power shall accommodate same.

Telecommunications - Cable

In each Student's room there shall be one data jack that covers data and phone per occupant. There shall be one cable television jack per student rooms. There shall be a data jack every 16 ft. in all Study rooms, Lounge rooms and Game rooms.

See Appendix IV – Telecommunications Design Guidelines and Performance Standards for additional information and requirements regarding residential buildings.

Fire Life Safety

Buildings shall be fully sprinklered with hard-wired smoke detectors in each room. A wire cage shall be specified to protect sprinkler heads in areas that are accessible to accidental damage (stairwells, corridors, etc.). Standpipes in stairwells (used for sprinkler system) must have locking cap on the chain.

25.5 General Finishes

Ceilings

All circulation and gathering public areas shall have gypsum board ceilings. All residential rooms shall be exposed deck.

Flooring
All building entrances shall be designed to have built in floor walk off mat at least 4' deep into the building. All office areas, meeting rooms, student lounges and studies rooms shall have carpet tile with complimentary color/pattern changes with a quarter turn of each tile upon installation. All corridors and resident rooms shall have VCT. All bathroom rooms shall have ceramic tile. All shared living space shall have carpet tile.

Walls
All walls shall be vandal proof resistant. The preferred material for all corridors and common areas is double layered sheetrock with a chair rail. Resident rooms shall be double sheetrock and bathrooms shall be cement board with waterproof membrane.

Interior paint must be washable, medium luster (no flat paint on surfaces that are within access to residents).

Doors
All student room doors shall be solid core laminated/vinyl covered for cleaning purposes, with peepholes, door closures and locking keyed hardware. The University may consider the use of card readers for future residential buildings.

Hardware
All designated ADA accessible student rooms, bathrooms, corridors to those rooms, laundry rooms, lounges, studies, recreation and fitness room to have automatic door openers.

25.6 Bedrooms
Standard bedrooms shall be designed as double or single occupancy. Double occupancy rooms shall be approximately 165 sq. ft. and single rooms shall be approximately 130 sq. ft. Rooms shall be large enough to house a single bed, desk, chair, dresser and built-in closet per person. Floors shall be vinyl tile, no carpeting. Windows shall have horizontal blinds. Single surface mounted ceiling lights shall be installed.

25.7 Apartments
The typical 2-bedroom apartment (housing no more than 4 residents) shall have a full kitchen, dining/living area, washer and dryer and private bathroom for each bedroom. A full kitchen shall include an oven, microwave, and refrigerator, but does not require a dishwasher.

25.8 Suites
The University has three suite models that shall be utilized within the design programming.

Shelter Model (less than 150 sq. ft. per student). This type of housing provides bedroom and bathroom space and minimal social and support space.

Campus Life Model (150-200 sq. ft. per student). This type of housing includes bedroom and bathroom space, plus support space (such as laundry areas and storage rooms), and program and social space for

activities that help young people experience the best aspects of campus life in a college sponsored residential setting.

Academic Model (200 plus sq. ft. per student). This model adds space for formal and informal academic experiences to the Campus Life Model, such as space for faculty in residence, tutor offices, seminar rooms, etc.

25.9 Student Lounge, Game Room and Leisure Space

Create these spaces with open floor plan and no doors. Provide areas for bulletin boards/building postings and vending machines. Floor finish shall be vinyl tile.

Create a recreation game room to house a pool table or ping pong table, big screen TVs, etc.

25.10 Study Rooms

Create smaller study lounges on each floor. Design with sound retardant finishes where possible.

25.11 Multi-purpose Rooms

Create a large multi-purpose room for residential meetings (40-50 people) and study space. Design with an audio/visual/IT component. Floor finish shall be carpet tile.

25.12 Resident Assistant (RA) and Hall Director Rooms

Provide a single room for Resident Assistant (130 sq. ft. minimum size). Desired ratio of 1 RA to 35 residents.

25.13 Restrooms / Bathrooms / Showers

General Guidelines

For every 40 residents, provide a dedicated men's bathroom, dedicated women's bathroom, and two individual flex bathrooms.

All baths shall have a large mirror area; adequate bathroom exhaust systems; appropriate GFCI electrical outlets every three feet at sink and mirror locations; LED lighting (ceiling and over mirror); private shower stalls with adjacent changing area and built in storage for toiletries and adjustable showerheads. Design for private toilets and showers, gang showers are not acceptable. Private showers shall provide for a foot rest within the shower and a changing area with a shelf for personal items within the space.

