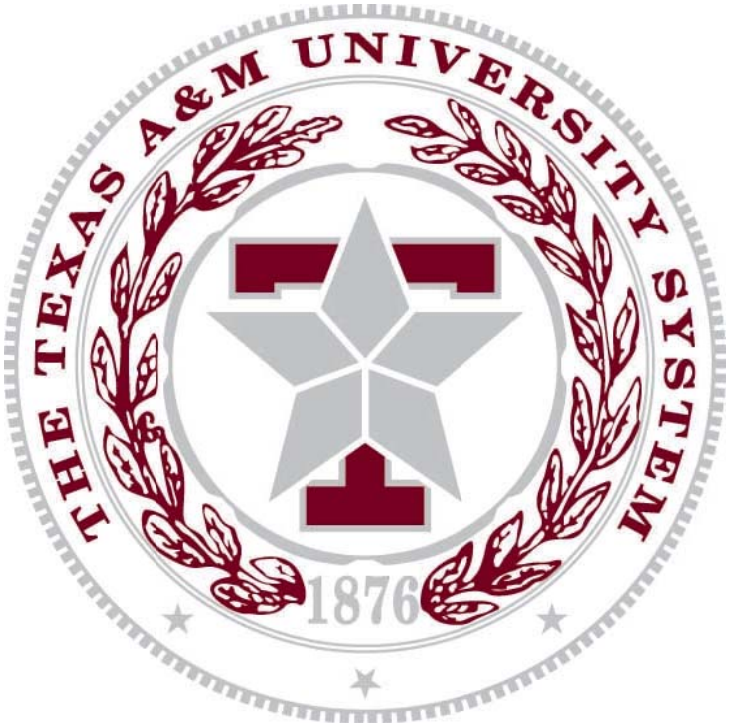
Facility Design Guidelines



The Texas A&M University System
Office of Facilities Planning and Construction
June, 2008

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Historically Underutilized Business Program

The Texas A&M University System Office of Facilities Planning and Construction is committed to promoting the participation of minority, women-owned, and small businesses through the Historically Underutilized Business (HUB) Program for the procurement of goods and/or services. The procurement process utilized by the A&M System seeks to provide equal opportunity and equal access in the design and construction opportunities on projects managed by Facilities Planning and Construction.

General Information

The "Facility Design Guidelines" is intended as guidance for the project architect/engineer team and the contractor team during the design and construction process for The Texas A&M University System Capital Projects. The content covers specific design criteria, the design process and administrative procedures for permanent buildings on System campuses. Subsets of this document will pertain to renovation, civil, etc. type projects. Many but not all requirements for each System Campus or System Agency of the A&M System are covered. The Project A/E shall also refer to items covered in their A/E Services Agreement and in the project's Program of Requirements (POR).

The "Facility Design Guidelines" shall be used along with the project specific Program of Requirements and the Services Agreement.

In the event of conflict between this document and specific project requirements the A/E, CMAR or D-B shall contact the Project Manager with Facilities Planning & Construction for clarification.

The guidelines in this document are not intended to prohibit the use of alternative methods, systems, products or devices not covered in this document. All alternatives shall be documented by the A/E, CMAR and D-B and submitted to the Project Manager for approval by Facilities Planning & Construction prior to implementation.

Design Philosophy

Design Quality

The Texas A&M University System Office of Facilities Planning & Construction is committed to excellence in the design and construction of buildings for the System Member Universities and Agencies. To accomplish this the Office of Facilities Planning and Construction (FPC) is committed to the highest quality of aesthetics in meeting the requirements of the System Member Universities and Agencies while at the same time delivering a project that is cost effective to operate and maintain throughout its useful life.

All buildings shall be designed with flexibility in mind. Over the life of all major campus buildings the functions will change and the spaces will be reconfigured.

Campus Design Standards

The building design shall follow the guidelines established in the University or Agency Master Plan as well as the guidelines in this document. In the event of a conflict between standards established in a Master Plan and this document the Campus Master Plan shall govern. In lieu of master plan guidelines the design shall blend with campus standards and neighboring buildings. The design shall also conform to neighboring building setbacks, roof lines, etc.

Operating & Building Maintenance

Systems and materials incorporated into all buildings should be selected on the basis of long term operations and maintenance costs. The design should incorporate ease and efficiency of operation and allow for easy and cost effective maintenance and repair. The Project A/E should obtain constant feedback from the Physical Plant Department during design. Detailed instructions from the Project A/E stating the design intent for all building systems and the operating/maintenance procedures are required during the design process.

Sustainability & Energy Performance

The design of all buildings shall incorporate established principles of sustainable design and energy efficiency. Design following these principles improves the buildings performance while enhancing the occupant's health, satisfaction and performance. Sustainable design is an integrated approach in which all phases of the building life cycle are considered. The energy performance of the building

should exceed any requirements per codes.

Project A/E shall include a rainwater collection systems from building roof drains and condensate return for irrigation use.

Codes and Standards

Comply with all state and Federal laws applicable to construction. Local municipal building codes are not applicable to construction on State of Texas properties, which includes all properties owned by The Texas A&M University System. However, the Project A/E and the FPC Project Manager shall cooperate with municipalities when tying into local utilities.

Codes and regulations (Latest Revisions) to be used in the design of projects:

- Life Safety Code, NFPA 101, 2006 edition, and all referenced codes.
- International Building Code, 2006 edition, International Code Council, Inc., (for all items not covered by Life Safety Code).
- Other applicable National Fire Codes, NFPA.
- State Energy Conservation Design Standard (ASHRAE 90.1-2004 Energy Standard).
- State Energy Conservation Office (SECO) Suggested Water Efficiency Guidelines for Buildings and Equipment at Texas State Facilities.
- Other applicable ASHRAE Standards
- International Plumbing Code and International Mechanical Code, 2006 edition, International Code Council, Inc.
- Building Service Piping, ASME/ANSI B31.9.
- Applicable ANSI, ASTM and ASME codes and standards
- Applicable OSHA, EPA and Texas Commission on Environmental Quality (TCEQ) regulations
- Texas Accessibility Standards (TAS), Texas Department of Licensing and Regulations, Architectural Barriers Act, Ch. 469, Government Code.
- Americans with Disabilities Act, Public Law 101-336, enacted July 26, 1990
- Safety Code for Elevators and Escalators, ASME A17.1 & A17.3.
- TIA/EIA Standards.
- FMGlobal Standards for Roof Systems and Fire Protection Systems

The Project A/E is required to submit sealed documents for an accessibility review. The required review should be accomplished by a Registered Accessibility Specialist located near the project site. The same Registered

Accessible Specialist (RAS) will be utilized for the plan review and the post construction inspection. The cost of the review and inspection will be borne by the Owner.

The A/E will be required to secure permits from state and federal government agencies when necessary, such as Texas Department of Highways and Public Transportation, Health Department, etc. The cost of any permits will be borne by the Owner.

If the project site is along the Texas coast the Project A/E is expected to provide design details and specifications to meet Texas Windstorm certification requirements. The design team will include an individual certified and authorized to make the required design decisions, submittal reviews, and on-site inspections of the building during construction (to include signing the certification documentation) to ensure compliance with the Windstorm certification requirements.

The Project A/E will complete and submit the Energy Conservation Design Standard Certification Statement and compliance forms required by ASHRAE 90.1-2004 as part of the required Energy Report to the FPC Project Manager.

Environmental Practices

Sustainable Design

All buildings shall be designed to meet LEED Silver requirements. Refer to the project POR to determine if the building shall be certified through U.S. Green Building Council. All buildings shall be designed to maximize daylighting, maximize human comfort and minimize energy use.

Energy Performance

All buildings shall be designed to exceed the requirements of ASHRAE 90.1-2004 by 17.5%. Energy modeling by the project team will be required to verify energy performance of buildings. (Identified as reimbursable in A/E Agreement)

Daylighting

In order to maintain a relationship between the building occupants and the outdoors, direct views of the outside must be provided for at least 75% of the

regularly occupied areas unless the needs of the spaces dictate otherwise. The building design should strive to provide outside views for 100% of all offices in the building.

If daylighting systems, beyond windows, are included in the design for daylight harvesting the project team must take special concern to ensure adequate daylight illumination, avoid common glare issues and fully integrate the lighting and mechanical systems with the interior architecture and daylighting systems.

Building Materials

Wherever possible, products and materials with recycled-content and no volatile organic compounds (VOC) shall be specified in the building design.

Indoor Air Quality

Products incorporated into the design shall have minimal or no VOC off-gassing and noxious odors. The design shall follow ASHRAE 62.

Commissioning

All building projects shall employ commissioning practices to assure delivery of program goals and related performance requirements. The Project A/E shall coordinate commissioning practices with the FPC Project Manager, the Physical Plant Department, the Commissioning Authority (if contracted separately) and the contractor (if the delivery method is construction manager at risk or design-build) during design.

Life Cycle Cost Analysis

Life Cycle Costing (LCC) compares initial investment options and identifies the least cost alternatives for a twenty year period. It shall be incorporated in the selection of major building systems and to determine the viability of LEED items. LCC can also support selection of all building systems that impact energy use: building envelope, passive solar features, fenestration, HVAC, domestic hot water, building automation and lighting.

All LCC efforts should be completed in the Design Development phase of the project.

Space Standards

Calculation of Building Areas

The method used to calculate the assignable square feet and gross square feet in a building is based on guidelines from The Texas Higher Education Coordinating Board (THECB). These guidelines are intended to establish common standards for building inventory for all state institutions of higher education. In large part these guidelines are also based on those from the U.S Department of Education, National Center for Education Statistics.

Gross area should be computed by measuring from the outside face of exterior walls, disregarding cornices, pilasters, buttresses, etc., which extend beyond the wall face. The gross area includes all floored spaces from ground level through top floor. It includes basements (except unexcavated portions), attics, garages, enclosed porches, penthouses, mechanical equipment floors, lobbies, mezzanines, balconies (inside and outside) utilized for operational functions, and corridors (provided they are within the outside face lines of the building).

The sum of floor areas of a building included within the exterior walls for all stories or areas that house floor surfaces including attics, basements, sub-basements, penthouses, mechanical rooms, etc. These are areas with six foot six inch clear headroom or areas with lower ceilings that are usable for storage or other purposes.

Gross area does not include open courts and light wells, or portions of upper floors eliminated by rooms or lobbies which rise above single-floor ceiling height.

Net Assignable Area is defined as the sum of all areas within the interior walls of rooms on all floors of a building assigned to or available for assignment to, an occupant or use, excluding unassignable space.

Unassignable area of a building is the sum of space within a building not assigned to directly support academic programs. Included in this are:

Building support areas used for the protection, care and maintenance of a building, circulation areas such as corridors and stairwells, Mechanical areas which are areas designed to house mechanical equipment, utility services and shaft areas, Inactive areas space in a building that once was assignable but is permanently no longer in use, shell space or unfinished space designed to be converted into usable space at a later date and public restrooms which are accessible to the public.

Building Core Elements

Building Entrances

All main entry points to a building must be provided with a vestibule and; have walk-off mats acceptable to the System Member Physical Plant Department. Weather protection must also be provided for the exterior doors.

Building Circulation

The building circulation system (corridors) should be clearly designed to lead building occupants from entrances to their destination. It is desirable to introduce as much natural light as possible into corridors, through windows, transoms or borrowed light. Utility systems should be routed in circulation pathways to provide access to utilities without disrupting occupied spaces.

Doors on opposite sides of corridors shall be offset to prevent direct viewing from one room to another. Classroom and laboratory room doors opening into corridors shall be recessed the width of the door to eliminate corridor obstructions.

Egress Stairs

The location and design of egress stairs within buildings should encourage their use for everyday vertical circulation. Magnetic door hold open devices, interconnected to the building fire alarm system, are allowed to keep interior doors to egress stairs in an open position to encourage their use.

Equipment Rooms

All mechanical and electrical equipment rooms must be designed with adequate aisle space and clearances around equipment to accommodate maintenance from the floor and replacement of items. There must be a defined pathway from all equipment rooms to the building exterior of adequate size to permit the replacement of equipment. This path may involve corridors, elevators, knock-out panels, hoists and provisions for cranes, etc. Plans and elevations for all equipment rooms, at a scale not less than ¼" = 1'-0", shall be prepared for each room to indicate that adequate circulation and maintenance areas are provided. All equipment rooms must be designed to control noise transmission to adjacent spaces including corridors.

Electrical Closets

Electrical closets must be designed so that three walls stack vertically and NO wall is centered on a structural beam that would interfere with vertical risers. Do not route building utility capable of conveying liquids through electrical closets. The only exception allowed is the branch sprinkler line serving only the sprinkler head in an electrical closet. NFPA 13 allow the electrical closet to be unsprinklered if a 2 hour wall and door are used. Access to electrical closets must be from within the building from the corridor system and not through any other space. Door should open out from space to maximize usable interior floor and wall area.

Main Switchgear room

The main electrical switchgear room for a building should be located on the ground floor. It shall never be located below restrooms, custodial closets or at an elevation that requires sump pumps for drainage.

Communication Closets

Communication closets must be designed so that all four walls stack vertically and NO wall is centered on a structural beam that would interfere with vertical risers. Communication closets must be provided on each floor and located such that no wiring run exceeds 270 feet. A single communication closet can generally serve 10,000 square feet of floor space. Access to communication closets must be from within the building from the corridor system and not through any other space. Door should open out from space to maximize usable interior floor and wall area.

Air Handler Rooms

Air Handler rooms should be designed so that they stack vertically and NO wall is centered on a structural beam that would interfere with vertical risers. The spaces must be arranged and sized to provide maintenance staff with safe access to all pieces of equipment for routine maintenance. Access to air handler rooms must be from within the building from the corridor system and not through any other space. Door should open out from space to maximize usable interior floor and wall area.

Rest Rooms

Rest rooms must be located on each floor and should be located within 200 feet of every occupied space. Rest rooms should be grouped with custodial closets for ease of maintenance and to reduce plumbing runs. Rest rooms should be sized to accommodate a minimum fixture count determined by the International Plumbing Code (IPC) and accessibility based on the Texas Accessibility Standards. Rest rooms serving assembly areas must accommodate short term, high volume traffic and will require higher fixture counts. Also, the number of fixtures for women's rest rooms shall be higher than minimum determined by the IPC. The increase will vary according to project and campus, up to a fixture ratio of 1/3 men to 2/3 women. Confirm this with the campus Physical Plant Department.

Direct or reflected lines of sight into restrooms and dressing rooms from the corridor are prohibited.

Provide at least one accessible gender neutral restroom containing one water closet, one lavatory and a diaper changing station. Location should be adjacent to building entrance or elevator lobby on first floor.

Loading Dock

Provide a loading dock at each new building. The loading dock and service yard shall be screened from major streets and views. Refer to the POR and Physical Plant Department for specific requirements for loading dock.

Trash Dumpsters

Either in the loading dock service yard or a separate screened enclosure provide concrete pad for trash dumpsters. Refer to the POR for any specific requirements for dumpsters or the need for a compactor. Refer to the Physical Plant Department for the type of dumpsters used and access requirements.

Recycling Room

A recycling area should be provided for each building located adjacent to the loading dock or service entrance. This space will allow for sorting of recyclables such as paper, glass and metals. Refer to the local Physical Plant for details on campus recycling programs.

Custodial Closets

Should consist of 80 sq. ft. minimum floor space, include shelf and mop sink. The

minimum clear width of a custodial closet is six feet. A closet of this size can serve a floor area up to 50,000 gross square feet (gsf). Building designs with floor areas larger than 50,000 gsf shall require more than one custodial closet per floor. Door should open out from closet to maximize usable interior floor and wall area. Custodial closets shall not have telephone, cable television, data, mechanical or electrical cables or equipment in it nor roof or under floor access through it. The custodial closet should be located near the restrooms on each floor.

Smaller custodial closets approved by FPC Project Manager and Physical Plant Department may be utilized in outlying small buildings but they should have the basic items such as mop sink, shelving, mop and broom hangers, and room enough to store cart and floor buffer. These custodial closets should have an area of not less than fifty (50) square feet and a minimum clear width of five feet.

Custodial closet shall contain the following:

- Standard 2'x2'x8" floor corner mounted mop sink located close to door.
- Wall surfaces material above the mop sink must to be moisture resistant.
- Provide six mop hangers, above the mop sink and twelve mop and broom hangers along wall near the mop sink.
- Provide shelving on one side wall, at least four 12” shelves 16" to 18" apart with the bottom one being approximately two feet from floor. Adjustable heavy duty shevling systems are acceptable
- Overhead fluorescent lighting controlled from switch just inside door.
- One electrical duplex outlet on each side wall.

Server Room Requirements

Almost every office building has a requirement for one or more server rooms. Some buildings house mission critical servers and as such have more stringent environmental requirements. The size and intensity of a server room is not usually known during the concept or design phase of a building. Due to rapid advances in technology, the equipment that served as a basis for design is not the equipment that will be installed at owner occupancy. The trend has been for servers to get smaller in physical size yet increase the quantity of power supplies and heat rejection into the space. Thus more equipment with a greater heat and power load is being placed into spaces that were not designed to handle either the power or thermal loads.

Some installations have electrical power installed at levels of 20 kw per relay rack. While this may be excessive in a university environment, there are some

universities have started using this design criteria. In an effort to anticipate some of this effect provide the following:

- Each server room shall be furnished with an electrical service that equals at least 200 watts per square foot. This works out to approximately 7 kw per rack. Some spare capacity must be included. Present design criteria require about 3 kw per rack. A computer grade panelboard should be furnished in each server room.
- Each server room should be served from a standby generator. As the servers become more mission critical this requirement becomes essential.
- The thermal requirements for all server rooms should be supplied first from the building thermal utilities with humidity control and secondary back up in the form of an independent DX system. The power for the secondary system should be from a standby generator. Special consideration should be given to consolidating server rooms into one centralized server room. Server rooms should be designed with sufficient capacity to operate at 48 degree chilled water supply to meet planned and future loads.
- Each server room must have some form of entry access control.
- If the server rooms are unmanned and remote some form of environmental monitoring and alarm should be provided.
- The server room minimum width shall be 11' based on a single row of racks in the center of the room. The length shall be determined by the number of racks plus the required circulation space on each end.

While the power and thermal requirements are considerably less, the telecom closets should be likewise provisioned. There are other applications that require increased consideration for reliability and environmental controls that must be evaluated on a case by case basis.

Floor and Space Identification Systems on Drawings

Each space shall be identified by name as identified in the Program of Requirements or as agreed to by the FPC Project Manager and the User Coordinator and room number.

Room numbers used in the Construction Documents will become the actual and permanent space numbers.

Assignment of Floor Numbers

The floor level containing the primary entrance shall be considered the First

Floor and shall be numbered in the 100 series; the floor above being the Second Floor shall be numbered in the 200 series. Third and subsequent floor shall be numbered in a similar manner. Basement level shall be numbered 001 series.

Assignment of Room Numbers

The rooms on each floor opening off of either side of a corridor shall be numbered consecutively in a clockwise direction from the primary entrance which shall be 100. If there is more than one main entrance to the building use the one mutually agreed to by the FPC Project Manger and the User Coordinator.

Rooms and spaces not opening off a corridor shall carry the room number of the connecting room with an additional suffix letter (108A, B, C, etc.). Letter clockwise, if more than one room is involved.

Corridors, vestibules and other areas and spaces which have not been assigned numbers by the Campus maybe assigned numbers for completing room finish schedules and for use in reference notes and correspondence. These numbers are not to be considered permanent numbers.

Campus Specific Requirements

Texas A&M University

Commissioning

The Project A/E shall coordinate commissioning practices with the FPC Project Manager, the Physical Plant Department's Facilities and Utilities Divisions, the Commissioning Authority (if contracted separately) and the contractor (if the delivery method is construction manager at risk or design-build) during design.

Family Rooms

Provide at least one family rest room containing one fixture, one lavatory and one diaper changing station. Locate on ground floor near other rest rooms.

Maintenance Service Area

In all building at Texas A&M University, for every 25,000 gsf of building area 50 nsf shall be set aside as a maintenance service area. This space shall be located

on the first floor level near the service entrance and loading dock.

Vending Standards

- Provisions for vending machines should be considered in new buildings with occupancies greater than 25 people.
- At a minimum, space should be allocated for 3 vending machines. Allow 4ft. wide x 4ft. deep for each vending machine. For recessed or alcove applications with ceiling drops, allow minimum 7 ft. clear height for vending machines.
- Vending areas should be located in spaces that are readily visible to the public, both occupants and visitors. Vending should be located along the most frequently and highly traveled traffic areas in the building. Vending signage is helpful, but location of machines is more critical.
- Provide a dedicated GFCI duplex receptacle (on separate 20 amp breaker) for each vending machine. Receptacles should be located directly behind each machine. Refrigerated soft drink machines will average 10 to 13 amps when compressor is running. Compressors can pull up to 30 amps for a few seconds during start-up.
- Provide a data drop for debit card (Aggie bucks) readers on vending machines. Run conduit to communications room in the building.
- Accessible routes should be considered for installation and servicing of vending machines. Ground floor locations are preferred on two story buildings. Elevator access is required on second floor and above locations. Access and docking or parking for vending product (truck) deliveries to the building should be provided. Ramps should be provided for dolly traffic on approaches to service entrances.
- Provide space for trash containers and recycling container (alum. cans) in or near vending areas.
- If provided as a part of project, vending machines shall be compliant with Energy Star Program Requirements for Vending machines to ensure minimum energy consumption.

West Texas A&M University

Main Switchgear room

At WTAMU basement or below grade main electrical switch gear rooms are acceptable with walls separating it from other building functions.

Maintenance Service Area

In all building at WTAMU, for every 25,000 gsf of building area 50 nsf shall be set aside as a maintenance service area. This space shall be located on the first floor level near the service entrance and loading dock.