All bathroom areas no matter the size shall have underneath the finish floor a waterproof membrane pitched to the floor drains to prevent flooding.

There shall be no bathtubs or urinals. All toilets, shower heads, and faucets shall be specified as low flow, 1.5 GPM water conservation.

Ensure that all shower valves shall have integral stops. Manufacturer's providing acceptable quality for shower valves with integral stops are: Simmons, Kholer or Delta.

All bathrooms with the exception of flex restrooms, shall have a closet with sufficient storage for residents to use for their personal hygiene products and clothes to hang.

Exterior windows within a bathroom shall be frosted opaque from the factory. Film application is prohibited.

Public Bathrooms
Incorporate a series of public bathrooms on the first floor next to the formal lounge located in proximity to the entrance/lobby. They shall be all gender and accessible with a sink and toilet. A drinking fountain should be located just outside the bathroom.

All Gender Bathrooms
There shall be a minimum of two flex bathrooms per living floor. Flex bathrooms shall be handicap accessible, gender neutral and complete with toilet, accessible shower and sink. The Designer is to ensure that appropriate design of the hardware associated with this type of bathroom addresses cases where a handicap person who cannot open and lock the door on their own, that the automatic door assist secures the room when occupied. And where the same occupant activates the assistance call alert, the automatic door assist unlocks for emergency assistance.

Semi-Private Bathrooms
Incorporate a semi private bathroom within an apartment or suite. There shall be two sinks within the bathroom with storage cubbies for personal hygiene products. Toilet shall be private with a locking door and exhaust fan and shower shall be private with a changing area, exhaust fan and locking door within the shared bathroom.

25.14 Laundry Rooms
Develop centrally located laundry rooms in each building(s). Access to the laundry rooms shall not require occupants to pass through the main entry/lobby of the building. Provide areas for bulletin boards for building postings. Calculate 24 residents to one washer/dryer set. Incorporate table space for folding and one standard size laundry cart per washer/dryer set. The University has determined the following Manufacturer(s) to be of acceptable quality for washers and dryers shall be Speed Queen or approved equal.

25.15 Student Trash and Recycling Room
Follow the requirements outlined in Section: Interior Building, for a trash storage room immediately adjacent to the loading dock or service area. In addition, the Designer must program a minimum of one (1) separate student trash room for each Residence Hall floor for student trash and recycling. Such room shall be sufficient enough to easily place 2-4 50 gallon containers.

25.16 General Storage Room
Incorporate a room sufficiently sized for equipment, supplies and furniture storage.

25.17 Mailbox Area
The demand for mail areas shall be determined on a project by project basis. Currently there are central locations in the vicinity of residential halls for student mailboxes.

25.18 Bicycle Storage
Incorporate a room for the storage of bicycles. Provide a secured door from the exterior and to the interior of the building. Provide racks for the students to secure their bikes.

25.19 Outdoor Recreational Areas

The program for any residential hall shall include sufficient recreation space for the students for general volleyball, tag football, and frisbee play.

25.20 Residential Furniture

The Designer is responsible to incorporate interior design services which includes furniture layouts and coordination of data/telecom and electrical with the furniture locations. If requested by the University, specify the different types of furniture needed and provide three acceptable manufacturers that are equal for each piece. The furniture should be durable and practical and for high volume.

26 Dining Hall and Convenience Retail Space

26.1 Guiding Principles

When designing residential operation's production, serving and dining areas all areas should be considered as subsets of one holistic experience when developing plans for dining FO. The following provides guidelines for standards that should be implemented in facility design.

Sustainable Development

The development of sustainable FO is an important Dining Services initiative and should be included as an integral component of the design process. Sustainable materials should be utilized where possible, such as low volatile organic compound (VOC) paint and vinyl. Sustainable use of water, electric and waste should be addressed.

Theming

During pre-schematic design, consideration must be taken to theme the dining. Many thematic environments are best presented in the foyers, lobbies, and dining areas, since available space in serving areas is normally fully utilized for food service equipment and functions.

Mechanical, Electrical, and Plumbing

In addition to those overall standards for MEP that has been provided, for dining FO provide flexibility for future modifications of production, dining and serving areas by strategically locating all mechanical, electrical, and plumbing (MEP) service. This includes potential future areas that may require electrical or plumbing outlets. Where possible, conceal all utilities such as exposed wires and floor drains for maximum visual aesthetics. Provide for data and wireless access in appropriate sections of the dining area. Consider current and potential future needs for power, data outlets, and internet access in the dining areas.