Vending Standards

- Provisions for vending machines should be considered in new buildings with occupancies greater than 25 people.
- At a minimum, space should be allocated for 3 vending machines. Allow 4ft. wide x 4ft. deep for each vending machine. For recessed or alcove applications with ceiling drops, allow minimum 7 ft. clear height for vending machines.
- Vending areas should be located in spaces that are readily visible to the public, both occupants and visitors. Vending should be located along the most frequently and highly traveled traffic areas in the building. Vending signage is helpful, but location of machines is more critical.
- Provide a dedicated duplex receptacle (on separate 20 amp breaker) for each vending machine. Receptacles should be located directly behind each machine. Refrigerated soft drink machines will average 10 to 13 amps when compressor is running. Compressors can pull up to 30 amps for a few seconds during start-up.
- Provide rough-in for debit card (Buffalo Gold Card) readers on vending machines. Rough-in to include a wall mounted duplex box with ¾" conduit and pull string stubbed above ceiling. Buffalo Gold Card uses Cat 5 UTP Ethernet communication cables (gold jacket). All communication cable shall be run from the communications room demark to the wall mounted duplex box. If there is more than one duplex box (for a bank of vending machines) the wire shall "LOOP" through "continuously" in a single run from one duplex box to the next leaving at least 12' of loop wire at each box.
- Accessible routes should be considered for installation and servicing of vending machines. Ground floor locations are preferred on two story buildings. Elevator access is required on second floor and above locations. Access and docking or parking for vending product (truck) deliveries to the building should be provided. Ramps should be provided for dolly traffic on approaches to service entrances.
- Provide space for trash containers and recycling container (alum. cans) in or near vending areas.

Texas A&M University-Texarkana

Maintenance Service Area

In all building at Texas A&M University-Texarkana, for every 25,000 gsf of building area 50 nsf shall be set aside as a maintenance service area. This space shall be located on the first floor level near the service entrance and loading dock.

Vending Standards

- Provisions for vending machines should be considered in new buildings with occupancies greater than 25 people.
- At a minimum, space should be allocated for 3 vending machines. Allow 4ft. wide x 4ft. deep for each vending machine. For recessed or alcove applications with ceiling drops, allow minimum 7 ft. clear height for vending machines.
- Vending areas should be located in spaces that are readily visible to the public, both occupants and visitors. Vending should be located along the most frequently and highly traveled traffic areas in the building. Vending signage is helpful, but location of machines is more critical.
- Provide a dedicated GFCI duplex receptacle (on separate 20 amp breaker) for each vending machine. Receptacles should be located directly behind each machine. Refrigerated soft drink machines will average 10 to 13 amps when compressor is running. Compressors can pull up to 30 amps for a few seconds during start-up.
- Provide a data drop for debit card readers on vending machines. Run conduit to communications room in the building.
- Accessible routes should be considered for installation and servicing of vending machines. Ground floor locations are preferred on two story buildings. Elevator access is required on second floor and above locations. Access and docking or parking for vending product (truck) deliveries to the building should be provided. Ramps should be provided for dolly traffic on approaches to service entrances.
- Provide space for trash containers and recycling container (alum. cans) in or near vending areas.
- If provided as a part of project, vending machines shall be compliant with Energy Star Program Requirements for Vending machines to ensure minimum energy consumption.

General Information

The following Division 0 Sections have been developed by Facilities Planning & Construction and are to be utilized on all A&M System projects. The FPC Project Manager will provide the Project A/E with a final copy of all Division 0 Sections for insertion into the project specifications.

If the Project A/E has additional sections or changes to these sections these items shall be brought to the attention of the FPC Project Manager. If the additions or changes are agreed upon then the final copy supplied by the FPC Project Manager will reflect the agreed upon items.

In no event will the Project A/E modify the final sections supplied by the FPC Project Manager.

The following is a listing of the standard Division 0 Sections for Construction Manager at Risk and Design-Build delivery methods:

Guaranteed Maximum Price Proposal
Performance Bond, Form C-6A
Payment Bond, Form C-6B
Uniform General and Supplemental Conditions, Form C-8
Special Conditions and Wage Rates
Soil Investigation Data

The following is a listing of the standard Division 0 Sections for Competitive Sealed Proposal delivery method:
(Examples of some of these files are located in the Appendix)

Request for Competitive Sealed Proposal
Instructions for Competitive Sealed Proposal, Form C-3 CSP
Supplemental Instructions for Competitive Sealed Proposal
Bid/Proposal Bond, Form C-2
Part 1, Competitive Sealed Proposal
Part 2, Proposer's Qualifications
Part 3, HUB Subcontracting Plan
Part 4, Subcontractors' Qualifications and Cost Reduction Considerations
Post Proposal Amendment
Addenda
Contract, Form C-5a
Performance Bond, Form C-6A
Payment Bond, Form C-6B

Uniform General and Supplemental Conditions, Form C-8
Special Conditions and Wage Rates
Soil Investigation Data

General Information

The following Division 1 Sections have been developed to work with the Uniform General and Supplemental Conditions and the Special Conditions and are to be utilized on all A&M System projects. The FPC Project Manager will work with the Project A/E to complete Section 01 11 00 – Summary of Work and Section 01 23 00 – Alternates. The FPC Project Manager will provide the Project A.E with a final copy of all Division 1 Sections for insertion into the project specifications.

If the Project A/E has additional sections or changes to these sections these items shall be brought to the attention of the FPC Project Manager. If the additions or changes are agreed upon then the final copy supplied by the FPC Project Manager will reflect the agreed upon items.

In no event will the Project A/E modify the final sections supplied by the FPC Project Manager.

The following is a listing of the standard Division 1 Sections:

01 11 00 - Summary of Work
01 23 00– Alternates (CSP Only)
01 25 00 - Contract Modification Procedures
01 29 00 - Payment Procedures
01 31 00 - Project Management and Coordination
01 31 50 - Project Meetings
01 32 00 - Construction Progress Documentation
01 33 00 - Submittal Procedures
01 34 00 - Shop Drawings, Product Data and Samples
01 42 00 - References
01 43 00 - Quality Assurance
01 45 00 - Quality Control
01 50 00 - Temporary Facilities and Controls
01 61 00 - Basic Product Requirements
01 63 00 - Substitution Procedures
01 72 50 - Field Engineering
01 73 50 - Cutting and Patching
01 74 00 - Cleaning
01 77 00 - Closeout Procedures
01 78 00 - Closeout Submittals

General Information

Survey

A topographic survey will be performed for each project involving new construction and for renovation projects where necessary by a surveyor licensed in the State of Texas.

The survey shall include information for, but not limited to, topography, existing construction (buildings, roads, sidewalks, etc.), existing utilities on site including closest point of connection if not on site, significant vegetation, easements, etc.

The survey shall be drawn using AutoCad or other CAD program and final copy shall be plotted on the same size sheet as other drawings. All dimensions and elevations shall be in English units. The plotted scale shall be 1.0" = 20.00' and the title block shall include the project name and project number. The final drawing shall be sealed by a Texas RPLS, if requested. Upon completion of the survey provide two copies of the plotted survey and one cd-rom with professional label containing project name and project number.

Specifically the survey shall:

Include a legend of symbols and abbreviations used on the drawing, a north arrow and a graphic scale.

Provide contours at 1 foot intervals unless directed otherwise by the System Civil Engineer with an error not to exceed 1/2 contour interval.

Provide at least two horizontal and one vertical control points with description and elevation to nearest .01'. Datum shall be NAD 83 for horizontal and NGVD 88 for vertical.

Provide spot elevations at street intersections and curb, crown of roads, sidewalks, edge of paving including far side of paving, drainage flow line, manhole rims/covers, top and bottom of retaining walls, etc. Spot elevation on paving or other hard surface shall be to the nearest .05' and spot elevations on other surfaces to the nearest .1'

Include the location of above and below ground structures, man-made and natural features; all floor elevations and finish floor elevations at each entrance of buildings on the property, if applicable.

Include the location, size and depth of water, gas and thermal utilities. For depths, coordinate with the Physical Plant Department.

Include the location of fire hydrants available to the property and the size of the main serving each.

Include the location and characteristics of power and communications systems above and below grade.

Include the locations, size, depth and direction of flow of sanitary sewers, combination sewers, storm drains and culverts serving or on the property; location of catch basins, manholes, and inverts of pipe at each.

Provide the name of operating authority of each utility. Utility information can be provided by the University's Physical Plant. Additional information will also be provided by Facilities Planning Division.

Provide the mean elevation of water in any excavation, well or nearby body of water.

Provide the location of any floodplains, flood level of streams or adjacent bodies of water and analysis of site for potential flooding.

Provide the extent of watershed onto the property.

Provide the location of trees along with the species name in English, the caliper in inches and the canopy width.

Provide the perimeter outline only of any thickly wooded areas unless otherwise directed.

Show boundary lines, giving length and bearing (including reference or basis) on each straight line; interior angles; radius, point of tangency and length of curved lines. Where no monument exists, set permanent iron pin (monument) or other suitable permanent monument at property corners; drive pin into ground to prevent movement, mark with wooden stake; state on the drawing(s) whether corners were found or set and describe each.

Survey shall be reviewed by FPC Project Manager and Physical Plant Department before being finalized.

Hazardous Materials Assessment

Geotechnical Investigations

If included as a reimbursable service in the A/E Services Agreement the A/E shall include the services of a qualified Geotechnical firm.

Proposal for Geotechnical Services

Borings proposed by the geotechnical engineer are indicated on a map with depths.

Where drilled piers are involved, provide a separate hourly rate and a not to exceed cost (based upon 1 trip and 8 hours of time) to be onsite during the first day of pier drilling to verify bearing stratum and other field conditions.

Schedule of rates attached to proposal.

Drilling & Sampling Methods

Drilling and sampling in accordance with current applicable ASTM standards.

Samples taken at ground surface, at two feet below existing grade and at each change in soil stratification or soil consistency, but not further apart than five feet in each of the borings unless specified.

Rock cores, if applicable are not to be less than 1 3/8" in diameter.

Samples shall be preserved and filed logs prepared by an experienced soil technician.

Make any necessary pavement repairs of like material.

Field & Laboratory Reports

All parts of the report are to be made on white or off white paper measuring 8 1/2 x 11 inches, suitable for photocopying and bound in booklet form. If larger drawings are absolutely necessary, they shall be

folded to 8 1/2 x 11 inches to fit into the report booklet.

Written reports and analysis shall be on geotechnical firm's letterhead.

Include with the report a chart illustrating the soils classification criteria and the terminology and symbols used on the boring logs.

Identify the ASTM or other recognized standard sampling and test methods utilized.

Provide a plot plan giving dimensioned locations of test borings.

Provide vertical sections for each boring plotted and graphically presented showing the number of borings, sampling method used and date of start and finish.

Soil classified in the field logs in accordance with current applicable ASTM and other standards.

Surface elevation at all bores.

Description of soil and thickness of each layer

Hydraulic pressure required or number of blows per foot (N value) and where applicable

Depth to loss or gain of drilling fluid

Depth to wet cave-in

Depth to artesian head

Ground water elevation and time when water reading was made (repeat observation after 24 hours)

Presence of gases.

Location of strata containing organic materials, wet materials or other inconsistencies that might affect engineering conclusions.

Description of the existing surface conditions and summarize the subsurface conditions

As a minimum, the following test are to be performed: Moisture Contents, Atterberg Limits, Percent Passing #200 Sieve, Hydrometer, Pocket Penetrometer, Unconfined Compression and Unit Dry Weight.

Foundation Evaluation & Recommendations

Foundation support of the structure and slab, including soil bearing pressures, bearing elevations foundation design recommendations, potential vertical rise and anticipated settlement.

Anticipation and management of groundwater.

Lateral earth pressures for design of walls below grade, including backfill, compaction and sub drainage and associated requirements.

Soil material and compaction requirements for site fill, construction backfill and for the support of structures and pavements.

Pavement design

Design criteria for temporary excavation, temporary protection such as sheet piling, underpinning and temporary dewatering system.

Stability of slopes

Analysis of soils to ascertain presence of potentially expansive, deleterious, chemically active or corrosive materials or conditions or the presence of gas.

Deliverables

Two final reports sealed by a Texas Registered Professional Engineer with the project name and project number on the cover page and one cd-rom with the report in Acrobat "pdf" format.

Demolition

All site demolition shall be indicated on a separate demolition plan indicating all items to be turned over to the Physical Plant Department and all trees and vegetation that shall remain and be protected during construction.

Perform all demolition of existing surface and underground facilities/improvements as required to construct the project. Demolition plans/details shall be included in the design drawings. Underground facilities shall be removed as required to clear construction and in accordance with good prudent practice and considering potential future construction. As a minimum all structures shall be removed to a point 3' below natural ground. All cavities left below ground shall be filled with compacted native material or a flowable fill material. The portions of piping systems remaining in place shall be neatly cut and capped/plugged. Where partial demolition occurs the remaining portions shall be left in a finished functional condition. Coordinate with Physical Plant Department to determine any items to be salvaged and turned over to the Campus and clearly indicate these in the plans and specifications.

Fill all voids left by clearing and demolition operations with native material compacted in maximum 8" lifts to a density equal to that of the surrounding undisturbed soil.

Tree Protection

Provide adequate tree protection around all trees in project site that are to remain. Also, refer to Division 1, Section 01 50 00 for additional information.

General Information

Concrete

All cast-in-place concrete shall be designed, transported, placed, finished and cured in accordance with American Concrete Institute (ACI) requirements. Components of the concrete mix shall meet applicable ANSI/ASTM requirements. Mix requirements and strength shall be specified by the Design Team for each item of construction. Limit the number of mix strengths specified as much as practical.

Concrete form work shall meet applicable ACI requirements.

Concrete reinforcement material, design and placement shall meet the applicable requirements of ACI and the Concrete Reinforcing Steel Institute (CRSI) along with associated ASTM requirements. Reinforcing bars shall typically be Grade 60. No welded wire fabric reinforcing is allowed except in topping slabs or unique situations as approved by the FPC Project Manager. Main reinforcing bars to be minimum No. 4 in size. Limit No. 3 bars (Grade 40) to ties and dowels.

Admixtures to the concrete mix meeting applicable ANSI/ASTM specifications may be used as recommended by the structural engineer to improve concrete workability, wear/weather resistance characteristics, etc., to better meet project conditions. Pozzolan Admixtures should used only within the limits recommended by the structural engineer and approved by the Owner.

The project specifications shall clearly establish finish measurement tolerances/standards suitable to the intended use of the surface and its exposure along with other quality control requirements needed to verify the concrete meets the specifications.

Curing compound manufacturer is to provide certification that their product is compatible with the finish flooring scheduled for the space.

Void Space Below Grade Beams

Provide soil retainers at face of grade beams below grade to form a void of sufficient depth to prevent expansion of earth to cause pressure on bottom of beams. Acceptable product is SureRetainer by MotzBlock.

General Floor Loading

Design floor live loads on all major buildings to carry a minimum of 100lbs/s.f. unless greater is required by Code and/or use for a particular space such as library shelving. This allows flexibility of future design when the building is renovated. Floors must be designed sufficiently rigid to prevent objectionable vibration.

Porches and Steps

All stoops, porches, ramps, docks and steps, exterior and interior should have non-slip surfaces and nosings where applicable. Slope exterior porches and treads where allowed by TAS to drain water. Exposed concrete finished work shall be accomplished in two pours: the first structural and the second being a two inch minimum finish topping poured near completion of project.

Primary entry floors may not be constructed using brick or pavers since these surfaces are excessively noisy when carts are rolled across them.

Cement Finished Floors

Generally cement finished floors are to receive hardener with colorant. Positive protection is to be provided to prevent staining and chipping during construction work. Slick finishes shall be avoided.

Crawl Space Under Suspended Structural Foundations

Provide an accessible crawl space with 2 inch thick, 2500 psi unreinforced mud slab, properly sloped and drained, under all buildings unless otherwise directed by Associate Vice Chancellor for Facilities Planning Division. All crawl spaces must be provided with lighting and ventilation (minimum 2 air changes per hour) along with adequate access hatches and access ladders. Area ways can be used as a means of access to a crawl space.

Concrete Reinforcing

No welded wire fabric shall be used for reinforcing concrete except in topping slabs. All other reinforcing shall be by bars.

Precast, Tilt-up and/or Special Finished Concrete

On projects designed for precast, tilt-up and/or special finished concrete, the Specification shall require a sample panel, constructed all as specified, or at least 42 square feet to be erected at the jobsite for approval consideration by the Assiciate Vice Chancellor for FPC. The approved panel shall remain on the jobsite as a visual criterion which the final construction must match.

Roof Decks

The preferred material for flat roof decks is concrete. Where the roof is supported by a combination of structural steel, steel joists and steel deck, the topping shall be standard weight concrete.

The main slope for the roof shall be accomplished by the structural system. Only secondary slopes can be accomplished by the roof system.

Mow Strips

2' wide x 4" thick continuous reinforced concrete mow strips shall be doweled to the building foundation in grassed areas which will require mowing. Mow strips shall also be doweled to the back of curb in grassed areas adjoining head in parking areas which are subject to car bumper overhang. Mow strip to be sloped in the direction of drainage. Jointing shall be provided to match that in the adjoining curb.

General Information

Brick

Brick masonry to be designed and constructed per the standards of the Brick Institute of America

Brick Selection Procedure

Brick will be selected during project design and shall be specified in the bid documents.

Face Brick shall be ASTM C216; Type FBS grade SW.

In the drawings the A/E will provide a detail that indicates the size of the brick mock-up panel that will also contain all exterior materials such as stone, cast stone, curtain wall, glazing, sealants, etc. for final approval of brick color as well as all exterior colors for the project.

The A/E shall require, in the Project's Specification along with a detail in the drawings, that prior to ordering brick, the Contractor shall erect a 300 brick sample panel in mortar, all as specified, at the jobsite for final approval consideration by the Associate Vice Chancellor for FPC or designee. The approved panel shall remain on the jobsite as a visual criterion which the final construction must match.

Mortar shall be Type N with concave tooled joints.

Expansion joints and control joints in masonry veneer walls shall be appropriated detailed and shown on building elevations. Extra precautions shall be taken at Texas A&M International University due to extreme summer temperatures.

Concrete Masonry Units (CMU)

Concrete masonry units shall be used wherever feasible for back up to exterior face brick.

Concrete masonry units shall comply with ASTM C90.

Use bullnose type concrete masonry units at all edges and exterior corners.

Stone

Limestone shall be no closer than 4 inches to grade when adjacent to lawns and planting areas.

Marble and granite shall be domestic.

Anchors, dowels and other accessories used in setting stone shall be stainless steel.

Overhung Masonry

Construction where the masonry units are suspended using concealed mechanical devices, or where the units extend beyond lower courses and concealed mechanical support devices are required are not to be used. Building being renovated which have such overhung masonry units shall be carefully examined for safety and a report of condition provided.

Masonry Accessories

Mortar net or a comparable mortar collection product shall be added to the base of brick veneer and single wythe concrete masonry walls to prevent clogging of weep holes.

Campus Specific Information

Texas A&M University

Brick

Acme Brick: ELP Blend No. 172 Modular Velour Paloma Grey
Acme Brick: PEP Blend No. 250 Modular Velour Royal Oak
Boral Brick: Stone Castle #103
Interstate Brick: Modular Velour Valley Tan
Interstate Brick: Modular Velour Tumbleweed

Cut Stone

Cordova Cream Texas Limestone

Cast Stone

Cast Stone shall be mixed thoroughly dry as follows: One (1) sack Atlas White Portland Cement with one (1) oz. of Lanbert Bright Yellow Color. After Blending the above, use the following mixture:

Four (4) parts "Big Sandy" sand to one (1) part of blended cement color

mixture. Stone should match stone on TAMU Northside Parking Garage.

Tarleton State University

Brick

Acme Brick: EUR Blends No. 230, 240, 245 and 260

Prairie View A&M University

Brick

Acme Brick: TUP Blends No. 2-25%, 3-30%, 5-35% and 20-10% Modular Velour
Acme Brick: EUR Blends No. 230-25%, 240-25%, 260-30%, 241-20% Modular Velour
Cloud Ceramics: Navajo Blend Modular Velour

Texas A&M University at Galveston

Brick

Acme Brick: PEP Blend No. 30 – Dove Grey

Texas A&M University-Corpus Christi

Brick

Acme Brick: PEP Blend No. 58 Shamrock Modular Velour with white mortar
Interstate Brick: Artic White Modular Velour with white mortar
D'Hanis Brick: Accents Only

Texas A&M International University

Brick

Acme Brick ELP Blend No. 130 Heritage Americana
Acme Brick Blend No. 218 Scratched Face

Cut Stone

Honed Buff Light Range Lueders Limestone, quarried by Featherlite, Texas Quarries Division, Austin, Texas
Dolomite Limestone quarried by Valders Stone and Marble, Inc., Valders, Wisconsin.

Texas A&M University-Kingsville

Brick

Acme Brick ELP Blend No. 154 Sierra
Acme Brick ELP Blend No. 102 Yellow/Tan Martini

West Texas A&M University

Brick

Acme Blend PEP Blend No. 166 Marble Grey
Boral Brick Medium Brown No. 10-670 & Light Grey No. 10-933

Texas A&M University-Commerce

Brick

Acme Brick Blend No. 4 Modular Velour Windsor Park

Texas A&M University-Texarkana

Brick

Acme Brick TUP Blend No. 20 50% and
Acme Brick TUP Blend No. 33 50%

General Information

Structural Steel

The contractor shall be required to provide an affidavit, at the completion of the project, that the structural steel framing is plumb and level within the normal tolerances specified in the AISC Code of Standard Practice.

The main slope for the roof shall be accomplished by the structural system. Only secondary slopes can be accomplished by the roof system.

Cold-Formed Metal Framing

Cold-formed metal floor and wall framing shall be spaced 16 inches on center, maximum.

Metal Fabrications

All exterior ferrous metals shall be hot dip galvanized.

Wherever dissimilar metals come in contact with each other, they must be separated with an approved layer of bituminous coating. Galvanized metal or zinc plated fasteners shall not be used to anchor aluminum or copper. Use aluminum or copper fasteners.

Metal Stairs

Metal stairs with concrete, terrazzo or other similar treads are acceptable for use as egress stairs.

Campus Specific Information

Texas A&M University at Galveston
Texas A&M University-Corpus Christi

All exposed exterior ferrous metal shall be stainless steel.

Kynar finish on exterior pipe railings is not allowed.

General Information

Consider specifying products from sustainable sources such as FSC Certified Wood or regionally available from abundant sources. Avoid use of imported or exotic species of woods.

Wood Treatment

Wood used in conjunction with roofing installations and wood which is installed in contact with concrete or masonry shall be pressure treated with an approved preservative to meet AWPS Standards. Other installations shall receive prime coats suitable for finishes specified as soon as installation is complete. Back prime where dampness or warping is anticipated.