Soda beverages deteriorate cast iron more quickly than PVC, therefore the University requires that all design work associated with dining service area sinks or other areas that provide soda products shall specify Schedule 40 PVC piping for drains.

Flooring

Ceramic tiles with sealed, dark grout are the most durable floor coverings for serving areas and travel paths for customers and employees. Quarry tile is preferred for all kitchen areas for its non-slip smooth, easily cleanable, non-absorbency, and durability. Provide cove base that matches the flooring.

Walls
Durability should be a major consideration when selecting construction materials for walls. Walls shall be easy to clean.

For serving areas, tile is the preferred wall coverings. Tile colors and designs may also be used to reinforce the themed environment of the facility. Corner guards and bumper rails on walls are mandatory and should utilize stainless steel or similar materials. Doors should also be protected by bumper guards manufactured from stainless steel or other durable materials to protect doors from damage.

Provide stainless steel finish behind ovens, grills, fryers and any other equipment that emits high levels of heat. Provide ceramic tile/stainless steel/frp (fiberglass reinforced panels- most cost effective) throughout kitchen if budget allows. If budget is a consideration, provide frp in wet areas and semi-gloss paint. Use semi-gloss paint throughout

Ceilings
Ceilings shall be easy to clean. Mylar suspended ceiling is acceptable.

Lighting
Specify flexible lighting that provide sufficient light levels for the activities of the space. Light fixtures in food preparation areas to have protective covering over lamp. If menu boards are used and are not electronic, provide adequate light to illuminate boards.

Window Treatment
Vertical blinds are preferred over horizontal blinds or drapes because they are easier to clean and adjust light levels effectively.

Countertops
Countertops shall be smooth, easy to clean, anti-microbial. Free of breaks, open seams, cracks, chips, inclusions, pits, and similar imperfections. Free of sharp internal angles, corners, and crevices. Finished to have smooth welds and joints. Example: stainless steel. Not to be used: Copper, galvanized metal, wood

26.2 New Construction
When evaluating criteria to determine site selection, each alternative should be considered based upon its adequacy under forecasted conditions, such as increase of student population in the adjacent areas. The availability of adequate handicapped parking areas and loading dock access should also be a consideration.

26.3 Serving Station Counters
Serving areas that feature a desired “scatter” configuration is preferable. This type of design offers desired advantages that enable these FO to serve the most amounts of people in the shortest amount of time. The configuration of each serving station area must accommodate the type of food service options to be provided. Designs should consider flexibility for future changes to accommodate the delivery of

alternative menu selections. Different types of serving stations include hot food service from warming containers, grill-to-order cooking stations, sandwich preparation stations, self-service buffet style stations, and other specialty configurations that may feature a combination of menu selection delivery methods. Entree stations should be prominently located in the servery area.

Lighting shall be sufficient and flexible for both the front and back of the serving stations, for cooking, serving, and cleaning. Serving stations need the ability to be serviced from the back in most instances. A shelf for dishes should be located below serving counters. Cups should be available at counter level, where possible, and sized to match demand at peak capacity.

Serving station counters should be commercial quality. Stainless steel provides a durable, easily cleaned surface, but should not be over utilized to create an "institutional" feel for the facility. Solid surface materials also provide durable surfaces and are available in a variety of colors. Functional and attractive serving stations can be achieved by utilizing a variety of durable materials that are compatible with the interior finishes and architectural character of the facility. Limit the use of wood inside the serving area, because it can be easily stained or damaged and can be difficult to clean. Do not use wood as a cove base. Trash receptacles need to be located under counters or out of sight.

Front service of beverage stations and consolidation units (ice maker/dispenser and beverage dispensers in one unit) are usually preferred, because less space is required. Beverage stations should be located where they do not conflict with queuing line for food serving stations and are provided by a University vendor. Glass holders should be provided adjacent to the beverage stations to minimize customer traffic. Easy access to beverage stations from the dining area for refills should be provided that does not disturb the flow of customers in the serving area.

Salad Bars and Soup Stations

Salad bars may be island configurations with access from all sides or just one side for customer access. Include accommodations for both hot and cold wells so the salad bar station may also be used as a universal station of self service offerings like a breakfast buffet or specialty selections. Address proper "sneeze guards" design for easy access by customers and provisioning by the dining facility staff. Soup stations and salad bars should be located together, where possible, and include accommodations for hot bread, crackers, and similar items. Salad plates, soup bowls, and soup spoons should also be located at each station, as required.