Sheathing

The preferable construction for exterior walls is brick with concrete masonry back-up and a gypsum wallboard interior finish material. If the exterior wall is brick with metal stud back-up then the sheathing material shall be Densglass Gold or equal. Gypsum sheathing shall not be used.

Finish Carpentry

Materials and fabrication shall conform to Architectural Woodwork Institute specification for Custom quality work.

Millwork

Materials and fabrication shall conform to Architectural Woodwork Institute "Quality Standards" specification. Use "Custom Grade" for standard millwork and "Premium Grade" for unique and special features.

Architectural Wood Casework

Materials and fabrication shall conform to Architectural Woodwork Institute specification for Premium quality work.

General Information

Building Envelope shall conply with State Energy Code, ASHRAE 90.1-2004.

Building Insulation

Maximize insulation value of the building envelope to conserve energy and incorporated an air barrier. Avoid insulation material containing formaldehyde and consider insulations with recycled content.

Roofing

Roofing system shall be determined by local Physical Plant Department or as indicated in this Division.

Specify service walkways (minimum 2'0" in width) appropriately located to service all roof top equipment from the roof access.

Carefully detail roof expansion joints and flashing.

Completely detail all parapet walls, caps, coping and scuppers. Top of coping should slope toward roofs.

Detail roof edges sufficiently high to prevent water from spilling over and spotting walls and fascias where roof drains are used.

Provide drips on overhangs, ledges, window stools and coping to prevent discolorations of fascias, soffits and walls.

Ensure that sealants specified are to be used within their limitations. When pre-cast concrete wall panels are used, ensure proper compatibility between the surface sealant and the concrete panel when caulking a joint.

Flashing materials for permanent type buildings to be aluminum, stainless or copper (not galvanized metal).

Slope roof adequately to drain (minimum 1/4"/ft. slope). Design primary roof slopes for new buildings into structural frame and not by roof insulation. Crickets to roof drains may be sloped with insulation. Metal building roofs (minimum 1/4"/ft. slope).

Lightweight concrete insulating fill roof decks will not be used in conjunction with urethane roof system. Lightweight structural concrete is allowed.

Specific Campus Requirements

Texas A&M University

Single Ply or Urethane Foam

Tarleton State University

Single Ply

Prairie View A&M University

Modified Bitumen

Texas A&M University-Corpus Christi

Modified Bitumen

Texas A&M International University

Clay Tile and Single Ply

Texas A&M University-Kingsville

Clay Tile or Modified Bitumen

West Texas A&M University

Single Ply
Pitched Roofs – Standing Metal Seam Deck or Composite Shingles

Texas A&M University-Commerce

Modified Bitumen

Texas A&M University-Texarkana

Fully Adhered TPO Membrane

Guide Specification

Urethane Foam Roof System

1.0 GENERAL

1.1 SUBMITTALS: The following shall be submitted for review by the project architect prior to the start of any contract roof work.

A. Data

Submittals which provide descriptions or documentation regarding the work and descriptive information regarding products, materials, equipment, or components to be used in the work.

B. Instructions

Preprinted material describing installation of a product, system or material, including special notices and material safety data sheets, if any, concerning impedances, hazards, and safety precautions.

C. Certificates

Statement signed by an official authorized to certify on behalf of the manufacturer of a product, system or material, attesting that the product, system or material meets specified requirements. The statement must be dated after the award of the contract, must state the Contractor's name and address, must name the project and location, and must list the specific requirements which are being certified.

1.2 SCOPE

A. This section specifies polyurethane foam roof systems.

B. Packaging: Materials are to be received in sealed containers of the approved manufacturer; shipped from the factory with legible manufacturer's labels and underwriters labels thereon where applicable.

C. Batch Date: Age of packaged materials shall be evidenced by the date of batch clearly stamped on the container.

D. All material shall be new and to be applied within six (6) months from time manufactured as evidenced by the batch date.

1.3 WARRANTY

A. Roofing System: The Contractor shall provide a manufacturer's written warranty, as specified in paragraph 3.5, covering failure of the Foam Roof System against defects in manufacturing, materials, and/or workmanship. Failure is defined to include, but is not necessarily limited to, defects or deterioration of the system resulting in material discoloration, delamination, peeling, or cracking. Warranty period is ten (10) years after the date of substantial completion.

B. Guarantee Inspections: On expiration of the first year and at least every other year thereafter of the guarantee period, the Coating Manufacturer Accompanied by the Owner shall inspect the urethane foam and coating system to determine the condition of the roof.

1. Any repairs that are necessary shall be accomplished as stated in the guarantee.

2. The Coating Manufacturer shall submit to the Owner a report stating the results of each inspection as it affects the remaining period of the guarantee.

2.0 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Urethane Foam Roof System shall be UL-790 (ASTM E-108) Class A and UL-723 (ASTM E-84) approved, and comply to International Building Code requirements. Roofing System shall also comply as an assembly with UL 1256, Fire Test of Roof Deck Constructions. Roofing System shall comply with UL-1897 Standard for Wind Uplift and UL-2218 Standard for Impact Resistance.

2.1 SPRAY APPLIED MEMBRANE MATERIALS

A. Primers: As required by Materials Manufacturer for the following items or conditions:

Non-ferrous metals.
Ferrous metals.

B. All applications shall be applied with the appropriate mil thicknesses as recommended by the approved manufacturer.

C. Polyurethane Foam: Provide 3 PCF Density, two Component System, 1:1 ratio formulated for use on roofs where smooth surface characteristics are desired.

D. Approved manufacturers: If it meets the criteria of this specification, the following manufacturers will be acceptable;

PSI - S245-30 (SS, RS, WS) Bay Systems North America, Spring, Texas
Elastospray HPS-81302, BASF, Carrollton, Texas
RT-2031, Resin Technology, Ontario, California

1. Foam manufacturer shall provide manufacturing date of foam components. Foam shall be applied within six months of date of manufacture.

2.2 SILICONE COATING SYSTEM

A. Silicone coating shall consist of a two-coat system, fluid applied elastomeric membrane with granules for protection of polyurethane foam.

B. Approved manufacturers: If it meets the criteria of this specification, the following manufacturers will be acceptable:

BASF Elastocoat Silicone 3-5000
Everest Silicone Coating - Eversil 580
G.E. Silicone Coating - SCM 3308 Base Coat and SCM 3304 Top Coat
Neogard RTV Silicone #7850

1. Coating manufacturer shall provide manufacturing date of coating components. Coating shall be applied within six months of date of manufacture.

C. Granules: Shall be #1 grit blasting sand. Color to be selected from manufacturer's standard colors.

2.3 ACCESSORIES

A. Roof Jacks: As recommended by the roof system manufacturer, high temperature vents shall have insulation sleeve and storm collar. Roof jack construction and installation shall meet requirements of the International Building Code, International Plumbing Code, International Mechanical Code and NFPA 54, National Fuel Gas Code.

3.0 EXECUTION

3.1 SURFACE PREPARATION

A. Inspect existing roof system and parapet prior to starting any work. Make note and notify Owner of conditions unfavorable to beginning work.

B. All ferrous metal flashing, trim, vent stacks, cants, etc. will be cleaned dust and grease free prior to priming with specified primer.

C. All non-ferrous metals will be cleaned and chromate etched prior to applying specified primer.

D. No primer will be installed over metals, ferrous or non-ferrous, without a visual inspection by the Owner's representative of all preparation. Failure of inspection may constitute removal of work and work re-attempted until accomplished correctly without any additional cost to the Owner.

3.2 APPLICATION OF SPRAY FOAM

A. Prior to spraying foam the following criteria must be met: Contractor shall give Owner 48 hours notice prior to spraying any material, including primer, foam or coating.

B. The Contractor shall provide all necessary barricades, signs, warning of spray area as determined in the preconstruction conference. The Contractor shall set these signs out the night before spraying begins.

C. The Contractor shall be responsible for the removal of signs and barricades at the completion of the job.

D. The Contractor shall protect any automobile, bicycle, vehicle or other

property which is located in a warning area where contact with the Owner has not been made. The Contractor shall secure the property with a polyethylene cover and maintain as necessary during spray operations.

E. The Contractor shall employ approved wind screens for all foam applications. The Contractor is responsible for all overspray and shall have sole liability where damage occurs as a result of this work. Suspend foam spraying when wind speeds exceed 15 miles per hour.

F. Spray foam applicator shall be approved by the materials manufacturer. Spray foam operations shall be performed only during adequate period of calm, open weather, roof surface and ambient temperature above 50 degrees F., winds not exceeding 15 miles per hour. Protect all property from overspray or other damage.

G. Roof surfaces to receive spray foam shall be dry and free of dew or frost. Primer shall be dried free of solvent. One gallon per 100 square feet of surface minimum coverage. Any areas where primer is ponding shall be removed down to existing surface and re-primed with one thin coat of primer.

H. In areas where total tear off of existing built-up roofing is indicated, apply two inches of new urethane foam roof system as needed to ensure positive drainage.

I. In areas where partial removal of existing foam roofing is indicated, remove one-half inch to one inch of existing foam and apply one of new urethane foam to ensure positive drainage. Spray foam shall be applied in smooth uniform thickness over the entire area except those areas where greater thickness is required for proper drainage, and where other thicknesses are called for on the drawings. Foam shall be coved onto the walls, projections and feathered smoothly into drains, as indicated by the drawings. Grind foam smooth and trough around drains for proper drainage.

J. Low areas, which form puddles, shall be no longer than 18 inches in longest dimension and no deeper than ½ inch. Contractor shall perform a water test 48 hours prior to final inspection, to identify low areas and insure all roof drains are functioning properly.

K. The quantity of spray foam installed per day shall be regulated by the

applicator's capacity to apply protective coating during the same day. Any foam left exposed overnight, to include tie-ins, shall be dried and thoroughly primed prior to continuing with the application of new foam or coating.

L. Finished Surfaces: The finished surface texture of the applied spray foam shall be free of excessive ridges, bumps and pinholes, etc. "Popcorn" or "Tree Bark" surfaces as defined by the UFCA coating committee are not acceptable. The finished surface shall be in acceptable condition, without water, dew or excessive moisture prior to application of the specified coating system.

3.3 PROTECTIVE COATING

A. The coating applicator shall be approved by the material manufacturer. Protect all property from overspray or other damage.

B. Protective Coating: Silicone coat shall be applied the same day the foam is applied. ***NO EXCEPTIONS ALLOWED!*** Coating shall not be applied later than one hour prior to sundown. Any late spraying of coating can only be done with Architect's approval.

C. Equipment: Shall be as required by approved coating manufacturer. Contractor shall submit data on the equipment as specified by the coating manufacturer. Data shall identify, pump ratio, components, pressure ratings and performance criteria.

D. Silicone Coating, Base Coat: Apply to all horizontal surfaces to yield an average of 8 dry mils thickness on horizontal surfaces and 8 dry mils on vertical surfaces. The base coat shall be applied in a single coat using airless spray equipment. Coating to be sprayed using crosshatch method making sure the entire surface is coated evenly without pinholes, sags or curtains.

NOTE TO APPLICATOR: Backroll basecoat to ensure adequate seal of existing surface.

E. Intermediate Coat: Apply to all horizontal surfaces to yield an average of 8 dry mils thickness on horizontal surfaces and 8 dry mils on vertical surfaces. Coating to be sprayed using crosshatch method making sure the entire surface is coated evenly without areas of pinholes or sags.
NOTE TO APPLICATOR: The above quantities should yield a

minimum of 16 dry mils must be achieved prior to top coat and granule application. Upon the satisfaction of proper foam texture requirements, these minimum requirements can be achieved. A wet mil gauge should be used to check thickness. Verify application thicknesses by taking sample slits to ensure minimums. Granules cannot be applied until Owner can verify that the manufacturer's required minimum thicknesses have been achieved.

F. Silicone Coating, Top Coat: Apply to all horizontal surfaces to yield an average of 8 dry mils thickness and 8 dry mils of vertical surfaces. Coating to be sprayed using crosshatch method making sure the entire surface is coated evenly without areas of pinholes or sage.

G. Granules: Immediately upon completion of topcoat application, granules shall be uniformly broadcast over the wet silicone, at the rate of 50# per 100 square feet, totally covering the entire silicone roof surface.

H. Details: Apply an extra heavy coating in each application around all projections, parapet wall, junctions and drains. Coating shall be applied beyond the foam in a double lap coat 4 inches or as far as possible.

I. Batch Mixing: Shall be as recommended by the approved coating manufacturer. Contractor shall submit for approval all documentation regarding the proper mixing and batching of elastomeric coating material. Identify procedure, process of mixing, equipment required, components and sequencing solvents required.

3.3 INSPECTION

A. The Contractor shall maintain a daily project log containing the following information:

1. Temperature and relative humidity at start time, midday and end of day (sling psychrometer permitted)
2. Wind velocity (speed and direction)
3. Sky conditions (overcast, partly cloudy, etc.)
4. Amount of coated foam or coating installed
5. General remarks

A log shall be submitted to the Architect at the end of each day or as directed by project inspector.

B The Contractor shall flood the roof with water 48 hours prior to final inspection. This procedure shall be coordinated with and in the presence of the Owner. Flooding will provide a means for checking roof drains, low areas and cleaning of roof prior to final inspection.

C. The coating manufacturer shall make an on-site inspection, accompanied by the Owner upon completion of the project. The manufacturer shall submit a report to the Owner stating the final results of the on-site inspection and approval of the application of the materials.

D. The inspection shall include, but not be limited to the following: A slit sample, each 2,000 s.f., 2 inches long x ½ inch wide x 3/4 inch deep. Slits shall be closed by the Contractor using an approved silicone caulk. Depth of foam shall be measured adjacent to slit area.

E. Film thickness shall be measured. Overall thickness shall average 24 mils, with top coat of 8 mils.
Thickness shall not vary over .5 mils.

F. The Architect shall periodically inspect the project for compliance with the specification requirements.

3.4 CLEANUP

A. Limited equipment cleanup, such as nozzles, on the roof will be allowed, and only with a suitable nonflammable solvent such as methylene chloride. Major cleaning of equipment shall be confined to the ground.

3.5 GUARANTEE

A. The Contractor shall certify that the foam and coatings were applied in accordance with the manufacturer's recommended procedures. The Contractor shall submit an executed copy of the Guarantee before final payment.

B. The Contractor shall furnish to the Owner a manufacturer's written guarantee, guaranteeing all materials and workmanship for a period not less than ten (10) years from date of final acceptance.

C. The urethane foam and silicone coating system shall be guaranteed against failures of workmanship and materials. Repair of the system, including materials and labor, shall be at no cost to the Owner.

D. On expiration of the first year of the guarantee, the **COATING MANUFACTURER, FOAM MANUFACTURER AND CONTRACTOR** accompanied by the Owner, shall inspect the urethane foam and coating system to determine the condition of the roof.

E. Any repairs that are necessary shall be accomplished as stated in the guarantee. Any defects and corrections necessary, but not covered under the guarantee, shall be at the Owner's expense.

F. The coating manufacturer shall submit to the Owner a report stating the results of each inspection for the remaining period of the guarantee.

APPLICATION FOR ACCEPTANCE OF ROOFING SYSTEM

CONTACT INFORMATION: **INDEX NUMBER:**

ROOFING CONTRACTOR (NAME & ADDRESS)	TELEPHONE NO.:	**FAX:**
	E-MAIL ADDRESS:	**CONTACT:**
CLIENT (NAME & ADDRESS)	TELEPHONE NO.:	**FAX:**
	E-MAIL ADDRESS:	**CONTACT:**

OVERVIEW OF WORK: *(Submit 1 form per roof area)*

Building Name & Number:		
Building Dimensions: Length: *ft/m;*	Width: *ft/m.;*	Height *ft/m.*
Roof Slope:		
Parapet Height ,max *(in./m)*:	Parapet Height ,min *(in /m):*	
Type of Work: ☐ New Construction ☐ Recover (New roof over existing Roofing System) ☐ Reroof (New cover/remove existing roofing system to deck) ☐ Other		
FM Approved RoofNav Assembly Numbers:		

ROOF SURFACING:

☐ None	
☐ Coating	*(Trade Name/Application Rate)*
☐ Granules	*(Application Rate)*
☐ Gravel/Slag	*(Application Rate)*
☐ Ballast: ☐ Stone Size ☐ Pavers *(Beveled or square edge)* ☐ Other:	
Ballast Weight (psf): Field: Perimeter: Corners:	

ROOF COVER/MEMBRANE:

(Please provide ALL applicable details including trade name, type, number of plies, thickness, reinforced, adhesive)

☐ Panel: ☐ Through Fastened Metal ☐ Standing Seam metal ☐ Fiber Reinforced Plastic (FRP) ☐ Other:			
☐ Built Up Roofing (BUR)			
☐ Modified Bitumen			
☐ Single Ply:	☐ Adhered	☐ Fastened	☐ Ballasted
☐ Spray Applied			
☐ Other:			

BASE SHEET:

(Please include Trade Name, Type, and Thickness)

☐ None		
Trade Name:		Width: ☐ 36 In. ☐ 1 meter (39 In.)
☐ Fastened		☐ Adhered
☐ Secured per RoofNav	**OR**	☐ Per FM Global Loss Prevention Data Sheet 1-29
Comments:		
☐ Air Retarder		
☐ Vapor Retarder		

INSULATION

Layer	Trade Name	Thickness (In.)	Fastened	Adhered	Tapered
1. Top			☐	☐	☐
2. Next			☐	☐	☐
3. Next			☐	☐	☐
4. Next			☐	☐	☐

☐ Glass Fiber/Mineral Wool/Batt	☐ Facer Type/Vapor Barrier
☐ Thermal Barrier	
☐ Other:	
☐ None	

APPLICATION FOR ACCEPTANCE OF ROOFING SYSTEM

DECK:

(Please include manufacturer, type, yield strength, thickness/gage, etc.)

☐ Steel:	
☐ LWIC (Form Deck):	☐ Cementitious Wood Fiber:
☐ Concrete: ☐ Pre-cast panels or ☐ Cast in Place	
☐ Wood	
☐ Fiber Reinforced Cement	☐ Fiber Reinforced Plastic
☐ Gypsum: ☐ Plank	☐ Poured
☐ Other:	
Comments:	

ROOF STRUCTURE (Include Size, Gage, Etc.):

☐ Purlins ☐ "C" OR ☐ "Z"		
☐ Joists ☐ Wood OR ☐ Steel		
☐ Beams ☐ Wood OR ☐ Steel		
☐ Other:		
Spacing: Field:	Perimeter:	Corners:
Comments:		

FASTENERS USED IN ROOF ASSEMBLY:

Roof Cover Fasteners: Trade Name:	Length:	Diameter:
Stress Plate/Batten:		
Spacing: Field: X	Perimeter: X	Corners: X
Insulation Fasteners: Trade Name:	Type:	
Size:	Stress Plate:	
Spacing: Field:	Perimeter:	Corners:
Deck Or Roof Panels Fasteners: Trade Name:	Type:	
Length:	Size Washer:	
If Weld: Size:	Weld:	Washer:
Deck Side Lap Fasteners: Field: X	Perimeter: X	Corners: X
Spacing: Field: X	Perimeter: X	Corners: X
Base Sheet Fasteners Trade Name:	Type:	
Head Diameter:	Length:	
Spacing: (Attached Sketches as necessary) Spacing Along Laps: Field:	Perimeter:	Corners:
No. Intermediate Rows: Field:	Perimeter:	Corners:
Spacing Along Intermediate Rows: Field:	Perimeter:	Corners:

PERIMETER FLASHING:

(Attach a detailed sketch of metal fascia, gravel stop, nailer, coping, etc.)

☐ FM Approved Flashing	☐ Per FM Global Loss Prevention Data Sheet 1-49
☐ Other:	Comments:

DRAINAGE:

For new construction: Has roof drainage been designed by a Qualified Engineer per FM Global Loss Prevention Data Sheet 1-54 and the local building code? ☐ Yes ☐ No (Attach details)
For re-roofing and recovering: will the roof drainage be changed from the original design (for example: drain inserts, drains covered or removed, new expansion joints, blocked or reduced scupper size? ☐ Yes ☐ No If yes, were the changes reviewed by a Qualified Engineer? ☐ Yes ☐ No (Attach details)
Is secondary (emergency) roof drainage provided per FM Global Data Sheet 1-54? ☐ Yes ☐ No (Attach details)

Signature of Property Owner: _____

Title: _____ Date: _____

Signature of Installing Contractor: _____

Title: _____ Date: _____

APPLICATION FOR ACCEPTANCE OF ROOFING SYSTEM

FM Global OFFICE REVIEW
(Please leave blank for FM Global Office Review)
WIND:

Design Wind Speed: *(mph)*	Ground Terrain: ☐ B ☐ C ☐ D
Uplift Pressure in field: *(psf)*	Uplift Rating Required:
Adequate Uplift Rating Provided:	Adequate? ☐ Yes ☐ No

FIRE:

Internal Assembly Rating:	☐ Class 1	☐ Class 2	☐ Non-Combustible	
External Fire Rating:	☐ Class A	☐ Class B	☐ Class C	☐ None
Concealed Spaces?	☐ Yes	☐ No	Sprinklers below Roof?	☐ Yes ☐ No
Adequate?	☐ Yes	☐ No		

HAIL:

Hail Rating Needed?	☐ SH	☐ MH	☐ None	Hail Rating Provided?	☐ SH ☐ MH ☐ None
Adequate?	☐ Yes	☐ No			

COLLAPSE:

If standing seam, has collapse been reviewed? ☐ Yes ☐ No

COMMENTS:

Reviewed By: _____

Date: _____

FM Global Field Review:
(Leave blank for on-site review by FM Global Loss prevention Consultant):

System installed per reviewed/accepted plans? ☐ Yes ☑ No
If no, explain:

Installation witnessed by FM Global? ☐ Yes ☐ No

Uplift test needed? ☐ Yes ☐ No

(Uplift testing is REQUIRED for applicable new and re-cover roofs in hurricane, typhoon or tropical cyclone prone regions (see DS 1-29 and 1-52 for more information)

Uplift testing satisfactorily completed ☐ Yes ☐ No ☐ DNA

If yes, note pressures held for the: Field_____ Perimeter _____ Corners _____
If no, explain and provide required and obtained uplift pressures and other details and attach to this form.

Reviewed By: _____

Date: _____

General Information

Building fenestration shall comply with State Energy Code, ASHRAE 90.1-2004, including assembly U values, assembly SHGC and percentage of glass.

Ensure that windows, doors, and louvers are designed for adequate wind loading and velocity pressures as per International Building Code and Texas Windstorm requirements as applicable.

All general use building entrances shall have a vestibule. At least one door at primary entrances shall be power operated. Primary entrances shall be designated by the User Coordinator and Physical Plant Department.

Doors may be sliding or swinging, as appropriate to the building use and design, with safeguards and handicapped accessibility as necessary. One-way or two-way types may be used, depending upon traffic. Door types, materials, hardware, and sensors shall be established designs with proven field experience under similar usage. Consideration shall be given to availability of trained service technicians and spare parts.

One or more entrance doors may require card key access. These entrances shall be selected by the User Coordinator. The door frames shall be prepped as a part of the design and construction of the building. The card key devices shall be acquired by the Campus and delivered to the Contractor for installation or installed by the Physical Plant Department.

The use of daylighting in the building design is strongly encouraged. Use of skylights is not allowed unless approved in writing by the Physical Plant Department. Use of protected clerestory glazing is allowed.

Warning bars or cross mullions shall extend across all full height glazed areas. Meet requirements of "Model Safety Glazing Code" and "Consumer Product Safety Commission."

Doors and Frames

Exterior and interior personnel doors shall not be taller than 7 feet high unless approved by the Physical Plant Department.

All entrance doors and frames shall be hinge and strike reinforced for “High Frequency” use.

Hollow Metal Exterior Doors shall be not less than 16 gauge with 14 gauge or heavier one piece welded frame. Door and frame shall be A60 galvanized.

Interior Hollow Metal Doors shall be not less than 18 gauge with 16 gauge one piece welded frame.

Interior wood doors shall be at least 1-3/4" thick to accommodate mortise locks.

Interior wood doors are generally flush type, solid core, hardwood with lifetime warranty. Wood doors can be either wood veneer or plastic laminate faced. Exotic wood veneers are prohibited.

Entrances, Storefronts and Curtainwalls

Metal framed glazed entrance assemblies shall have stiles of sufficient width to receive mortise locksets and/or panic hardware. Custom styled doors with vision panels may be used. Locksets shall be at conventional height and shall not be permitted in bottom rails. Bottom rail shall be a minimum of 12 inches and top rail shall be a minimum of 6 inches.

Wherever possible utilize storefront systems instead of curtainwall systems.

Include in specifications, steel reinforcing inserts in the hinge jamb section of doors in aluminum storefront systems.

Storefront, curtainwall and window frames shall have a color to match the campus standard.

Windows

Heads, jambs, and sills of windows in walls shall be flashed and shall be caulked or sealed during the window installation, prior to the placement of snap-on moldings or covers, to ensure that concealed surfaces are properly sealed against the penetration of wind and water. All windows should have drips at heads and sills.

Projected and casement type windows, and flush mounted windows are difficult to maintain watertight and their use is discouraged.

Design windows with maintenance in mind and include provisions for cleaning windows above third floor.

Hardware

A minimum of one pair of exterior double doors shall have a keyed, removable mullion for equipment access.

Use thresholds and weather stripping at exterior doors to prevent air and water infiltration.

Specify all finish hardware. Locksets will be by the manufacturers' below and for the most part shall be heavy duty mortise type with key removable core cylinders (except at Tarleton). Locksets shall accept interchangeably the cores and cylinders from the manufacturer(s) below

All doors leading into hazardous spaces, mechanical, electrical and telecommunication rooms shall have a textured surface on the door lever.

Contractor shall execute construction core agreement with Locking Systems Supplier prior to shipment of permanent cores.

Satin chrome plated finish is generally used.

Door closers by LCN, Norton or Sargent are acceptable; hinges by McKinney, Hager, Lawrence, or Stanley are acceptable; equal quality hardware of other manufacturers will be acceptable.

Specify plated hinges only for doors receiving a natural or transparent finish; specify prime coated hinges for painted doors.

Specify ball bearing or oilite bearing hinges only on doors which receive closers. Non-removable pin hinges for out swinging exterior doors and other "secured" areas. Specify closers generally for exterior doors, doors in fire-rated walls, and toilet room doors. Special laboratory conditions or other special room function may require use of closers on doors.

All doors having closers should be protected from wear of wheelchairs by a minimum of 10" high kickplates.

Do not specify pivot hinges or concealed closers.

The A/E shall investigate the security requirements for the project and develop an appropriate keying system. The specifications shall call for two (2) keys for

each lockset, One (1) control keys along with an appropriate quantity of grandmaster, master and sub-master keys to be provided. A Bitting Schedule and set number of key blanks will also be required. Final keying functions shall be established during a key conference conducted by FPC, with the A/E, User, Contractor, and successful hardware supplier during construction.

Glazing

High performance glazing is strongly encouraged with a tint to match surrounding buildings. Highly reflective (mirror) glass and dark tinted glass are not allowed.

Partial shading of insulating glass can cause stress breakage. Manufacturers consider this to be a design error and will not replace glass broken by temperature differential stresses. Avoid partial shading of large panes.

Provide manufacturer's written guarantee that for ten years from date of Substantial Completion a replacement will be provided for any insulated glass unit which develops edge separation or other defects which materially obstruct vision through the glass or safety or affects the insulating qualities. Guarantee shall not cover glass breakage from physical abuse, storm or similar causes.

Specific Campus Requirements

Texas A&M University

Hardware

Hinges

All hinges shall be full mortise template five-knuckle, 4-1/2 inches high as manufactured by Hager, McKinney or Stanley. Use Non Removable Pin (NRP) feature on all exterior doors that swing out. Use the proper hinge width as determined by the clearance required.

Exterior doors over 36 inches and all primary entrance/exit doors. Use heavy weight, four bearing, stainless steel hinges with 630 finish.

All other exterior doors. Use standard weight/medium frequency, two bearing stainless steel hinges with 630 finish.

Interior doors over 36 inches, all corridor doors, and doors with closures - Use

heavy weight four bearing, steel hinges with 652 finish.

All other interior doors - Use standard weight medium frequency, two bearing steel hinges with 652 finish.

Locksets

Mortise locks shall meet, ANSI A256.13 Series 1000, Grade 1 Operational and Grade 2 Security. Listed by Underwriters laboratory for use on 3 Hour A label doors. Lock case and face plate dimensions fit standard door preparation as specified in ANSI A115.1. Locksets and Latch-sets must have the ability to change handling without opening the case. Other requirements are as follows:

Satin stainless steel No. 626 or 630 finish.

One inch stainless steel throw deadbolt.

3/4 inch throw anti-friction latch bolt standard.

Quick re-keying with Best interchangeable cores.

Solid lever trim with return.

3 year published limited warranty.

Furnish all locksets without cylinders. Acceptable locksets are:

Best 45H - 15H or 15M
Sargent 8200 – LNL
Schlage L Series – 06L

Cylinders

Cylinder housing and cores shall be manufactured by "Best" and shall be an extension of the existing A2 master key system using interchangeable B2 core cylinders 1E72 or 1E74 as applicable. Use Best interchangeable core cylinder 1E7C4 on exterior aluminum doors that have Adams Rite Locksets. 3 year published limited warranty.

The TAMU Keyshop will be responsible for changing out the construction cores with the permanent cores and for returning construction cores to Best Locking Systems.

Exit Devices

Devices shall be Satin stainless steel finish No. 630. Other requirements are:

Narrow stile exit devices only where the door stile dimension requires.

Use mortise exit devices only where a pair of doors cannot have a removable mullion. Use on the active leaf with a surface mounted device on the inactive leaf.

Five year mechanical warranty and one year electrical warranty.

Device to be equipped with lever. Acceptable exit devices are:

		Sargent	Precision
Rim Mounted		8813 ETL	2108
Rim Mounted, Fire		12-8813 ETL	FL2108-4908A
Surface, Verticle		8713 ETL	2208-4908A
Surface Verticle, Fire		12-8713 ETL	FL2208-4908A
Mortise		8913 ETL	2308-4908A
Mortise, Fire		12-8913 ETL	FL2308-4908A
Removable Mullion		980 (Steel)	PR-822
Removable Mullion, Fire		12-980 (Steel)	FL-822

Doors where electronic access is required and magnetic locks are going to be used, shall include an internal signal switch to break lock power. Only Sargent electric panics are acceptable wherever electric panics are specified.

Doors Closers

Door closer will have a heavy duty cast iron cylinder with all-weather hydraulic fluid, 10 year warranty, painted aluminum finish, UL listed for use on fire-rated doors, separate back check, sweep speed, and latch speed regulating valves, fully adjustable. LCN 4040 Series, Sargent 1430, Sargent 1431 (handicapped) are acceptable.

Any substitution or alternates will need to be approved by Physical Plant Department, Facility Maintenance and Renovation Division. Approval process will begin with FPC Project Manager.

Tarleton State University

Hardware

Hinges

Locksets

Sargent Zone 11 with 4-7/8 inch strike
For mechanical rooms which use the Sargent S series

Exit Devices

Sargent 8800 Series, Exterior doors to heve key dogging

Closures

Door Opener

Power Access 4300 Series

LCN 4041

Prairie View A&M University

Hardware

Best or Falcon removable cores (except Sargent locks on mechanical and equipment rooms)

Texas A&M University at Galveston

Hardware

Sargent removable cores

Texas A&M University - Corpus Christi

Hardware

All primary entrance doors shall be horizontal sliding

Service entry doors and frames shall be fiberglass construction

Hinges

Full mortise template hinges, five-knuckle type, plain bearing except at doors with closers or doors over 40 inches width furnish ball bearing type.

Non-removable pin at exterior doors. Non-ferrous hinges at exterior doors. 630 finish.

Furnish quantity of hinges per door as follows:

Doors up to 90 inches in height - 3 butts. Doors over 90 inches and less than 120 inches in height - 4 butts.

Furnish hinge sizes as follows for 1-3/4 inch doors:
Up to 3'-0" wide, - 4-1/2 x 4-1/2.
Over 3'-0" to 3'-4" wide - 5 x 4-1/2.
Over 3' - 4" wide - extra heavy 5 x 4-1/2.
Width of hinges adjusted as required to clear adjacent to.
Doors over 1-3/4" thick to receive heavy weight.
Hager, Stanley, McKinney, Lawrence or equal.

Locksets

Qualities: Mortise locksets, function as listed on schedule (function identification numbers of BHMA-PS). Backsets and strike types as required by conditions. Furnish with construction key system. All locks to accept interchangeable removable core cylinders.

Standard: ANSI A156.2, Series 4000 Grade 1. 626 Finish.

Source: Schlage D Series Rhodes.

Cylinders

As recommended by lock manufacturer.

Exit Devices

Wood and hollow metal doors: Von Duprin 88 Series with push trim or Sargent 9800 Series.

Door Closers

Fully hydraulic, full rack and pinion action high strength cylinder. Furnish complete with forged steel arms, necessary brackets and fasteners. Top of door mounting. Provide parallel arms at exterior doors. Provide hex nuts and bolts on wood doors. Provide necessary brackets and plates for complete working application. Furnish other scheduled accessories. Provide non-handed closers at doors requiring handicapped opening force requirements. Size closers in accordance with manufacturer's directions.

Standard: ANSI A156.4, Series 2000.

Source: LCN 1460/4040

Texas A&M International University

Hardware

Best removable cores

Texas A&M University-Kingsville

Hardware

Best 7 pin removable cores

West Texas A&M University

Hardware

Hinges:

All hinges shall be full mortise template hinges, 5 knuckle type, heavy-duty ball bearings, and 3-4 ½ inch butts per door.

Roton continuous hinges are to be used on all external doors and doors with special application i.e. abnormal weight or high volume usage. Finish on all hinges is to match other hardware on door, and existing surrounding hardware.

Hager Hinge Co. and Stanley Hardware are approved for butt style hinges.

Spring loaded hinges are to be used on approved doorways. PBB World Class Hinges, model number SP81 or other approved manufacturer are to be used.

Locksets:

All locksets shall be heavy-duty, Schlage "ND" Rhodes.

All exterior access with hard key shall be interchangeable core design locks.

All hardware installed during a remodel or new construction shall match finish with existing hardware or as so specified in new construction guidelines.

Cylinders:

Schlage maintains and expands WTAMUs master key system.

Contractors shall furnish information on cylinders to Schlage i.e. Cylinder design- Rim, Mortise, Key in Lever, etc.

Levels of master keying shall be coordinated through the WTAMU Lock Shop. A copy of the Lock/Key order shall be provided to the Lock Shop prior to the order being sent to Schlage by the contractor.

Exit Devices:

All exit devices shall be Arrow S3800 series, Sargent 80 series, or Von Duprin 98/99 series or approved series via the WTAMU Lock Shop.

Any panic device that is keyed access shall use Interchangeable Core (IC) cylinders.

Panic devices that have dogging mechanisms shall use I.C. cylinders.

On double doors that incorporate center mullions: the center mullion shall be key removable with I.C cylinders.

Electronic Access:

Any electric strikes shall be H.E.S. 9600 series, 5000 series or a model approved by WTAMU Lock Shop.

NO electrified Locksets will be accepted unless first approved by the Lock Shop. Finish should match surrounding door treatments.

Closures:

All door closers shall meet ADA requirements.

Approved closure: LCN model #4041

Closers shall be installed with H-EDA arms or 3049 EDA arms or other approved arms per application.

Power Operators:

Any automatic door opening systems should be a Stanley Magic-Force, Nabco Model 710 Swing Door System or LCN 4630/4640 Electric Auto-Equalizer Series

Any variations shall be approved by the WTAMU Lock Shop

Texas A&M University - Commerce

Hardware

Locksets: Best or Sargent

Cores: Best

Texas A&M University-Texarkana

Hardware

Hinges – Full mortise, button tipped, ball bearing. Interior hinges primed for paint, USP. Exterior hinges, satin finished stainless steel, US32D

Lockset – Heavy duty mortise lockset with cast lever and rose trim. Finish: US32D satin stainless steel at exterior openings; US26D satin chrome plated at interior openings. Provide Best interchangeable cores, MX8 patented keying system.

Hardware accessories – Match lockset finish.

General Information

The preliminary selection of interior finish materials shall take place during the schematic design phase. During the design development phase the A/E's Interior Designer shall present a minimum of two distinct color schemes to the User Coordinator and FPC Project Manager. A final color scheme will be selected and incorporated into the specifications.

Interior finish materials shall be high quality, durable materials that are easily maintained and manufactured regionally. Particular attention shall be given to finishes in public spaces. The use of materials with recycled content is encouraged.

Avoid the use of imported, costly or high maintenance materials. Finishes or detailing that have minimal tolerances and place unrealistic expectations on the installing contractor(s) shall be avoided.

Gypsum Wallboard

All interior gypsum wallboard should be at least a DensArmor or DensArmor Plus or equal mold resistant wallboard.

All gypsum wallboard, regardless of location, shall be not less than 5/8".

Tile

The use of ceramic tile is encouraged for high profile/high use public areas, restrooms, shower and locker rooms or other spaces where a durable material is appropriate. Avoid dark colors and extremely light colors for tiles. Avoid white or light colored grout for floor applications.

All floor tiles shall be non-slip and rated for heavy duty use.

Designs where floor and wall tile indicate a pattern of colors or a "mosaic" shall be detailed in the drawings using specific tile sizes dimensions and notes to clearly indicate the extent and complexity of the pattern or "mosaic".

All floor tile grout shall be sealed. In frequently wet areas such as showers, floor and wall grout shall be sealed.

Suspended Acoustical Ceilings

All ceilings shall be designed to be easily accessible for maintenance and other access needs. A single type of ceiling tile such as 2 ft x 2 ft or 2 ft x 4 ft, minimum 5/8" thick, non-directional pattern tiles with a high recycled content shall be used throughout a building to minimize maintenance and repair costs. Exceptions to this are special areas that are identified in the POR.

Ceiling suspension assemblies shall be supported directly from the building structure and shall be supported at all four corners of fluorescent light fixtures. Location of hangers shall not interfere with access to VAV filters, valves, dampers and other items requiring maintenance.

Terrazzo

Use of terrazzo flooring where high traffic occurs is encouraged.

Carpet Systems

Refer to Guide Specification at the end of this division.

Resilient Tile Flooring

Vinyl composition tile shall be 1/8 inch thick with thru pattern or thru-chip construction and meets the requirements of ADA for static coefficient of friction when installed in accordance with manufacturer's guidelines. Recycled content (post-consumer and post-industrial waste) shall be minimum 10%. Material must meet or exceed 5 year warranty

Rubber flooring is also acceptable.

Vinyl Wall Covering

The use of vinyl wall covering is discouraged especially on interior surface of exterior walls.

Painting and Coating

Satin or semi gloss enamel paint shall be used on all surfaces and items normally painted. Flat finish paint is not acceptable. Minimum of two finish coats over a prime coat of a different tint than finish coat.

Manufacturers standard color selection shall be utilized. Avoid the use of deeply saturated colors for walls. The use of lighter colors is recommended since these colors enhance reflectivity and reduce the need for lighting. The selection of zero or low VOC products is required to eliminate problems with off-gassing.

Inside surface of wood cabinet drawers two receive two coats of clear sealer.

Top and bottom edges of wood doors to receive two coats of tinted sealer to aid visual inspection.

Except for prime coats on equipment and piping insulation, specify all field painting under the painting section of the specifications.

The following colors shall be used for banding of all piping and conduits.

Service	Color
Domestic Water, Cold or Hot	Blue
Chilled, Heating or Condenser Water	Green
Natural Gas	Orange
Air	White
Steam and Condensate	Light Gray
Electric Conduit	Yellow
Drain Lines	Black
Fire Water	Red

Each pipe circuit is to be marked by stencil. Stencil shall include flow arrow and identification mark as follows: At wall penetrations, machine or tank connections and at not over 50 feet intervals. Stick-on type or plastic wrap-on markers are not acceptable.

Service	Mark
Domestic Water Supply	Dom-W-S
Domestic Hot Water Supply	Dom-HW-S
Domestic Refrigerated Water Supply	Dom-RW-S
Chilled Water Supply (Air Cond.)	Ch-W-S
Chilled Water Return (Air Cond.)	Ch-W-R
Condenser Water Supply	Cond-W-S
Condenser Water Return	Cond-W-R
Heating Water Supply	Ht-W-S
Heating Water Return	Ht-W-R

Natural Gas	Nat. Gas
Air (Pressure)	Air-Pressure
Steam (Pressure)	St-Pressure
Condensate	Cond
Electric (Voltage)	Elect-Voltage

Campus Specific Information

Texas A&M University

Resilient Tile Flooring

All resilient tile flooring shall be cleaned and left unsealed by the contractor. The Physical Plant Department will seal and polish the floors.

Texas A&M University-Corpus Christi

Gypsum Wallboard

All interior wallboard shall be DensArmor Plus or equal.

West Texas A&M University

Carpet Systems

Lees Faculty IV

Colors:
- 4047 Jewel Blue
- 4267 Aruba Blue
- 4052 Tea Rose
- 4002 Bordeaux

Resilient Tile Flooring

Standard vinyl composition tile colors:

Field – Armstrong 51911 Classic White
Accents – Armstrong 51814 Pomegranate Red

Painting and Coating

Standard Interior Wall Colors

Standard White – Standard white shall be Kelly-Moore semi-gloss latex (1605-100) mixed with 1/8 oz. Raw Umber or 00-0257. This product is to be used in all dorm rooms or as directed by the WTAMU Painting Manager.

WT Off-White – WT Off-white shall be Kelly-Moore semi-gloss latex. Mix on record at Amarillo, Texas Kelly Moore Dealer

Old Main White – Old Main White shall be Kelly-Moore Dura-Poxy Semi-Gloss Acrylic Enamel (1685-111). This product is to be used in all Old Main trim work or as directed by the WTAMU Painting Manager.

Old Main Flat White – Old Main flat white shall be Kelly-Moore Interior Flat Latex Wall Paint (550-121). This product is to be used in the lobby area and some ceiling trim in Old Main or as directed by the WTAMU Painting Manager.

Old Main Grey – Old Main Grey shall be Kelly-Moore Interior Flat Latex (551-121) mixed to 97-1229 color. This product is to be used in Old Main or as directed by the WTAMU Painting Manager.

Old Main Grey Dura-Poxy - Old Main Grey Dura-Poxy shall be Kelly-Moore Semi-Gloss Acrylic Enamel (1685 Old Main Grey at Amarillo, Texas Kelly-Moore Dealer). This product is to be used below the wainscoating in Old Main hallways or as directed by the WTAMU Painting Manager.

Maroon – Rust Oleum Industrial Acrylic 5205 or 5207 Metal Trim or Kelly-Moore Sequoia Redwood (interior) satin finish. (PMS 202)

Blue – Kelly-Moore Caribbean Sky, KM-3178-1

Green - Kelly-Moore Spring Frolic, KM-3402-1

Yellow - Kelly-Moore Shredded Wheat, KM-3530-1

The following colors shall be used for banding of all piping and conduits.

Service	Color
Fire Water	Red, equal to Kelly-Moore 5780-562.
City Water	Dark Green, equal to Kelly-Moore 5780-551
Domestic Water	Dark Green, equal to Kelly-Moore 5780-551.
Domestic Hot Water	Light Green, equal to Kelly-Moore 5780-565
Treated Water	Beige, equal to Kelly-Moore Bone-27
Brine	Beige, equal to Kelly-Moore Bone-27
Chilled Water	Dark Blue, equal to Kelly-Moore 5780-564
Condenser Water	Light Blue, equal to Kelly-Moore KM299-M

Heating Water	Yellow, equal to Kelly-Moore 5780-563
Utility/Control Air	White, equal to Kelly-Moore 5780-103
Natural Gas	Gray, equal to Kelly-Moore Rust-3086.
Sewer/Drain	Black, equal to Kelly-Moore 5780-568.
Steam	Dark Orange, equal to Kelly-Moore 5780-571
Condensate Return	Light Orange, equal to Kelly-Moore AC7-Y
Boiler Feedwater	Yellow, equal to Kelly-Moore 5780-563
Freon/Refrigerent	Tan, equal to Kelly-Moore 171 Sandpebble
Vacuum	White, equal to Kelly-Moore 5780-103

Each pipe circuit is to be marked by stencil. Stencil shall include flow arrow and identification mark as follows: At wall penetrations, machine or tank connections and at not over 50 feet intervals. Stick-on type or plastic wrap-on markers are not acceptable.