26.4 Specialty Food Stations

Consider special needs for dessert and cold food stations, such as refrigeration, plumbing, and electrical requirements. Provide flexible display spaces that can be reconfigured as service options change. Non-refrigerated food selections include cereal, fruit, and other items served and consumed at room temperature. All serveries must include a gluten free area that has an ambient area for product, a refrigerator, a small freezer and a toaster unit.

Locate silverware stations near the serving lines or entrance. Napkin dispensers, may also be required at the same location. Provide for adequate access (from the rear if possible) to re-supply silverware and other supplies with minimal disruption to customers. Utilize only commercial quality materials and other products, as needed.

26.5 Serving Station Signage and Menu Board

Non-Electronic Signage identifying each serving station should be commercial quality and integrated into the architectural designs. Overhead serving station signs, such as individual letters or neon, help to identify each station and the type of food selection available. These signs may also be used to reinforce the themed environment of the facility through terminology, colors, images, and materials.

Accommodate for menu board display information at each serving station and/or a central location near the servery entrance to confirm daily menu choices and prices. Menu boards should be easily changeable and located where they do not obstruct the transaction area. Electronic menu boards or display screens controlled by a central computer system allow easy updates and changes, however some of these systems may be cost prohibitive and shall be confirmed with the University Representative. Menu information can be effective at eye level or overhead, provided they are easily legible, even during crowded conditions of peak periods.

Menu display signage should be located near the entrance to the serving area to provide food selection and price information. A menu display should be presented at eye level and located where it does not obstruct the flow of people entering the serving area.

26.6 Condiments and Amenity Stations

Condiment stations should be centrally located as you exit the serving area. Depending upon the size of the facility, additional smaller condiment stations with popular refill items may also be needed in the dining areas. An ice cream freezer with an area for toppings should be adjacent to the servery. This area should be equipped with a dipping well for bulk ice cream.

26.7 Validine Stations

Validine stations need to be located at the entrance of the dining facility. Provide space for the cashier to sit inside the cashier station that allows transactions to be conducted from both sides. Provide adequate queuing and counter space. Cashier stations should not appear cluttered or disorganized.

26.8 Dining Area

Dining areas should provide flexibility to reconfigure tables and chairs for maximum efficiency. Tables should be a mix of high tops, community tables, traditional seating and low conversational areas. Microwaves, water stations, and supplemental condiment stations located in the dining areas are effective.

Chairs and Tables

Seating groups should vary with a combination of tables with four, six and eight seats. Square tables offer the most flexible options to rearrange the seating areas as needed and to place tables together for small group functions. Booths should be used selectively. Corners and other awkward areas next to walls and windows are good potential locations for booths with bench seating. Chairs should not be located too close to a transition of floor materials (tile to carpet). Allow room to push chairs back from the table, as needed. Chair rails are required to prevent wall and/or chair damage, especially if walls are constructed of rough stone or concrete. Stackable chairs offer the most flexibility for storage, reconfiguration, and are also cost effective. Flat leg bottoms are preferred over those with casters on non-carpeted floors due to caster maintenance problems. No dining floors should be carpeted. Cloth or wood seats are preferred for chairs and bench seating.

26.9 Foyers, Lobbies and Corridors: Floors and Walls

Natural stone materials, terrazzo or dark ceramic tiles with sealed, dark grout are the most durable floor coverings in foyers, lobbies, and corridors due to the high traffic in these areas. Recessed walk-off mats inside the entry where customers hit four footsteps on each mat will reduce maintenance cost for flooring. Walls should be constructed of durable materials or wall coverings with corner guards.

Foyers and lobbies should address foul weather requirements with easily cleanable floor materials. Foyers and lobbies must be adequately sized with large cueing areas. Walk-off mats inside the foyer and removable rugs in lobby areas should be provided for particularly bad weather days. Consider the need for bicycle racks and trash receptacles outside each entrance of dining facilities.

26.10 Kitchen / Production

Kitchen production facilities shall have suitable plumbed emergency eyewash equipment in areas wherever corrosive materials, such oven cleaners, may be used.

Floor sinks are required for equipment that requires indirect waste lines – three compartment sinks, expresso machines, etc. All drainage must meet FOG (fats, oils and grease) compliance. Schedule 40 piping shall be specified for all kitchen drains and soda dispenser drains.