Service	Mark
City Water	White-City Water
Domestic Water	White-Dom-W-S
Domestic Hot Water Supply	White-Dom-H-W-S
Domestic Hot Water Return	White-Dom-H-W-R
Treated Water	Black-Treated Water
Brine	Black-Brine
Chilled Water Supply	White-Ch-W-S
Chilled Water Return	Whire-Ch-W-R
Condenser Water Supply	White-Cond-W-S
Condenser Water Return	White-Cond-W-R
Heating Water Supply	Black-H-W-S
Heating Water Return	Black-H-W-R
Utility/Control Air	Black-Air
Natural Gas	Black-Nat Gas
Sewer/Drain	White-Sewer
High Pressure Steam	Black 90# Steam
Low Pressure Steam	Black 15# Steam
Condensate Return	Black-Cond Return
Boiler Feedwater	Black-Feedwater
Freon/Refrigerant	Black-Refrig
Vacuum	Blue-Vac
Decoupler	Decoupler

Use the following for letter sizing

Outside of Diameter of Pipe or Covering In Inches	Length of Field In Inches	Height of Characters	Width of Principal Stroke
Less than ¾	Use Tags	--	--
¾ to 1-1/4	8	½	1/8
1-1/2 to 2	8	¾	3/16
2-1/2 to 6	12	1-1/4	5/16
8 to 10	24	2-1/2	5/8
Over 10	32	3-1/2	7/8

Texas A&M University-Texarkana

Resilient Tile Flooring

All resilient tile flooring shall be finished by Contractor with 5 coats of Johnson Showplace wax.

Gypsum Wallboard

All interior gypsum wallboard shall have a Level 4 finish, topped with light textured finish.

Guide Specification

Carpet Systems

PART 1 – GENERAL

1.1 SUMMARY

A. The following shall be used as a guide for a minimum carpet specification. Other products with equal or better characteristics or qualities shall be considered.

PART 2 – PRODUCTS

2.1 CARPET SYSTEMS

A. Modular vinyl backed carpet tile or six foot roll carpet with vinyl back.

B. Manufacturers: Interface, Lees, Mannington, Tandus C&A or acceptable substitute shall meet the following requirements:

1. Construction: Textured or level loop tufted.

2. Face Fiber: 100% Invista Antron Lumena® or Antron® Legacy, Antron Blend. Type 6,6 nylon - continuous filament with anti-soil, anti-stain protection.

3. Pile Height: $\geq$0.117 and $\leq$0.187.

4. Yarn Weight: (varies depending on tuft gauge and pile height).

5. Dye Method: 100% solution dyed or a solution dyed yarn dye blend.

6. Stitches per inch: 12 minimum.

7. Tuft Gauge: 1/13 inch (1/12 inch minimum).

8. Primary Backing: 100% sealant vinyl or non-woven synthetic

9. Secondary Backing: 100% vinyl back or 5/32 inch vinyl closed cell

cushion back. Backing shall be fusion bonded to face fiber and primary backing to create an integrated product. Shall pass: Test ASTMD 3936 delaminating of secondary back, Test ASTMD 1667 with 25% deflection @710 PSI.

10. Density: 4500 minimum.

11. Electrostatic Propensity: 3.5 KV or Less.

12. Warranty: Lifetime – 20 years, non-prorated warranty against delaminating, edge ravel, zippering, moisture penetration, wear.

C. Performance Characteristics:

1. Flammability:
   a. Radiant Panel Test (Direct Glue): ASTM E-648, Class 1.
   b. Pill Test: pass Doc FF1-70.
   c. Flaming Mode: <450 per ASTM E-662 NBS Smoke Density.
   d. Non-flaming Mode: <450 per ASTM E-662 NBS Smoke Density.
2. Static: < 3.5 KV Permanent Conductive Fiber per AATCC-134.
3. Electric Resistance: pass NFPA 99.
4. Burroughs Method: pass NFPA 99.
5. U. S. Green Building Council LEED-NC 2.2, Indoor Environmental Quality, EQ Credit 4.3, Low-Emitting Materials, Carpet Systems:
   a. All carpet installed in the building interior shall meet the testing and product requirements of the Carpet and Rug Institute's Green Label Plus Program or for which testing has been done by qualified independent laboratories in accordance with the appropriate requirements.
   b. Any carpet cushion installed in the building interior shall meet the requirements of the Carpet and Rug Institute Green Label program.
   c. All carpet adhesive shall meet the requirements of U. S. Green Building Council LEED-NC 2.2, EQ Credit 4.1: VOC limit of 50 g/L.
6. Recycled content: minimum 35%.
7. Recyclable: 100% of all content.

2.2 ACCESSORIES

A. Carpet Adhesive: Releasable, pressure sensitive type adhesive shall be

water based and allow for removal without damage to carpet or substrate and leave no residue.

B. Adhesive Seam Sealer: (For 6 foot roll goods) As required, provide adhesive seam sealer certified in writing by the manufacturer as compatible with carpet backing. Seam sealer shall have minimum five year manufacturer's guarantee. Sealer shall create a 100% chemical weld at the seam site to provide a monolithic installation with a moisture barrier.

C. Carpet Edge Guard: Shall be either aluminum or vinyl edge guard or transition in color suitable for a particular installation. Edge guard attachment shall be by mechanical fasteners or glued down.

D. Tread Edge Strip: Shall be rubber or transition in color suitable for a particular installation.

PART 3 – EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. All existing carpet and existing carpet waste shall be reused or recycled in an "environmentally friendly" manner. "Environmentally friendly" carpet recycling methods shall be performed subsequent to job completion. As used herein, "environmentally friendly" methods consist of the following:

1. Repurposing – reusing the product in another application such as facilitating the donation of used carpeting to a charity or other nonprofit organization.

2. Recycling – turning waste materials into new materials.

B. Description of Reclamation Services – Carpet must be removed from the existing installation and prepared for pickup based on the type of material and reclamation option selected. Specifications for removal from the jobsite include:

1. Removal of carpet tile and 6 foot roll carpet for repurposing or recycling

a. Carpet material shall be palletized and secured for shipping, (i.e., shrink wrap, banding, strapping).

b. Carpet shall be kept dry and free of any moisture damage.
c. Carpet shall be clean of any non-carpet debris.
d. Provide a certificate upon request verifying the reclamation of the carpet material.

3.2 INSTALLATION CONDITIONS

A. All sub floors shall be level, clean, dry, and free of dust, dirt, wax, paint, grease, cut back adhesive or any material that might interfere with the overall bond strength of the adhesive. Concrete floors shall be fully cured and free of excessive moisture and alkalinity. No condensation within 48 hours on underside of a four foot by four foot polyethylene sheet, fully taped at perimeter to substrate. Conduct moisture test maximum allowable amount of moisture emitted from floor shall be 3.0 pounds per 1,000 square feet in a 24 hour period.

B. Store carpet and adhesive at a temperature of 70 degrees Fahrenheit for 48 hours prior to installation and maintain for 48 hours during and after completion.

C. Do not expose adhesive to ultraviolet light. Adhesive may be photosensitive and lose its tack.

D. For 6 foot roll carpet cut edges tight to form seams, without gaps, using carpet manufacturer's recommended seam sealer.

E. When carpet is scheduled for installation on risers and treads, as in auditoriums, and the carpet project as specified with a vinyl cushion back will not install properly over risers and treads, the installer of the carpet project shall be required to provide and install rubber tread edge strips along the front edge of all treads including treads located with in the seating areas.

F. Installer shall have at least five years of experience and be certified by the manufacturer of the carpet submitted.

General Information

Directories

Each building shall have at least one primary directory located in the main entrance of the building. Secondary directories on each floor may be required depending on the complexity of the building.

Graphics

Interior graphics shall be designed, shown and specified by the A/E and their placement in accordance with Texas Accessibility Standards. Use positive secure method to anchor graphics (tamper-proof screws or toggle bolts not double face tape or epoxy cement). Interior letters shall be Helvetica medium upper and lower case.

All building utility spaces shall include the name of the space as well as room number on door graphics.

Exterior graphics such as plaques, signs (except "Handicapped Parking" and traffic signs) and building letters will normally be furnished and installed by the Owner. During design the Project A/E will suggest locations on the building elevations for building name. Exterior letters are generally cast aluminum with mill finish or bronze satin duranodic finish, Helvetica medium font with both upper and lower case letters.

Traffic control signs shall be heat/vacuum baked process using 0.080 gauge aluminum blank sign face of Engineer grade reflectorized sheeting conforming to specification requirements of the Federal and State Manuals on Uniform Traffic Control Devices.

Toilet Partitions

Partitions or stalls should be floor mounted and constructed of solid plastic or stainless steel in all permanent buildings unless other materials are approved by the Owner. Provide coat hook and bumper guard on back of each toilet partition door.

Corner Guards and Rails

Provide corner guards on corners of corridor walls with heavy pedestrian traffic.

Provide wall guard rails along corridor walls in laboratory areas to protect walls from lab carts.

Toilet Accessories

Provide toilet accessories as required by each Campus

Fire Extinguishers and Cabinets

Fire extinguishers and recessed or semi-recessed cabinets shall be incorporated into the design as required by code.

Fire extinguishers selection and installation shall conform to the requirements of NFPA 10 *Standard for Portable Fire Extinguishers* or other codes as applicable. Fire Extinguisher shall be new extinguishers and be installed within one year of the manufacture date.

Specific Campus Information

Texas A&M University

Rest Room Requirements

Stainless Steel Paper Towel Dispensers and Receptacles

Frontal Approach (48" max. aff., must be separate units to comply with maximum height above finished floor)

69907-T "Parker" w/656 Waste Receptacle
B-3860 "Bobrick" w/B-3644 Waste Receptacle

Side Approach (54" max. aff.)

6996A "Parker"--Dispenser and waste receptacle.
B3960 "Bobrick"--Dispenser and waste receptacle.
04651 "Accessory Specialties, Inc."--Dispenser and waste receptacle.

Water Closet Tissue Dispenser

Stainless steel, jumbo roll tissue system equal to: Scott Brand 09564, JRT JR. by

Scott Paper Co. or Katrin Model No. 1000 by Airwick Professional Products of Houston, Inc.

Soap Dispensers

Sani-Fresh System, Model No. 91125, surface mounted, stainless steel by Scott Paper Company w/800 ML refillable liquid dispensing system.

Fire Extinguishers

Fire extinguishers selection and installation shall conform to the requirements of NFPA 10 *Standard for Portable Fire Extinguishers* or other codes as applicable. Fire Extinguisher shall be new extinguishers and be installed within one year of the manufacture date. Extinguishers shall be of the followings:

5#CO_2	Amerex Model #315 or equal
10#CO_2	Amerex Mode #330 or equal
10#ABC	Amerex Model #419 or equal
20#ABC	Amerex Model #423 or equal
Class D	Amerex Model #570 or equal
Class K	Amerex Model $B260 or equal

Tarleton State University

Rest Room Requirements

Towel dispensers:	Kimberly-Clark (Scott) 9719 or 9707
Toilet Tissue	Kimberly-Clark (Scott) 9796
Soap Dispenser	Kimberly-Clark (Scott) 91101, 91102, or 91501
Trash Receptacles	Kimberly-Clark (Scott) 9054
Water closets	Kohler K4330
Lavatory	Kohler Chesapeake Wall Mount
Handicap Water Closet	Kohler Kingston Bowl K4330
Handicap Lavatory	Kohler Morningside K12634
Urinals	Kohler K4960-ET
Water Closet Flush Valves	Sloan Royal #111
Urinal Flush Valves	Sloan #186
Lavatory Faucet	Kohler K-7401-2A
Lavatory Handicap Faucet	Kohler K-7437KC
Handrail	K-16025CP

All water Closets and Lavatories shall be on Carriers

Halsey Taylor D.F.	#HPC8F-Q
Handicap Urinal	Bardon Urinal K-4960-ET
Service Sinks	Whitby K-9146

Texas A&M University-Corpus Christi

Rest Room Requirements

Paper Towel Dispensers and Waste Receptacles

James River - Series 2000
James River - Max 2000

Water Closet Tissue Dispenser

James River - RollMaster

Soap Dispensers

James River - Carex Lotion Soaps

Texas A&M University-Kingsville

Rest Room Requirements

Paper Towel Dispensers and Waste Receptacles

Bobrick #B-39003 Dispenses C-fold, multifold and single fold.
Surface mount, stainless steel

Bobrick #B-390039 Same as above but with stainless steel skirt for surface mounting

Paper Towel Dispenser (Replacement)

Continental Mfg.Co. #630C Stainless Steel, Singlefold only

Water Closet Tissue Dispenser (Enclosed Box Type for Renovations)

Bobrick #B-3888 Contura Multi-roll with plated steel dispensing

mechanism for recessed areas

Bobrick #B-2888 Contura Multi-roll with plated steel dispensing mechanism for surface mount areas

Water Closet Tissue Dispenser (Replacement Single open roll type)

Palmer Fixture Company #TP-202 Single Holder Hinged roller pin, security roller, non-controlled delivery, surface mount. Mount two single fixtures per stall

Bobrick #B-2730 Removable, security pin, non controlled delivery. Mount two single fixtures per stall

Water Closet Tissue Dispenser (Residence Halls)

Royce Rolls Ringer Company Surface mount
3 Roll #TP-3 Order Master Lock #TP-Lock or
4 Roll #TP-4 Order Master Lock #TP-Lock

Soap Dispensers

Plastic hand soap dispensers with mounting holes. The dispensers will receive prepackaged 800 ml liquid soap cartons and may take 1000 ml cartons

Johnson Soft Care Elite System
DermaCare Hand Care

West Texas A&M University

Rest Room Requirements

Paper Towel Dispensers and Receptacles

Towel Disposal Units Georgia Pacific brand, model 59462 smoke color, which uses an 89460 towel.

Water Closet Tissue Dispenser

Bay West Model 722, Smoke Grey in color. Two-roll (2) vertical tissue locked enclosed cabinet

Soap Dispenser

DEB/SBS Pro line 1-litre White Dispenser, custom printed with the WT logo

Sanitary Napkin Disposal Unit

Lagasse floor receptacle. White enamel finish, galvanized inner liners 9" W x 9" D x 11 ½" H. Serves two stalls with two spring-closing push doors on full length piano hinges.

Mop & Broom Rack (Located in janitor's closets)

ASI Model 8215-4 20 gauge type 304 stainless steel satin finish 4" x 36" long with 4 rubber can holders ribbed for grasping.

Fire Extinguishers

Kidde 5 lb., dry chemical extinguisher with hose. Canister meets DOT requirements and can be hydrostatic tested.

Texas A&M University-Commerce

Rest Room Requirements

Paper Towel Dispensers and Waste Receptacles

Kimberly Clarl Model 09994

Water Closet Tissue Dispenser

Kimberly Clark Model 09606

General Information

Audio-Visual Equipment

Projection screens, where required by the Project Program of Requirements, shall be motorized and controlled by a **non-keyed** switch.

Audio visual equipment will generally be purchased and installed separate and apart from this contract. The design team must however identify this future equipment and provide a secure location to house it if requested by System Member.

In area where an assisted listening device is required or where sound reinforcement is required by the POR then a complete sound system shall be provided in the project.

Laboratory Equipment

Laboratory Fume Hoods

The following are minimum design specifications for laboratory fume hoods and associated exhaust systems for A&M System projects except as modified with the approval of the System Member Director of Environmental Health and Safety.

1. All laboratory hoods shall meet the requirements of the National Fire Codes, NFPA 45, "Fire Protection for Laboratories Using Chemicals." Hoods handling radioactive material shall also meet the requirements of NFPA 801, "Recommended Fire Protection Practice for Facilities Handling Radioactive Materials." Fume hood systems shall also meet the requirements of the American National Standard for Laboratory Ventilation, ANSI/AIHA Z9.5, and AHSRAE 110-1995. If the requirements below conflict with those of the most recent versions of these national standards, the national standards shall prevail.

Fume hood manufacturer shall be required to certify that hoods comply with all requirements.

2. Hood design will incorporate airfoil jamb and airfoil sill to reduce airflow turbulence.

3. A variable volume or constant volume hood system design is preferred, depending upon the HVAC system design. For constant air volume hoods, bypass or balanced air feature should be considered to provide an inlet for air to

be drawn into the top of the hood as the sash is lowered, still maintaining the velocity through the face opening at 100 FPM. Hoods will be an integral part of the HVAC system.

4. Auxiliary Air Make-up Hoods with make-up air externally supplied above and on the outside of the hood face are not permitted.

5. Utility valves and switches shall be external, and shall be in conformance with applicable codes and standards. All service valves shall be easily accessible for maintenance personnel and clearly marked. Fixture outlets inside the hood shall be corrosion resistant or have a corrosion resistant finish.

6. Hood lighting shall be vapor or explosion proof, depending upon the intended purpose of the hood. Hood design should be such that light bulbs are changeable from the outside of the hood.

7. The hood sash shall be transparent, easily removable, horizontal sliding or vertical rising panel that will close off the hood face. All parts and counterbalance mechanism shall be of corrosion-resistant material and finish. The sash panel shall be safety glass or plastic that has a flammability rating of 25 or less.

Fume hoods with vertical sashes shall have stops at 18 inches. Whenever the sash is beyond 18 inches a visual alarm shall be activated.

8. Hood construction materials should be selected with regard to the requirements of hood use. Examples of material used include stainless steel and epoxy coated material.

9. Face Velocity Requirements:

Hood selection is greatly influenced by the type of experiments to be conducted within the hood. It is important to establish the maximum degree of hazard anticipated for present and future use before the choice of a hood is made. National standards recognize that the acceptable face velocity requirement for toxic materials used in research laboratories is an **average face velocity of 100 fpm** with the **hood sash fully open (100%)** and a **minimum at any point of 80 fpm.** These performance parameters are to be met. Fume hood testing shall be accordance with ANSI/ASHRAE 110.

10. Airflow Measuring Device:

An airflow measuring device shall be permanently installed on each fume hood. The device shall continuously monitor airflow face velocity, shall give a digital readout of face velocity, and shall sound an alarm for low-flow conditions or whenever the face velocity drops below 80fpm..

11. Exhaust Duct:

Fume hoods may be designed with either an independent exhaust duct system or a manifold system.

A high transport velocity of at least 2000 fmp is needed so that dust and aerosol-size materials are not deposited in the joints, cracks, or corners in the duct system. Normally all exhaust ducts will be constructed of Type 316L Stainless Steel with all welded or mechanically fastened joints sealed with mineral impregnated woven fiber taper which is further impregnated with an activator/adhesive of the polyvinyl acetate type as manufactured by Hardcast, Inc. or equal. Ducts should be routed vertically with a minimum number of turns.

Perchloric acid hoods shall have a completely welded exhaust duct system. Duct shall be routed by the shortest and straightest path to the roof, and if horizontal runs are required they will be sloped toward the fume hood. When required for construction, and approved by the Owner, flange joints and acid resistant gaskets may be used. Do not manifold perchloric hoods.

All hood exhaust outlets shall be flanged and furnished with a companion flange for welding to the exhaust duct.

12. Hood exhaust system design should provide for 10% minimum flow through exhaust duct when hood is not in service. The hood exhaust may be used as part or all of the required exhaust from the laboratory room.

13. Fans blowing into the exhaust duct system will not be permitted.

14. Fume Hood Location:

No fume hood should be installed closer than 10 feet to the primary room entrance/exit door. Fume hoods should also not be installed near expected high traffic areas within the laboratory or where supply air grills can cause turbulence at the hood face.

Suggested Fume Hood Manufacturers:

Kewaunee Scientific Equipment Corporation
Statesville, North Carolina 28677
704/873-7202

Hamilton Industries
Two Rivers, Wisconsin 54241
414/793-1121

Advanced Lab Concepts
Houston, Texas 77284
281/859-5496

15. Special Hoods:

Perchloric:

Perchloric acid hoods require a "wash down" feature in which water spray is used to remove acid crystals from the exhaust fan, ductwork, and hood plenum after each use. The water must not splash or fall on the work surface. Only one manual valve will control the wash down water. The valve handle shall be outside of the hood enclosure.

Each perchloric hood shall have an automatic five minute wash down cycle activated when the fume hood fan is de-energized.

Radioisotope:

Requires special construction to permit easy cleaning. Filtration requirements of the exhaust air and fume hood construction shall be determined on a case by case basis in consultation with the System Member Environmental Health and Safety Department's Radiological Safety Officer.

Biological:

Biological Hoods shall meet NIH 03-112C Performance Specifications and shall be in accordance with National Sanitation Foundation Standard, NSF 49, and be listed by NSF. For application guidelines and filtration requirements use HHS Publication No. (CDC) 93-8395, "Biosafety in Microbiological and Biomedical Laboratories."

Units shall be of steel or stainless steel construction; interior shall be stainless steel with coved corners. All seams and welds to be ground smooth and polished. Sliding view window shall be ¼" safety or tempered glass. Supply and exhaust HEPA filters shall be front loading and shall be 99.99% efficient for 0.3 micron

sized particles. Unit shall be listed by UL and CSA for electrical safety. Unit shall include at least one petcock and one duplex outlet; additional services to be provided by user request. Unit shall include a fluorescent light and an ultraviolet (germicidal) light. Certification of unit after installation is required and must be performed by an approved certification company.

Suggested Biological Safety Cabinet Manufacturers:

NuAire Inc.
BioMedical Solutions, Inc.
281/240-5893

The Baker Company
Scientific Resources Southwest, Inc.
888/980-2845

Thermo Forma 800/848-3080

Campus Specific Information

Texas A&M University

Special Hoods

A list of approved certification companies is available from the Environmental Health and Safety Department.

General Information

Window Treatments

Window blinds and shades are considered to have a significant impact on the HVAC and Lighting systems in a building. Automatic and/or manual window blinds and shades shall be provided wherever practicable to support and enhance energy efficiency of building systems.

Horizontal 1" mini-blinds shall be included in the design for all spaces.