Clean/ Wash Area

Located the wash area near the kitchen entrance for dish drop off, wash area can be divided by specific activity – ex. tray/dish rinse off area, drying racks, etc. A three-compartment sink is required for utensil washing. Sinks must have adequate drain boards, racks, or tables large enough to accommodate all soiled and cleaned items that may accumulate during hours of operation. A mechanical flight type dishwasher will be used in addition to the utensil sinks.

Food Preparation Area

Located near cooking and service area and have easy access to storage and refrigeration areas, food preparation area can be divided by activity – ex. veggie wash/chop, Food prep sink, cutting areas, dry mixing area, etc. Design for sufficient in number and size designated food preparation sinks, with an indirect waste drain, are required if produce is cleaned on site. Sufficient number of food preparation sinks to include for wash, soak, rinse, drain, cool, thaw, or otherwise process any food that requires placement in a sink. Splash guards around sinks may be required to prevent contamination of foods and food contact surfaces.

Cooking Area

Located adjacent to food preparation area and near storage areas, cooking areas can be divided by activity – ex. baking area, frying station, grilling station, etc. And include but not limited to; convection ovens, stoves, fryers, Panini makers, grills, steamers etc. Incorporate proper equipment ventilation requirements. Unless conditions deem otherwise, all kitchen exhaust shall be roof installed. The Designer is to ensure that any Kitchen ventilation hoods conditioned for grease, shall have a roofing protection system to protect the roof area surrounding the exhaust.

Service Area

Located adjacent to seating areas if applicable and food preparation, service areas must include food “drop off” area, warmers, sneeze guards, etc.

Hand Washing Area

Hand washing sinks are required in each food preparation area and service area. Each sink must be equipped with hot and cold running water with a mixing faucet, soap, paper towel dispensers, and hand washing reminder signs. Hand washing sinks must be sized to allow employees to wash hands simultaneously.

Storage Area
Located near the delivery area, cold storage areas must have adequate refrigerated storage must be available for the separation of raw and ready-to-eat foods. Refrigeration requirements are based on the menu. Cooling of potentially hazardous foods will require equipment that is capable of meeting cooling requirements for PHF's. Dry storage must be located in an area that will not be impacted by refrigeration failures and outside weather conditions.

Delivery
Located near to a loading dock/delivery door and storage areas, size delivery door (and other doors) to allow adequate clearance for items stored/transported (ex. Palates, dish return carts, etc.) as well as for the installation of new and future equipment. Include an inventory desk with a computer and telephone. And location for disposal of garbage, recycling, etc.

26.11 Restrooms
Restrooms shall be conveniently located near the food establishment and accessible to employees during all hours of operation. It is preferred to have separate restrooms from the patrons, however they may be used jointly by patrons and employees, provided patrons accessing the toilet room are excluded from food preparation area and unpackaged food storage areas.

26.12 Support Space
Janitor Room
A mop/utility sink is required and must be located so foods are not contaminated. May include washer/dryer for linen laundering, mop sink, hot water heater, cleanser/chemical storage, etc.

Staff Space
Provide desk, chair and filing space for the Supervisor and lockers for employee's personal items

26.13 Kitchen Equipment
Kitchen equipment shall be developed in concert with the University Representative and University Dining Services and will be unique to each project.

27 Specialty Structures / Areas

27.1 Parking Garage and Parking Lots
Parking garages can be constructed out of reinforced concrete or precast concrete. All reinforcing in parking garage construction shall be epoxy coated. Specify a hardener to be applied to all surfaces of the parking garage, and a membrane waterproofing system over all occupied areas within a parking garage. Wheel stops should be provided at all perimeter parking spaces.

The standard parking space at the University is 9’-0” wide by 18’-0 long. One-way traffic loops are acceptable as long as they are up and down transfer ramps provided on each floor. Snow removal and drop locations should be identified in the plans and safety provisions provided for same.

Parking garages are generally controlled with an entry and egress gate system. The specified gate system shall be compatible with the most current University access card system. Designer is responsible for confirming requirements for any parking area or structure on controls.

All mechanical and plumbing pipes are required to be protected as dictated by State code. Heat tracing of any metal piping may be required and utilized to avoid the freezing of piping in unconditioned space. Electric charging stations should be provided on the entry level of the garage in dedicated spaces for electric vehicles.

Security Cameras are required for any parking area. Cameras are mounted on light poles and the poles and bases must have access panels. See exterior light pole specifications for further details.

End of University Design Standards