In spaces where more light control is required "Mecho Shades" or equal are acceptable.

Laboratory Casework

Laboratory casework shall be high quality wood or steel construction.

Book Shelves

In order to maintain maximum room use and furniture placement flexibility typical faculty and staff offices shall not have built-in book shelving. Movable bookcases will be provided as Movable Furnishings where indicated in the POR.

Furniture Selection

During the preparation of the POR, the FPC Interior Designer will consult with the User Coordinator to determine only the types and quantity of furniture needed to satisfy functional requirements.

The A/E in their Schematic and Design Development submittals will include furniture layouts to POR requirements to ensure accommodation in the space proposed for doors, columns, etc.

Fixed Seating

All classrooms are to be designed to accommodate left-handed students. Ten percent of the total number of desks shall be for left handed people.

Seating shall be not less than 20 inches in width with preference for 22 inch width.

General Information

Controlled Environment Rooms

Rooms defined as cold room, environmental rooms, plant growth chambers, etc. shall be specified as complete units from a single manufacturer.

The design of refrigeration systems for environmental rooms and growth chambers shall be reviewed by the Mechanical Engineer only for coordination with the building mechanical systems.

Project A/E shall specify that the manufacturer of this equipment shall submit a detailed test procedure for factory testing the first unit of each type and that the Owner will witness the test.

General Information

Elevators

Elevators shall be selected and designed to comply with American Society of Mechanical Engineers/American National Standards Institute safety code for elevators, dumbwaiters and escalators, and moving walks, A17.1, latest revision as well as all requirements from with Texas Department of Licensing and Regulation and Texas Accessibility Standards.

Elevators manufactured by Otis, ThysenKrupp, and Kone may be acceptable subject to meeting all applicable requirements of this section. Equal quality elevators of other manufacturers will be acceptable subject to approval of the Project A/E, the FPC Project Manager and the System Member Physical Plant Department.

Elevator shall be specified to receive an electronic door safety device that extends the full height of the cab. Mechanical safety edge or traditional two beam photo-electric eyes are not acceptable.

Installation shall be by mechanic directly employed by the manufacturer or by installers franchised by and responsible to the manufacturer.

Electric operated elevators are preferred; however, oil hydraulic operation may be considered where use is intermittent or where elevator serves three or less floors.

General Contractor's use of elevators will only be allowed with written permission of the FPC Project Manager, Physical Plant Department and Elevator Vendor. General Contractor's use of the elevator even with written permission of the Owner and vendor shall not relieve Elevator Vendor of any warranties expressed or implied. Provide complete inspection and maintenance service of each elevator for a period of 12 months at no cost to Owner. Elevator Vendor shall be able to show that they have had successful experience in the erection and maintenance of the type elevator equipment proposed for this project and that they maintain within 50 miles of the elevator installation an adequate stock of parts for emergency and replacement purposes; and that they have qualified men in their own employ available to insure the fulfillment of any maintenance and/or repair services without delay within one hour notification, 7 days a week on a 24 hour basis. Elevator Vendor must be firms established in operation for the past five years and having a proven selection of parts and service facilities to meet the qualifications stated above for 2 years. The elevator

contractor must also be the manufacturer of the elevator being installed.

Passenger Elevators

Speed: 2 through 3 floors travel of 150 ft./min.;
4 and above floors travel of 350 ft./min.;

Capacity: Generally, stretcher number 3500 to 4500 pounds is specified depending on floor area and person density.

Control: Selective/collective automatic for single cars. For multiple units of two or more, group automatic control. Solid state controls preferred.

Diagnostic Tools: The elevator contractor shall provide to the Owner, integral with and built into the elevator controller, as part of this specification, any and all diagnostic tools and/or instruments and all written operating and instruction manuals needed to use the diagnostic tools required by the specification to allow for adjustment of any and all computer parameters and/or troubleshooting the equipment provided. These diagnostic tools shall be provided at no additional cost to the Owner. The Owner shall not be required to execute any type of written agreement in order to obtain said tools. The use of any handheld or removable diagnostic devices shall be specifically prohibited. The integral diagnostic tools and/or instruments shall permit the Owner and/or his authorized representative to access, diagnose and/or adjust any and all computer and/or software based variable features and/or parameters for the entire lifespan of the new equipment provided as required by the specification.

Operation: Leveling with resistance operation through 150 ft./min.; generator or solid state control for 200 ft./min. and above.

Cab: Stainless steel front and car door, stainless steel base, plastic laminated sides and rear, luminous ceiling with UL approved, manufacturer's Standard concealed fluorescent lighting, exhaust fan, stainless steel handrails on three sides and contain a device for voice communication to meet Texas Accessibility Standards.

The cab should have the following as standard features:

A. Emergency Phone

1. Hands free, auto dial, flush mount, vandal resistant

B. Door Operators

1. Heavy duty

C. Door Protection/Reopening Device

1. Infrared electronic scanning

D. Fireman service key switches phases I and II

1. "Adams" cylinders with WD01 key

E. Cab Lights

1. Fluorescent or screw-in base with easy access for replacement

F. Vandal-resistant car enclosures

1. Swing return (hinged) car stations

2. Hall and car button and fixtures

Hoistway Entrances: 3'-6" min. width, 7'-0" high, baked enamel finish, power operation.

Machine Location:

Electric elevators: Overhead preferred, but location at lower level optional on installations of four floors and less.

Oil hydraulic elevators: Not above first floor, adjacent to hoistway preferred.

Platform: Size according to code for capacity; however, standard sizes should be selected.

Signals: Provide Braille markings on car operating face plate and call signals and other features. One emergency alarm bell button in each car connected to emergency alarm station at main floor. Position indicators, direction arrows, and hall, and car buttons should be L.C.R. or L.E.D. standard 100,000 hour lamps

Flooring: Same as adjacent area by flooring subcontractor.

Floor Lockout Provisions: Provisions shall be included if directed by FPC Project Manager.

Emergency Generator: Interlock with emergency generator if Emergency Power System is approved for building. Otherwise, make no provision for emergency generator for elevator unless specifically directed to do so by the FPC Project Manager and Physical Plant Department.

Hooks & Pads: Hooks shall be installed in all passenger elevators. In addition, one complete set of pads shall be furnished for the Contractors' and Owners' use during construction. Prior to final acceptance, the pads are to be furnished in good condition and clean to the Owner.

Combination Passenger/Service Elevators

Will be designed to meet requirements of passenger elevators; cab size, hoistway entrances and capacity to meet freight requirements.

Freight Elevators (Freight only)

Speed: Up to and including 2 floors travel of 50 ft./min.; above 2 floors travel 100 ft./min.

Capacity: Minimum of 2500 pounds; however, product and product weight should be considered.

Control: Same as for passenger elevator operation except for 2

floor installation single automatic pushbutton.

Operation: Same as passenger service.

Cab: Standard freight (steel wainscoting).

Hoistway entrances: Bi-parting type. Generally, door operation is manual; however, consideration should be given to power operation where use of equipment is extensive.

Signals: Door open bell, in use light and illuminating buttons.

Machine Locations: Same as passenger elevators.

Platform: Size and classification according to code, building requirements, and capacity.

Campus Specific Information

Texas A&M University

Elevator Requirements

Electric operated elevators are required. Oil hydraulic elevators are not acceptable.

Electric elevators: Overhead preferred, but location at lower level optional on installations of four floors and less. Machine-room-less-elevators as manufactured by Kone are acceptable. For machine-room-less elevators, provide a 24" x 24" fire-rated access door near the top of the shaft to access the governor and the brake. This access door shall be located such that the frame of the elevator does not impede access to the governor or the brake. Coordinate location height of access door with manufacturer.

1. Pit

    A. Sumps in pits shall be covered. The cover shall be level with the pit floor.

    B. Interior and exterior of elevator pits shall be water-proofed

1. Means to prevent the accumulation of water shall be provided.

2. Removal of water from pit shall fall under the plumbing code.

3. Sump holes, if used, must be covered with a metal grate flush with the pit's floor.

2. Machine Rooms

A. A self-closing, self-locking, properly rated machine room door is required.

B. The elevator machine room shall be properly ventilated, heated and cooled.

C. Provide a 120-volt, 20 amp, circuit for car lights, fan and alarm circuit. This circuit must be provided with a lockable disconnect per NEC 620-53.

D. Provide adequate 120-volt receptacles in each elevator equipment room. Each outlet shall be GFCI.

E. All disconnects located in the elevator equipment room shall be able to be secured with a lock.

F. If battery lowering is specified provide an auxiliary contact on the main disconnect for the elevator equipment. This contact shall be used to determine the difference between a power outage and a maintenance or emergency shut down.

G. Provide a 10-pound ABC fire extinguisher in each machine room.

H. Only such equipment directly required in the function or support of the elevator system is allowed in the machine room or hoist way. No other equipment, piping drains, etc., is permitted in this space.

3. Fire Protection and Alarm Detection

A. Smoke detectors must be installed in each elevator

equipment room and elevator lobby. They must be so arranged that if activated, the elevators will go into recall mode. Activation of the smoke detector will recall all elevators to the designated floor.

B. If the building is fully sprinkled, then the following requirements must be met:

1. Sprinklers shall be installed in hoist ways and elevator equipment rooms in accordance with **NFPA 13.8.14.5** (not more than 2 feet above the floor of the pit for hydraulic elevators).

2. A heat detector must be installed within 6 inches of each sprinkler head located in the hoist ways or elevator equipment rooms. The fire alarm system must function such that when the heat detector's temperature rating is reached, the fire alarm system shunt trips the main breaker in the elevator equipment room in accordance with **ASME A17.1** Rule 102.2 C (3) and (4). **A smoke detector shall be installed.**

3. Temperature settings for heat detectors and sprinkler heads shall be as follows:

   a. Heat detectors: 175 to 195 degrees.

   b. Sprinkler heads: 200 to 225 degrees (The sprinkler head rating will be picked so as to be approximately 25 degrees higher than the temperature rating of the heat detector.)

4. If elevators are powered from emergency power. Interlock wiring (conduit and wire) must be provided between the transfer switch and each elevator equipment room and between each elevator equipment room.

5. The battery lowering option cannot be provided if the emergency power option is purchased.

6. One analog telephone line per elevator shall be installed in each elevator room.

4. Elevator Cab

A. Provide an ADA approved flush mounted telecommunications device in each elevator. Use of this device shall not require the opening of a door.

B. Elevator Car Interior to Controller Communication Requirements

1. In addition to the emergency phones required to be provided in elevators, separate means shall be provided to enable two-way voice communication between the controller location and the interior of each individual car, complying with the following:
   i. Each two-way communication device must have emergency power back-up for at least 4 hours.
   ii. Each two-way communication device shall not be a part of the existing emergency phones. They shall be installed separately from communication devices already present.
   iii. They shall not require intervention by a person inside the car to establish two-way communication or allow communication to be disconnected from inside the car. All manual operation of the device shall be done by emergency personnel from the controller location and no operation shall be required of persons inside the elevator car.
   iv. Once two-way communication has been established a visual indication within the car shall illuminate and only extinguish when the communication link is terminated by emergency personnel.
   v. Operating instructions (AMSE A17.1-2.27.7.3) shall be provided adjacent to the two-way communication device in the controller location.

5. Quality Assurance

A. No variance to the codes shall be sought from the governing authority without written approval from the TAMU Physical Plant Elevator Representative.

1. Copies of variances, if granted, shall be submitted to the TAMU Physical Plant Elevator Representative for record.

6. Submittals

A. Product Data: including capacities, speed, size, and type.

1. Provide this data at the design stage of the project to verify that the elevator will meet the anticipated traffic and handling demands of the building's design before proceeding to the development phase of the project.

B. Provide three (3) copies of both full line and schematic diagrams including nomenclature definitions and symbol keys for the entire elevator system.

1. Provide three (3) copies of operating and maintenance manuals, parts lists, diagnostic documentation, sequence operation, and manufacturers' parts numbers. For the entire elevator system, wire pull sheets shall be left on the job for future trouble shooting and shall become the property of the University.

2. Provide three (3) sets of all keys for all keyed features of the elevator system.

3. Provide any diagnostic tool necessary for maintenance, adjusting, testing, inspecting, and troubleshooting any part of the elevator system.

7. Demonstration and Training

A. On-site training shall be provided by the original equipment manufacturer for enrollment by individuals selected by the TAMU Physical Plant Superintendent for Operations Maintenance to learn about installation, adjustment

maintenance and troubleshooting the equipment. Any fees or costs of training for up to six (6) persons shall be included in bid price. Fees for additional persons shall be stated in bid and shall be at a reasonable cost.

8. Warranty

   A. Written warranty, signed by manufacturer, agreeing to repair, restore, or replace defective elevator work within specified warranty period.

      1. Warranty period of 12 months

9. Final Acceptance Test

   A. All tests required by the authority having jurisdiction (Texas Department of Licensing and Regulation) shall be witnessed by the TAMU Physical Plant Qualified Elevator Inspector and shall use the TAMU Physical Plant Elevator Equipment Inspection form. This form shall be signed by the TAMU Physical Plant Area Maintenance 7 Representative. All inspection reports shall be delivered to TAMU Physical Plant Area Maintenance 7.

General Information

The A/E shall identify on the drawings all areas that may be classified as hazardous in accordance with the latest edition of the NFPA Codes or that may pose a health hazard due to noise levels, radiation, chemical fumes, etc. The A/E shall describe how each such area will be treated in the building design.

Fire Suppression Systems

Sprinkler and Standpipe, Hose Systems:

The A/E shall include in the Construction Documents the Fire Protection Sprinkler System–Sprinkler Head and main header location, plans, riser locations and diagrams. Risers shall include sprinkler header take-offs with Fire Alarm points located. Drawing shall be laid out to allow for the addition at completion of construction as all as built header and branch piping to each sprinkler head. The Fire Protection Sprinkler and Standpipe System shall be designed by a Registered Professional Engineer or an organization which possesses a valid Certificate of Registration as issued by the State Fire Marshal and has at least one (1) person engaged in or working on the actual plans, who is licensed to perform the work authorized by its certificate.

Electrical equipment rooms are not required to be sprinkled when the room and equipment conforms to the requirements of NFPA 13. All materials shall be approved or listed by Underwriters Laboratories and/or Factory Mutual Laboratories. Compliance with Article 5.43.3 of the Texas Insurance Code and NFPA 13 is required. Test drains need to be located at the end of each run with a two inch drain located at the main and piped to a drain or outside.

Hoses need not be installed unless specifically required by other NFPA Chapters.

Grooved pipe is acceptable for fire protection systems.

Provide insulation and heat tracing for fire protection piping in the crawl space.

Specify galvanized or cad plated rods for sprinkler piping. Do not allow black iron rods or shot anchors for hanging sprinkler piping.

Provide a cleaning specification for sprinkler piping.

All sprinkler piping shall be schedule 40 pipe and **fully** reamed.

Special Systems

Systems designed to protect equipment or special hazard areas shall be an automatic total flooding FM-200 extinguishing system, with fire detection designed to conform to the requirements of the National Fire Protection Association codes and standards (NFPA 2001, NFPA 72, and other applicable codes).

The system shall be designed and installed by an experienced firm regularly engaged with automatic flooding FM-200 fire extinguishing systems. The firm shall have a minimum of five (5) years experience in design, installation, and testing of these systems and shall be certified and licensed by the State Fire Marshal's Office in accordance with Article 5.43.1 of the Texas Insurance Code.

It there is an FM-200 system the contractor must perform two (2) tests.

Campus Specific Information

Texas A&M University

Fire Department Lock Box

Key Boxes shall be installed on all new buildings or buildings being renovated that do not currently have a key box. The key box shall be located at or near the primary fire department access at eight feet (8') above the finish elevation. The approved College Station Fire Department key box shall be a "Knox Box."

The tamper switch shall be connected directly to the Siemens "Apogee" fire alarm system.

Fire Suppression Systems

Stand pipes and mechanically operated water gongs are required in all buildings having two or more floors. Installation shall conform to the latest version of NFPA 14.

Sprinkler systems with mechanically operated water gongs are required in all buildings. Installation shall conform to the latest version of NFPA 13.

Use of self-illuminating exit signs must be pre-approved by Environment Health & Safety Department (EHSD).

Distance from the fire hydrant to any portion of a new or renovated building shall be less than 300 feet. Distance from fire hydrant to fire department connection shall be less than 100 feet.

EHSD must approve the following:

a. the type, number and location of fire extinguishers,
b. alternative fire suppression systems, and
c. emergency power generator fuel tanks in excess of 1000 gallons

West Texas A&M University

Fire Protection Piping:

2-1/2 inches and larger:

Piping: ASTM A135 UL listed, threadable, light wall; Schedule 10 black
Mechanical Grooved Fittings: UL Listed and FM Approved, ASTM A536 ductile iron or ASTM A958 cast steel,
Mechanical Grooved Couplings: ASTM A-536 Ductile or Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers.

2 inches and smaller:
Piping: ASTM A135 UL listed, threadable; Schedule 40 black
Fittings: Cast iron or ductile iron, ASTM A126 Class B, ASME B16.4 class 125

General Information

Provide necessary services, piping, connections, fittings, and fixtures for floor drains, drinking fountains, custodial floor sinks, work room sinks, student laboratories, and toilets as required in the Requested Facilities. Provide a single hose bib with lock shield under the lavatories in each restroom. Provide the capability for a fume hood and shower and dressing capabilities in the Wet Lab area. Use the latest International Plumbing Code for requirements. Submit plumbing calculations with the Design Development submittal. Any changes to the plumbing design and calculations shall be submitted a minimum of one week prior to the first interim Construction Documents review meeting.

Room numbers must appear on plumbing plans and room names where space is available. Column lines or designations shall appear on all plumbing sheets as they appear on architectural and structural sheets.

Plumbing and HVAC systems shall be drawn as separate sheets. These systems may be combined only by written permission of the FPC Project Manager.

Where piping systems are to be installed underfloor, these shall be shown on an underfloor plan and not on the plan prepared for the space above. Floor plans for mechanical systems shall be drawn to show pipes, ducts, etc. on the floor in which they are installed. In general, underfloor plans shall be drawn to show all piping underfloor and, from there up, the systems between each floor slab shall be shown only on the appropriate floor plan.

All construction details shall be shown on the drawings and shall not be bound in the specifications.

All equipment and material specifications shall be bound in the specifications and shall not be shown on the drawings.

Performance data for all plumbing equipment shall be shown in schedules on the drawings. This data may also be included in the specifications but shall be carefully edited for conflicts.

The A/E shall identify on the drawings all areas that may be classified as hazardous in accordance with the latest edition of the NFPA CODE or that may pose a health hazard due to noise levels, radiation, chemical fumes, etc. The A/E shall describe how each such area will be treated in the building design.

Provide frost proof hose bibs and weather proof duplex electrical outlets on

exterior of buildings. Major buildings should have minimum of one hose bib and one electric outlet on each face of building.

Coordinate with the structural for block outs at floor drains.

Metering

All buildings shall be designed for metering of campus water. All auxiliary areas in a building shall be sub-metered.

Piping

Gas lines shall be of all welded black steel construction inside of the building to emergency shut-off valves. Gas lines from valve to lab table or appliances may be screwed black steel with M.I. fittings for 3/4" and smaller. All building gas piping shall be designed and installed in accordance with National Fuel Gas Code, NFPA 54, latest edition.

All control valves shall be listed in a schedule on the drawing showing identification number, body size, port size, if applicable, whether normally open or closed, spring range, and CV.

Provide insulation on all roof drain lines and overflow lines and pipes that accept condensate.

All interior water piping shall be type L copper.

Riser diagrams to show **all** waste, vent, supply piping, and cleanouts.

Provide threaded wall stops at all lavatory and sink water supply piping.

Deionized water piping shall be completely drainable. All low points and traps in the system shall have the capability to drain the system coompletely prior to starting the system.

Plumbing

Buildings shall be designed to permit gravity flow of sanitary and storm drainage (12 inch maximum storm drain size). Where sewage ejectors or sump pumps are required, they shall be located to have sufficient headroom to pull the pump shaft straight up through the floor plate. Lifting eyes or trolley beams shall be provided to facilitate the removal of the equipment. Emergency power shall be

provided if failure of pump would damage or flood electrical or mechanical equipment. A high level alarm shall also be provided.

Pipes penetrating exterior walls below grade must be installed properly to prevent breakage due to building settlement or expansive soil.

All connections to campus distribution systems or public utilities shall be precisely located by dimension or coordinates. Depth of piping shall be shown and inverts will be shown at manholes and other critical points.

Access shall be provided to all working parts of plumbing devices. Do not permanently seal in wall any plumbing items requiring periodic operation or maintenance.

Cleanouts shall be located at each bend and every 50 feet in straight runs.

Roof drains shall be run separately from all other storm water sources to outside of the building.

Roof overflow drains shall be designed in compliance with the International Plumbing Code. Scuppers can be used instead of overflow drains.

Caulk all toilets, urinals, and lavatories at the wall interface.

All toilet bowls and urinals to be set within 1/16" of the finished wall.

Provide 1-1/2" P-trap for all lavatories and provide ADA protection where required.

Provide Shokstops on all water piping in toilet battery chases with valve upstream of stop for maintenance. Install either above the ceiling or behind an access door for maintenance at the end of the header.

All no-hub cast iron to be provided with hangers within 18" of the hub on each side.

Provide drum sediment traps for all fume hoods and lab sink drains.

Mechanical Equipment Room

Provide at least one (1) 4" floor drain with trap seal protection in each equipment room. Locate out of walking area, but not under equipment. Connect to sanitary

sewer system. Locate one (1) domestic water line hose bib in each equipment room for coil washing.

Rest Rooms

Each rest room should have at least one 4" floor drain when serving 80 or more square ft. and 3" min. for less area. (Locate under stall partition or where one is not likely to walk). Floor drains shall be provided with trap seal protection. Each rest room shall have supply of conditioned air and a positive exhaust air system be separated to prevent sound transmission.

Provide stainless steel access doors for restrooms.

Specific Campus Requirements

Texas A&M University

Metering

Domestic Cold Water – the meter shall be exactly like the type manufactured by rosemount under the product umbrella "rosemount 8705 magnetic flow meter". All meters should be equipped with a rosemount remote transmitter model 8712. Meter should be installed per the manufactures specifications and should be field verified by physical plant – utilities personnel. Approval from the office of energy management must be obtained before sizing the flow meter to ensure it is within allowable flow ranges. Flow wiring from the transmitter will be ran to the wages plc.

Domestic Hot Water – The meter shall be exactly like the type manufactured by Rosemount under the product umbrella "Rosemount 8705 Magnetic Flow Meter". All meters should be equipped with a Rosemount remote transmitter model 8712. Meter should be installed per the manufactures specifications and should be field verified by Physical Plant – Utilities personnel. Approval from the Office of Energy Management must be obtained before sizing the flow meter to ensure it is within allowable flow ranges. Flow wiring from the transmitter will be run to the WAGES PLC.

Irrigation Water – The meter shall be exactly like the type manufactured by Rosemount under the product umbrella "Rosemount 8705 Magnetic Flow Meter". All meters should be equipped with a Rosemount remote transmitter model 8712. Meter should be installed per the manufactures specifications and should be field

verified by Physical Plant – Utilities personnel. Approval from the Office of Energy Management must be obtained before sizing the flow meter to ensure it is within allowable flow ranges. Flow wiring from the transmitter will be ran to the WAGES PLC.

West Texas A&M University

Water Piping, above grade in buildings

Copper Tubing: ASTM B88, Type L, hard drawn.
Fittings: ASME B16.22, wrought copper.
Joints: ASTM B32, solder, Grade 95TA.

For Pipe sizes 2 inch to 4 inch:
Press Fittings: ASME B16.18 or ASME B16.22 copper and copper alloy press fittings conforming to IAPMO PS 117, with EPDM sealing ring factory installed in fitting.

General Information

The design of the mechanical system and other building components shall be integrated together to produce a building that meets the project programmed functional, sustainable and energy requirements. Mechanical systems must be coordinated with all other building systems and features. Mechanical systems shall be designed to exceed the minimum performance requirements of ASHRAE 90.1-2004 by 17.5 % and incorporate cost effective energy conservation measures that do not compromise building performance or occupant comfort. Mechanical systems must be maintainable and all components reliable. The mechanical design and installation of all components and equipment shall allow for eventual removal and replacement.

All mechanical system components shall be manufacturers' standard commercial product. A standard commercial product is a product that has been sold for a period of at least three years on the commercial market, is listed in the manufacturers' catalogs and brochures and represents the latest production models.

Ductwork

All spin-ins shall be of the conical type with damper shaft mounted horizontally.

All grilles shall be regulated by a volume damper, when possible, in lieu of an OBD.

All metal components on galvanized sheet metal ducts shall be galvanized materials such as angle stiffeners. Trapeze hangers, rods, straps, etc.

All exposed ductwork to have internal insulation and metal liner and be fabricated from paint grip metal for painting.

Provide hangers for all slot diffusers and insulate. Provide detail on drawings.

Provide hinged access doors for duct access.

Provide required upstream straight duct for all air flow measuring station.

Provide air foil turning vanes.

All large round duct to be hung with half-round saddles and rods. Cable hangers are NOT acceptable.

Provide chrome cover plates for all recessed damper operators.

Provide a duct leakage test procedure.

Verify **ALL** return air paths.

Verify that there are sufficient dampers in the system to operate as specified, e.g. economizer.

Foil backed tape on ducts not permitted. Use fiberglass and Benjamin Foster sealant with fiberglass mat embedded in sealant.

All exterior duct insulation shall have a vapor seal and metal jacket applied with fiberglass mesh installed and resealed with vapor barrier sealer.

Metering

All buildings shall be designed for metering of campus thermal utilities. All auxiliary areas in a building shall be piped in a manner to allow sub-metering.

Piping

In-line pumps are not to be used except for small fractional horsepower circulators.

Piping shall not be buried beneath the lowest floor level except for soil pipe. Piping will not be run in concrete floors. If pressure piping placement under slabs is unavoidable then the piping must be run in a steel pipe sleeve so leakage can be channeled off.

All condensate drain lines shall be insulated to the vertical main. In exposed areas insulation shall be premolded. In unexposed areas the insulation can be foil wrapped.

All hangers on domestic water and hydronic lines shall be installed on the exterior of the insulation.

3/4" is the smallest size for a hydronic pipe to a coil.

All ball valves on insulated piping to have extension handles.

Provide metal jacket on all crawl space piping, exterior insulate piping and mechanical room piping (up to 8'-0" AFF) insulation.

Density of fitting for insulated piping shall be the same as the specified pipe insulation. Use pre-molded fitting insulation, and loose fill are not acceptable.

All auto air vents shall be constructed with a cast iron body and stainless steel ball and seat.

All manual air vents shall be plugged.

All valves preceding pressure gauges shall be needle type with snubbers installed on the discharge side of the pump.

Do not use red rubber gaskets on hot water lines and heat exchangers. Instead use EPDM or hard Gerlock gaskets. Use EPDM gaskets in "push on" joints.

Anchor all condensate lines to floor. Do not gang condensate lines together.

Require polyethylene jacket or high density polyurethane polymer jacket on preinsulated piping. Provide insulation on all chilled water pumps and air separators.

Do not use gate valves in hydronic piping, use ball valves 2" and smaller (e.g. stainless steel ball and stem) and butterfly valves for 2-1/2" and larger.

Butterfly valves shall have ductile iron disc and stainless steel nosing and stem.

Ball valves (HVAC and Plumbing) to have stainless steel balls and stem.

Mechanical Equipment Rooms

Access to equipment rooms shall be direct from hallways. Do not provide entrance through other rooms.

Special attention must be given to control the effects of sound and vibration from mechanical equipment to surrounding spaces.

Provide a curb around all penetrations through the mechanical room floor and all penetrations shall be sealed with appropriate fire stopping material.

Depress the floor of all mechanical rooms 1-1/2" and uniformly slope entire floor

to minimum 4 inch floor drain(s). All floor drains to have trap primers and be connected to building sanitary sewer system

Provide positive ventilation in all equipment rooms that are not return air plenums.

Equipment rooms with other equipment than those items directly related to air handling equipment will not be used for return air plenums. The use of rooms as plenums is permissible provided outside air and return air are directed to the plenum and volume control dampers are provided to control the quantity of each entering the plenum. Each component of an air handling system shall be spaced so there is ample room on all sides for inspection and maintenance (filter removal, bearing replacement, coil replacement, cleaning, etc.) and man sized hinged access doors shall be provided for ready access to the spaces in the air handling equipment.

Air handlers suspended must be provided with permanent platforms for maintenance. The maintenance platform must be a minimum of 7'-0" clear from floor below.

Provide dedicated 120 VAC duplex electrical outlets for maintenance equipment, and separate mechanical keying with University master keying system.

Provide conditioned, supply air into each mechanical room for tempering the air in the space. This may be accomplished with a “spin-in” and manually adjustable damper and branch duct or a variable air volume terminal located in the room.

Flow Diagrams

A basic flow diagram indicating major components for pressurized circulating water systems and air systems will be provided with the Design Development submittal. Detailed flow diagrams to include all line sizes, in-line devices (valves, strainers, control valves, thermometers, pressure gauges, flow measuring devices), and flow quantities for headers and branch lines will be provided in the Construction Documents phase.

Space Conditioning

Provide comfort conditioning winter and summer for all spaces except mechanical spaces. HVAC systems are to be selected, zoned, and designed to efficiently and effectively control the heat and humidity gain (or loss), and gains due to lighting, equipment, personnel, other special loads, and building

exposures. Provide a separate system for areas where timing of functional uses may so require.

The Project A/E shall consider systems such as: Variable air volume air distribution, variable speed pumping, dedicated outdoor air handlers to meet the Indoor Air Quality requirements of ASHRAE Standard 62-2004 (*Ventilation for Acceptable Indoor Air Quality*), energy recovery systems, high efficiency equipment and other accepted and normally utilized strategies to provide an energy efficient building. The Project A/E should be aware of the potential for mold and mildew problems in the humid climate at many of the campuses.

Varied levels of air filtration will be required in the building. Give consideration to design features to provide good indoor air quality (IAQ). In addition to filtration, these features would include double wall air handlers with stainless steel drain pans sloped to drain, exterior duct insulation, and provisions for access for duct cleaning

The A/E shall require controls contractor to supply one, or more, temperature-sensing element(s) in each Air Handling Unit. The sensor shall be required to be installed in a serpentine manner so that at least 75% of the coil's surface is covered and a representative average temperature can be transmitted to the Energy Management System (EMS). The length of sensor should be one (1) foot of length per square foot of coil area. Air Handling Units' condensate drain pans shall be constructed of stainless steel, pitched two ways per Code, with a minimum 1½" drain connection.

Ventilation

Provide power ventilation for restrooms, custodial areas, copy rooms, mechanical spaces, student and research laboratories, building crawl space, as well as other areas where required if there is the possibility of excess heat build-up, as required by code, and by the intended use of the space. The Design Team shall consider the efficiency of the ventilation equipment in their design.

Laboratory Design

The primary objective in the design of HVAC Sytems for laboratories is to provide a safe environment for laboratory personnel to conduct their work.

General laboratories shall have a minimum of 6 air changes per hour.

Laboratories must be maintained under negative pressure in relation to the corridor of other

less hazardous spaces.

Fume hoods should not be the sole means of room exhaust. General room exhaust shall be provided to maintain air change rates and temperature control.

Operable windows are prohibited in laboratories.

Type 316 stainless steel should be used for all parts of the fume hood exhaust system. The exhaust duct should have as few bends as possible and minimal horizontal runs.

The design of the laboratory ventilation system should follow the low pressure drop design concepts developed by Laboratories for the 21th Century.

Fume hoods shall maintain a minimum face velocity of 100 fpm with no measure point less than 80 fpm when the sash is open 18 inches. When the sash is fully open the minimum face velocity shall be 100 fpm with a 60 % diversity factor.

Exhaust Fan Assembly:

> The exhaust fan assembly shall be located on the roof. The fan shall be either a mixed-flow dilution fan or industrial single width centrifugal type. Fan may be either belt-driven or direct drive, with motors isolated from the exhaust airstream and accessible from the fan exterior for inspection and service. Fan shall be AMCA 99 certified for Spark Resistant Construction. Fan shall be coated inside and out with coating suitable for products being conveyed. All fasteners shall be 316 stainless steel.
>
> Fan and stack shall meet the requirements of ANSI Z9.5 for discharge velocity and stack height, unless a wind tunnel study can verify a lower discharge velocity or stack height will not be detrimental to occupants and air intakes for the building under design and the surrounding buildings.

Refer to Division 11 for other fume hood requirements.

Acoustics

Provide sound traps in the ductwork, noise suppression devices in the design of piping and equipment and consider other acoustical or vibration control as required. Design Team shall provide all acoustic calculations a minimum of one week prior to the 100% Detailed Design for the noise levels at each air handling unit and mechanical room.

The Variable Air Volume (VAV) terminals and fan powered terminals shall be

sized to have a room Noise Criteria (NC) rating so that the final discharge, or radiated sound pressure does not exceed the recommended values in Table 11 of Chapter 7, Sound and Vibration, of the 2001 American Society of Heating, Refrigerating, Air-Conditioning Engineers, Inc. (ASHRAE) Fundamentals Handbook.

Fan powered terminals shall be located outside of any noise sensitive areas. Refer to Requested Facilities section for identification of specific areas. More stringent criteria may be required in some areas.

Corresponding requirement for sound attenuation shall apply to the Variable Air Volume (VAV) terminals and fan powered terminals serving these areas.

Calculations for HVAC Design

Submit cooling and heating load calculations for each individual zone in the building's HVAC system and sizing data for all applicable proposed equipment such as air handling units, VAV terminals, boilers, fan/coils, pumps, etc. for piping systems along with the 50% Construction Documents submittal. Also, provide representative "cut sheets" for equipment and materials.

Each zone calculation shall indicate, at a minimum: individual rooms, total and sensible loads, and air flow requirements. The heating and cooling loads shall represent all loads: people loads (including diversity factors), appliances, fresh air for ventilation in accordance with ASHRAE Standard 62-2004, and external loads (e.g. solar and fenestration). Calculations shall be performed using a standard HVAC load calculation program such as: Elite Software's CHVAC, DOE2, Carrier's E20 or HAP, Trane Tracer, or other software regularly used and accepted in the HVAC industry.

The engineer shall submit necessary calculations to verify the design meets the requirements of ASHRAE Standard 62-2004. This shall be in the form of calculations indicating that the necessary outside air is supplied to each system, or zone, to comply with the requirements of the ASHRAE Standard. Where the engineer utilizes diversity factors and the multiple spaces portions of the Standard to supply the required outdoor air for ventilation, he must also submit documentation verifying the requirements of the Standard are met.

Mechanical and Electrical General

Room numbers must appear on air conditioning and electrical plans and room names where space is available. Column lines or designations shall appear on all MEP sheets as they appear on Architectural sheets.

Plumbing and air conditioning systems shall be drawn as separate drawings. These systems may be combined on common drawings only by written permission of the FPC Project Manager.

Where piping systems are to be installed underfloor, these shall be shown on an underfloor plan and not on the plan prepared for the space above. Floor plans for mechanical systems shall be drawn to show pipes, ducts, etc. on the floor in which they are installed. In general, underfloor plans shall be drawn to show all piping underfloor and, from there up, the systems between each floor slab shall be shown only on the appropriate floor plan.

All construction details shall be shown on the drawings and shall not be bound in the specifications.

All equipment and material specifications shall be bound in the specifications and shall not be shown on the drawings.

Performance data for all mechanical and electrical equipment shall be shown in schedules on the drawings. This data may also be included in the specifications but shall be carefully edited for conflicts.

The A/E shall identify on the drawings all areas that may be classified as hazardous in accordance with the latest edition of the NFPA Code or that may pose a health hazard due to noise levels, radiation, chemical fumes, etc. The A/E shall describe how each such area will be treated in the building design.

The A/E shall design the facility to connect to the central utility systems as available and as directed in the POR.

Design Conditions

The following information should be clearly shown on the General Information Sheet. Additions and deletions may be required if package unit equipment is incorporated in the design of facilities.

Mechanical	
Summer Outside	(°F.D.B.) (°FWB)
Summer Inside	(°F.D.B.) (%R.H.)
Winter Outside	(°F.D.B.)
Winter Inside	(°F.D.B.)
Total Cooling Capacity	(Tons)

Total Cooling Max. Demand		(Tons)
Total Heating Capacity		(BTUH)
Total Heating Max. Demand		(BTUH)
Fresh Air Req'd,	Winter	(cfm)
	Summer	(cfm)
Domestic Hot Water, Capacity		(gpm)
Domestic Hot Water Max. Demand		(gpm)
Steam, Capacity		(#hr)
Steam Max. Demand		(#hr)
Condensate, returned		(gph)
Fixtures (plumbing)		(fixture units)
Sanitary Sewer		(gpm)
Gas, natural		(cfh)

Determine the economic feasibility of incorporating solar energy for space heating, cooling, and water heating into the building design and proposed energy system.

Economic feasibility for each function shall be determined by comparing the estimated cost of energy procurement using conventional sources and energy systems with the estimated cost of using solar energy during the economic life of the proposed building.

Boilers

Specifications for boilers to include the following:

1. Chemically treat and flush boiler system prior to initial startup.
2. Begin internal boiler treatment with chemical comparable with JD-701 (Fort Bend Services).
3. Provide and install an automatic blow down system.
4. Provide and install a conductivity meter.

Campus Specific Information

Texas A&M University

Metering

Chilled Water: The meter shall be the type manufactured by Rosemount under

the product umbrella "Rosemount 8705 Magnetic Flow Meter". All meters should be equipped with a Rosemount remote transmitter model 8712. Meter should be installed per the manufactures specifications and should be field verified by Physical Plant – Utilities personnel. Approval from the Office of Energy Management must be obtained before sizing the flow meter to ensure it is within allowable flow ranges. There will need to be two immersion well temperature sensors of the type manufactured by Minco 100 Ohm Platinum with a temperature range of 30 deg.f. to 80 deg.f. which corresponds to a 4-20mA output. One sensor will be installed in the primary CHW supply and one sensor will be installed in the primary CHW return piping. Flow wiring from the transmitter will be ran to the WAGES PLC.

Heating Hot Water: The meter shall be exactly like the type manufactured by Rosemount under the product umbrella "Rosemount 8705 Magnetic Flow Meter". All meters should be equipped with a Rosemount remote transmitter model 8712. Meter should be installed per the manufactures specifications and should be field verified by Physical Plant – Utilities personnel. Approval from the Office of Energy Management must be obtained before sizing the flow meter to ensure it is within allowable flow ranges. There will need to be two immersion well temperature sensors of the type manufactured by Minco 100 Ohm Platinum with a temperature range of 65 deg.f. to 190 deg.f. which corresponds to a 4-20mA output. One sensor will be installed in the primary HHW supply and one sensor will be installed in the primary HHW return piping. Flow wiring from the transmitter will be ran to the WAGES PLC.

Steam Meter: The meter shall be exactly like the type manufactured by Rosemount under the product umbrella "Rosemount 3095 Mass Proplate Flowmeter". Meter should be installed per the manufactures specifications and should be field verified by Physical Plant – Utilities personnel. Approval from the Office of Energy Management must be obtained before sizing the flow meter to ensure it is within allowable flow ranges. Flow wiring from the transmitter will be ran to the WAGES PLC.

Natural Gas Meter: The meter will be supplied by the local distribution company

Central Plant Utility Systems

The Texas A&M University Utilities Plant produces and distributes all of the utility services required by academic, general purpose and research facilities. The following are design criteria for the central utilities systems which should be used in the design of building systems which are connected to the central system.

Chilled Water: Shall not be used for any purpose other than comfort space conditioning.

Chilled Water temperature is reset based on outside air temperature.

- O/A less than 40 deg.f. CHW = 48 deg.f.
- O/A from 40 to 50 deg.f. CHW = 46.5 deg.f.
- O/A from 50 to 60 deg.f. CHW = 45 deg.f.
- O/A from 60 to 70 deg.f. CHW = 43.5 deg.f.
- O/A greater than 80 deg.f. CHW = 42 deg.f.

Consult Texas A&M Physical Plant Department Utilities Division Technical Services Group for supply and return pressure data.

Heating Water: Shall not be used for any purpose other than comfort space conditioning.

Heating Hot Water temperature is reset based on outside air temperature.

- O/A less than 30 deg.f. HHW = 180 deg.f.
- O/A from 30 to 40 deg.f. HHW = 170 deg.f.
- O/A from 41 to 50 deg.f. HHW = 160 deg.f.
- O/A from 51 to 60 deg.f. HHW = 150 deg.f.
- O/A greater than 60 deg.f. HHW = 140 deg.f.

Consult Texas A&M Physical Plant Department Utilities Division Technical Services Group for supply and return pressure data.

Domestic Hot Water: Consult Texas A&M Physical Plant Department Utilities Division Technical Services Group for pressure and temperature data.

Large users shall be connected to central system if in close proximity to existing distribution system. Small users may generate their own domestic hot water with gas or electric heaters. Heating water shall not be used as the heat source in producing domestic hot water.

Compressed Air: Consult Texas A&M Physical Plant Department Utilities Division Technical Services Group for the availabilty of centrally produced compressed air for laboratory and instrumentation usage. Do not use for space conditioning instrument except as back-up for reliability.

Steam: Consult Texas A&M Physical Plant Department Utilities Division

Technical Services Group for the availabilty of centrally produced steam.

Condensate: Consult Texas A&M Physical Plant Department Utilities Division Technical Services Group for condensate return data.

Domestic Water: Consult Texas A&M Physical Plant Department Utilities Division Technical Services Group for pressure data.

Sanitary Sewer: All buildings with sanitary facilities will be tied into the sanitary sewer system.

Project A/E shall consult with and obtain the approval of the Department Head of System Member Environmental Health & Safety Department, Department Head of System Member Physical Plant Department and Director of Project Delivery, Facilities Planning and Construction prior to the anticipated used of the sanitary sewer system for the disposal of animal waste.

Storm Sewer: Used exclusively for rainfall run-off.

Prairie View A&M University

Central Plant Utility Systems

The Prairie View A&M University Utilities Plant produces and distributes the following utility services required by academic, genral purpose and research facilities. The following are design conditions for these systems.

Chilled water: Shall not be used for any purpose other than comfort space conditioning.

Supply:	Pressure 60 psi Normal, 95 psig Max. Temperature43°
Return:	Pressure 45 psi Temperature 54°F

Domestic Hot Water: Large users shall be connected to central system unless otherwise specified in Program of Requirements. Small users shall generate their own Domestic hot water utilizing steam as the heat source.

Pressure:	60 psig Max., 50 psig Normal

Temperature: 140°F

Steam:

Pressure: 150 psig and 15 psig.
Temperature: 550°F Max., 365°F Normal and 365°F Max., 250°F Normal.

Condensate:

Return Header Pressure: 15 psig.

Domestic Water:

Pressure: 54 psig

Sanitary: All buildings will be connected to this system. Do not use for storm drainage.

Storm Sewer: Used exclusively for rainfall run-off. Buildings shall have roof drain systems conveyed to underground storm sewers.

Tarleton State University

Central Plant Utility Systems

The Tarleton State University Utilities Department provides the following utility services required by academic, general purpose and research facilities. The following are design and general conditions for these systems.

Steam:

Pressure: 20 psig
Temperature: 259°F

Condensate:

Return Header Pressure: Gravity

Domestic Water:

Pressure: 55 psig

Sanitary Sewer: All buildings will be connected to this system. Do not use for storm drainage.

Storm Sewer: Used exclusively for rainfall run-off. Buildings shall have roof drain systems conveyed to underground storm sewers.

Texas A&M University at Galveston

Central Plant Utility Systems

The Texas A&M University at Galveston Utilities Department provides the following utility services required by academic, general purpose and research facilities. The following are design and general conditions for these systems.

Chilled Water: Shall not be used for any purpose other than comfort space conditioning.

Supply: Pressure
Temperature: 45°F

Return: Pressure
Temperature: 56°F

Heating Water:

Supply: Pressure
Temperature: 180°F

Return: Pressure
Temperature: 150°F

Domestic Water:

Pressure:

Sanitary Sewer: All buildings will be connected to this system. Do not use for storm drainage.

Storm Sewer: Used exclusively for rainfall run-off. Buildings shall have roof

drain systems conveyed to underground storm sewers.

West Texas A&M University

Chilled Water Piping:

Steel Pipe: ASTM A53, Schedule 40, 0.375 inch wall for sizes 12 inch and over, black.

2 inch and Smaller:
Fittings: ASTM B16.3, extra heavy malleable iron class 250 or ASTM A234, forged steel welding type.
Joints: Threaded or AWS D1.1 welded.

2-1/2 inches and larger – in mechanical rooms and crawl spaces.
Mechanical Grooved Fittings: ASTM A536 ductile iron, grade 65-45-12
Mechanical Grooved Couplings: ASTM A-536 Ductile iron housing clamps to engage and lock, "C" shaped EPDM elastomeric sealing gasket, steel bolts, nuts, and washers.

2-1/2 inches and larger – in concealed spaces, above finished spaces, and all connecting piping to air handling units.

Fittings: ASTM A234 forged steel welding type, Class 300.
Joints: AWS D1.1 welded.

Heating Water Piping:

2-1/2 inches and larger:
Steel Pipe: ASTM A53, Schedule 40, 0.375 inch wall for sizes 12 inch and over, black.

2-1/2 inches and larger – in mechanical rooms and crawl spaces.
Mechanical Grooved Fittings: ASTM A536 ductile iron, grade 65-45-12
Mechanical Grooved Couplings: ASTM A-536 Ductile iron housing clamps to engage and lock, "C" shaped EPDM elastomeric sealing gasket, steel bolts, nuts, and washers.

2-1/2 inches and larger – in concealed spaces, above finished spaces, and all connecting piping to air handling units.

Fittings: ASTM A234 forged steel welding type, Class 300.
Joints: AWS D1.1 welded.

2 inches and smaller:
Copper Tubing: ASTM B88, Type L, hard drawn.
Fittings: ASME B16.18, cast brass, or ASME B16.22, solder wrought copper.
Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.
Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F.

For copper Pipe sizes 3/4 inch to 2 inch:
Press Fittings: ASME B16.18 or ASME B16.22 copper and copper alloy press fittings conforming to IAPMO PS 117, with EPDM sealing ring factory installed in fitting.

Medium and High Pressure Steam Piping (150 PSIG Maximum)

Steel Pipe: ASTM A53, Schedule 80, black.
Fittings: ASTM B16.3 malleable iron Extra Heavy
Joints: AWS D1.1 welded.

Low Pressure Steam Piping (15 PSIG Maximum)

Steel Pipe: ASTM A53, Schedule 40, black.
Fittings: ASTM B16.3 malleable iron Extra Heavy
Joints: AWS D1.1, welded.

Medium and High Pressure Steam Condensate Piping

Steel Pipe: ASTM A53, Schedule 80, black.
Fittings: ASTM B16.3 malleable iron, Extra Heavy
Joints: Up to 1 inch: Threaded, or AWS D1.1, welded for all piping above 1 inch.

Low Pressure Steam Condensate Piping

Steel Pipe: ASTM A53, Schedule 80, black.
Fittings: ASTM B16.3 malleable iron Extra Heavy
Joints: Up to 1 inch: Threaded, or AWS D1.1, welded for all piping above 1 inch.

Guide Specification

Air Handling Units for Design & Construction

1. Install thermometers and pressure indicators in the hydronic coil piping. Don't rely on the EMS to read these values.

2. Flushing the piping loop(s), primary and secondary, is essential for a dependable maintenance free system. The engineer, or his designate, should be present during the flushing. This will mean a good specification delineating the goals and the definition of what is an acceptable measure of what "a clean piping system" is.

3. Temperature sensors across coils
   For best results, temperature sensors on coils should be sized for:
   In mixing plenums the length of the element should be two (2) feet in length for each square foot of coil area.
   In other applications the length of the element should be one (1) foot in length for each square foot of coil area.

4. Averaging-type sensors should be installed in a serpentine manner uniformly across the coil cross-section, with radius clips at each bend of the sensor in the coil supporting the sensor.

5. Multiple sensors can be wired in a series/parallel arrangement for complete coverage in plenums. As an alternative, for larger mixing plenums, it may be advantageous to install several analog-input points on the controller. This arrangement allows software averaging of temperatures for control while providing individual temperature indication to monitor stratification conditions with worse-case conditions triggering a software alarm.

6. Double wall casings are required on all air handling units. Gauge thickness shall be no less than 18 gauge exterior and 20 gauge interior. Insulation shall be a minimum of R-12 and conform to NFPA standard 90 requirements. All exterior wall panels shall be made of ASTM A653 G90 galvanized steel and built on a minimum of six inch rails. Units shall have access doors, minimum 15½" width, to access both sides of the coils, filters, fan section and mixing box sections.

7. Interior wall panels may be made of perforated ASTM A653 G90 galvanized steel for sound attenuation. However, other methods, i.e. external methods and devices, of sound attenuation are preferred.

8. Drain pans shall be of double wall construction with a stainless steel inner liner, sloped both ways to a single outlet with a minimum of 2" of uncompressed insulation, with a minimum condensate connection of 1" NPT stainless steel. Drain pans shall extend downstream of the coil far enough to contain moisture carry-over. Drain pans must be accessible for inspection and cleaning.

9. Cooling coils shall contain a minimum of 6 rows, tube diameter of either ½" with a minimum .025" wall thickness or ⅝" with .028" wall thickness and maximum of 10 fins per inch, and fin thickness of not less than .006 inches.

10. Air handling units shall be constructed to facilitate easy removal of the coil without disassembly of the cabinet. At the manufacturer's option, the coils may be installed on tracks to facilitate removal.

11. Coils shall comply with ARI Standard 410 for capacity, pressure drops and selection procedure. Where stacked coils are required in large units, the manufacturer shall provided for a means to collect and drain the condensate from the top coil to the drain pan without impingement on the lower coil.

12. If the campus is in excess of 50 miles of the Gulf coast coil tubing shall be copper with aluminum fins. If the campus is within 50 miles of the Gulf coast, tubes and fins shall be copper or, at the engineers' option, heresite coated aluminum fins.

13. Coil casing shall be stainless steel for chilled water coils. Any penetrations shall have rubber grommets and fully sealed for pressurization and insulated from the casing insulation.

14. Bearings shall self aligning, antifriction type with a life of 200,000 hours of L-50 life with external grease fittings. All bearings shall be factory lubricated and equipped with standard hydraulic grease fittings and lube lines extending to the motor side of the fan.

15. All units with a motor rated at 10 horsepower and larger, shall be furnished with and internal 120 VAC marine light. Lights shall be a

weather-resistant, gasketed, incandescent light. Air Handling Units shall also incorporate an inspection window constructed of glass reinforced with safety wire and installed in the fan section on the side from which the belt drives are visible.

16. All units shall have a single point of connection for the electrical service to the unit. The manufacturer shall seal the conduit to the motor with "Sealtite" to prevent condensation in the motor connection housing.

17. Safety latches shall be required on the fan section.

18. Minimum space between the coils in the air handling units shall be 15½" for cleaning coils.

19. Fans for air handling units shall be backward inclined or airfoil centrifugal type certified as complying with ARI 430-89. A/E shall specify the total static pressure and either the brake horsepower or impeller diameter. Fans shall be rated and certified in accordance with ARI Standard 430. All airfoil fans shall bear the ACMA seal. Fan Modulation – VFDs, dampers or inlet guide vanes are not acceptable. Fans shall have internal vibration isolation installed under the fan and motor.

20. Impellers shall be either aluminum or herisite coated. Motors shall be premium efficient rated for VFD operation shall be inverter duty type and capable of withstanding repeated peaks of 1600 volts at 0.1 microsecond rise time. Comply with NEMA MG-1 Part 31, where applied with and of type F insulation NEMA MG 1-10.38 with H rise.

21. Air handling unit installation shall utilize a method to measure the outdoor air flow rate and adjust the outdoor air flow rate to meet the ASHRAE 62-2001 standard. In addition, the A/E shall consider methods of controlling the systems to ensure compliance. For example, a "polling" system for VAV terminals and utilizing the EMS to comply with the ASHRAE 62-2001 standard.

22. Filters – Type, sizes, etc. shall be specified by the A/E and based on the individual application and use for the Air Handling Unit. Efficiency shall be specified by the "dust spot method" in accordance with ASHRAE Standard 52. Minimum efficiency shall be 30% unless otherwise approved

by the System Mechanical Engineer. Consider a secondary filter of 60% efficiency.

23. There is a difference in design requirements for AHUs operating under positive pressure (blow through) and negative (draw through) pressure.

A positive pressure trap should have a weir depth of the total expected static pressure plus ½". This static pressure can be gauged based on the worst case of the fan being "deadheaded" at the full rated speed allowed by the Variable Speed Drive (VSD).

However, a negative pressure trap should have a total depth equal to: 1" for each 1" of maximum negative static pressure, an additional 1", the weir height, and the pipe diameter and exterior insulation. The weir height should be half of 1" for each 1" of maximum negative static pressure plus the additional 1".

Without a trap, or if the trap is improperly designed, air will be drawn into the inside of the fan and AHU casing. In a negative pressure situation, this results in water from the condensate pan spraying the inside of the unit. This will eventually result in damage to the equipment and mold and mildew growth.

In a negative pressure situation, if the trap is too tall or too short, water can be drawn back up into the condensate pan and result in flooding the interior of the unit or dry out allowing air intrusion and water spraying into the unit.

Using the proper seal height will prevent these problems. The consultant shall not leave the trap design to the contractor.

Guide Specification

Variable Air Volume Terminal Units for Design & Construction

1. Casing - Terminals shall be constructed of a minimum 20 gauge G60 galvanized steel as per ASTM A 653, *Standard Specification for Steel Sheet, Zinc-Coated(Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dipped Process*, capable of withstanding a 125 hour salt spray test as per ASTM B-117, *Standard Practice for Operating Salt Spray (Fog) Apparatus*. Terminal casing shall be assembled with fasteners. Spot welded assemblies are not acceptable. Casing less than 36" wide min 22 gauge; greater than 36" min 20 gauge.

   Internal Liner - Casing shall be internally lined with ½" (*¾" or 1"*) thick 4 pounds per cubic foot, dual density fiberglass insulation rated for a maximum air velocity of 3,600 feet per minute. Insulation shall be fastened with adhesive complying with NFPA 90A. The insulation shall also use spot welded "stick pins" to ensure the insulation is securely fastened. Using adhesive to fasten the insulation to the casing is not acceptable. Insulation minimum "U" value shall be 0.24 Btu/hr-ft^{2}-^{0}F. Insulation shall meet or exceed the requirements of UL 181 and NFPA 90A. Raw insulation must be covered with a metal liner to eliminate flaking of insulation during installation. Simple "buttering" of raw edges with an approved sealant is not acceptable.

   Options -

   - Foil faced insulation – interior insulation shall be covered with scrim backed foil facing. All insulation edges shall be covered with foil or metal nosing. Insulation shall meet ASTM C 1136 *Standard Specification for Flexible Low Permeance Vapor Retarders for Thermal Insulation,* and ASTM 665 *Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing*, for biological growth in insulation.

   a. Engineers shall specify terminals with a fiber-free close cell electrometric foam liner. Liner shall not absorb water, be smooth, erosion resistant and washable. Liner shall be acoustically superior to standard dual density fiberglass insulation. Liner shall comply with the following Standards: *NFPA 90A – Supplementary materials for air distribution, ASTM E84 and UL 181 (25/50)*

Smoke and Flame spread, ASTM C1071, G21, and G22 no bacterial or fungal growth

Control Assemblies, hot water heating coils, electric heating coils shall not extend beyond the top and bottom of the unit casing.

2. Maximum Static Pressure Drop - At the inlet velocity of 2,000 feet per minute, the static pressure drop across the basic terminal or basic terminal with a sound attenuator shall not exceed .08" w.g for all unit sizes.

3. Primary Air Valve - the primary air valve shall consists of a minimum 22 gauge cylindrical body that includes embossed rings for structural rigidity. The damper blade shall be a connected to a solid shaft by means of an integral molded sleeve which does not require screw or bolt fasteners. The shaft shall be manufactured of a low thermal conducting *composite* material, and include a molded damper position indicator visible from the exterior of the unit. The damper shall pivot on in self lubricating bearings. The damper actuator shall be mounted on the exterior of the terminal for ease of service. The valve assembly shall include internal mechanical stops for both full open and closed positions. The damper seal shall be secured without the use of adhesives. The air valve leakage shall not exceed 1% of maximum inlet rated pressure at 3.0" w.g. inlet pressure.

   Air leakage thru the primary air valve shall not to exceed 2% (or 5%) of the nominal catalog flow at 3.0" w.g.

4. Airflow Sensor - Differential pressure airflow sensor shall traverse the duct using equal cross sectional area or log-linear traverse method along two perpendicular diameters. Single axis sensor shall not be acceptable for ducts 6" in diameter or larger. A minimum 12 total pressure sensing points shall be utilized. The total pressure inputs shall be averaged using a pressure chamber located at the center of the sensor. A sensor that delivers the differential pressure signal from one end of sensor is not acceptable. The sensor shall output an amplified differential pressure signal that is at least 2.5 times the equivalent velocity pressure signal obtained from a convention pitot tube. The sensor shall develop a differential pressure of 0.03" w.g. at an air velocity of 400 feet per minute. Documentation shall be submitted which substantiates this requirement. Brass balancing taps and airflow calibration charts shall be provided for field airflow measurements.

   The airflow sensor shall be a cross, i.e. two sensor elements that are the full diameter of the inlet duct connection and at 90^0 to each other.

Single axis sensors will not be acceptable. The sensor shall develop a differential pressure of 0.03" w.g at air velocities of 450 feet per minute or less. Consultant shall require submittals certifying the sensors do have this capability.

5. Hot Water Coils - where required by the schedules or on the drawings and shall be included in the terminal. The coil shall be manufactured by the terminal unit manufacturer (or approved coil manufacturer) and shall have a minimum of 22 gauge galvanized sheet metal casing with a minimum G60 coating. Stainless steel casings, with a baked enamel paint finish, may be used as an alternative. Coil to be constructed of pure aluminum fins with full fin collars at assure accurate fin spacing and maximum tube contact. Fins shall be spaced with a minimum of 10 fins per inch and mechanically fixed to seamless copper tubes for maximum heat transfer. Each coil shall be tested at a minimum of 350 psig under water.

   0.50" tube diameter with 0.017" wall thickness fins of 0.0045" thickness tested and certified in accordance with ARI Standard 410. Casing material. Specify who is to supply control valves, air vents and drain valves.

   Engineer shall specify that any coil bends or parts exposed to the outside of the terminal shall be insulated to prevent condensation.

6. Electric Resistance Heating Elements - where required by the schedules or on the drawings and shall be included in the terminal. Heater shall be manufactured by the terminal manufacturer (or approved coil manufacturer), and shall be ETL listed. The electric resistance heating element cabinet shall be constructed of not less than 20 gauge galvanized steel with a minimum G 60 zinc coating. Stainless steel casings or galvannealed steel casings with a baked enamel paint finish may be used as an alternative. The electric resistance heating cabinet shall have a hinged access panel for entry to the controls.

   The electric resistance heating element shall be factory installed to the terminal with heating elements located upstream of the airflow control damper to uniform velocity profile over elements. Elements located downstream of the damper are not acceptable.

   An electrical disconnect shall be mounted on the terminal box and shall render the heater non-operable. Heater shall be furnished with all of the controls for safe operation and full compliance with the UL 1995 and the National Electric Code, latest edition.

   Single point access for electrical and multiple access doors if they have

more than one motor.

The electric resistance heating element cabinet shall have a single point electrical connection. The connection shall include a disc-type automatic reset high temperature limit, secondary high limit(s), airflow switch, Ni-Chrome elements, and fusing per UL and NEC. Heater shall have complete wiring diagram with label indicating power requirement and kw input.

7. If the Consultant determines sound attenuators are required, it shall be provided and scheduled on the drawings to meet acoustical performance requirements. The attenuator and terminal unit shall be of single piece construction. Attenuator shall be constructed the same as the base terminal. Terminals shall meet the requirements of ARI Standard 885-98 for sound.

8. Multi-Outlet Plenums - if the Consultant determines a multi-outlet plenums are required, they shall be provided where scheduled on the drawings. The multi-outlet plenums shall have balancing dampers at each outlet with a locking quadrant. Multi-outlet plenums shall be constructed the same as the base terminal.

9. Fans - fan powered terminals shall be utilize a forward curved, dynamically balanced, galvanized wheel with a direct drive motor. The motor shall be permanent split capacitor type with three separate horsepower taps. Single speed motors with electronic speed controllers are not acceptable.

   The fan motor shall be unpluggable from the electrical leads at the motor case for simplified removal (open frame motors only). The motor shall utilize permanently lubricated sleeve type bearings, include thermal overload protection. The motor shall be mounted to the fan housing using torsion isolation mounts properly isolated to minimize vibration transfer.

   The terminal shall utilize an electronic (SCR) fan speed controller for aid in balancing the fan capacity. The speed controller shall have a turn down stop to prevent possibility of harming motor bearings.

   Options –

   1. The Consultant shall examine and determine if the use of ECM motors for the terminals can be economically justified. The terminal shall include a rectifier and filter for AC power to condition the power to the fan.

2. If the use of ECM motors requires additional electrical circuiting or grounding, the design electrical engineer shall notify the design mechanical engineer in writing. The Texas A&M University System Mechanical and Electrical Engineers shall also receive this notification. Prior to proceeding with the design incorporating any ECM motors, concurrence is required by the System Mechanical and Electrical Engineers.

10. Filter Racks - terminals shall contain a filter rack capable of holding a 1" thick filter. Filters shall be secured with quick release clips, allowing removal without horizontal sliding.

    Option - at the Consultant's discretion, the terminal shall include a V-bank or similar design to ensure the filter velocity is below 600 feet per minute. Field fabricated racks are not acceptable.

General Information

Automatic Temperature Controls

Provide a temperature control/energy management system and control function for the entire building. The system shall include a stand alone Direct Digital Control (DDC) System. This system shall communicate with the Central EMS at the Physical Plant Department through an Ethernet card and the campus instrumentation control distribution wiring system.

The EMS/Automatic Temperature Control (ATC) system must be compatible with the existing campus system. Systems or building components to be monitored and/or controlled by the central campus systems include, but are not limited to, the following: temperature control, temperature and humidity control of the greenhouse areas, fire alarm, security, outside building lighting, and the start and stop of major equipment. Monitoring of specific mechanical equipment and systems will be dependent on the recommendations of the Physical Plant. Provide metering of utilities with indication and totalization capabilities.

Energy Management System

Provide a stand-alone direct digital control (DDC) system for space conditioning in campus buildings connected to the central campus EMS system. During the design development and construction documents phase, consult with the respective controls firm in order to determine the number of DDC Panels required and the location for each panel. The panel locations shall be shown on the detailed design drawings.

Campus Specific Information

Texas A&M University

Landis Division, Siemens Building Technologies, Inc.

Tarleton State University

Johnson Controls, Inc.

Prairie View A&M University

Johnson Controls, Inc.

Texas A&M University at Galveston

Landis Division, Siemens Building Technologies, Inc.

Texas A&M University-Corpus Christi

Landis Division, Siemens Building Technologies, Inc.

Texas A&M International University

Landis Division, Siemens Building Technologies, Inc.

Texas A&M University-Kingsville

Landis Division, Siemens Building Technologies, Inc.

West Texas A&M University

Johnson Controls, Inc. (Electronic, no pneumatics)

Texas A&M University-Commerce

TAC Americas, Inc.

Texas A&M University-Texarkana

South Campus and Main Campus
Landis Division, Siemens Building Technologies, Inc.

Baylor College of Dentistry

TAC Americas, Inc.

On off-campus locations and remote on campus locations, type of controls shall be as required in the Program of Requirements or as directed by FPC Project Manager. As a minimum these locations shall have a means for night, week-end and holiday set-back.

Guide Specification

Automatic Temperature Controls & Energy Management System

PART I General

1.1 The bidding and Construction Requirements and General Requirements apply to this work.

1.2 Furnish and install all temperature, pressure, and flow sensors, transmitters, relays, switches, wire, tubing, and conduit external to the DDC panels. Also furnish all pneumatic controls, operators, air supply with compressor, control valves, transducers and tubing to connect components. Submit for approval, appropriate product data cut-sheets for all material/components intended for use prior to beginning work.

1.3 Owner shall furnish Direct Digital Control (DDC) panels complete with all microprocessors, software, terminal strips, pneumatic transducers, relays, and regulated power supply with battery backup. Empty panel boxes will be furnished by the Owner for mounting by the Automatic Temperature Controls Contractor.

1.4 Owner shall furnish a Terminal Equipment Controller (TEC) and electronic inlet damper actuator(s) for installation on each VAV terminal box and fan coil unit by the box manufacturer. These DDC devices shall be delivered to the VAV box or fan coil unit manufacturer's factory in sufficient time for the manufacturer to meet their scheduled delivery obligations.

1.5 The box manufacturer shall provide for each box an inlet flow sensor(s) suitable for interfacing with a Honeywell micro bridge pressure transducer, any necessary pilot control relays, and factory mount and connect these devices and the DDC controller as required for proper operation as required under this section. The cost of factory mounting shall be included in the cost of the VAV boxes. All other wiring and terminations related to the DDC controller (TEC) shall be provided by the ATC contractor.

1.6 Room temperature sensors, room humidity sensors, and room sensor mounting base plates shall be provided by the Owner for installation by the ATC contractor.

1.7 Pneumatic temperature controls and non-DDC accessories that are standard catalog products as manufactured by Landis and Staefa, Inc., Johnson Controls, Inc., or Honeywell will be acceptable. Industrial instrumentation supplied shall be standard catalog products of Rosemount, Honeywell, Bristol, Foxboro, Leeds and Northrup, Taylor or Brown. All coordination and execution of work pertaining to the installation, service and guarantee, under this section of the specifications, shall be the sole responsibility of the Contractor.

1.8 All controls to be installed, calibrated and adjusted by trained instrument technicians in the full-time employ of the Automatic Temperature Controls Contractor. The ATC Contractor shall not subcontract this work in whole or in part to another contractor or individual(s).

1.9 The ATC Contractor shall be a factory-owned branch of the corporations listed in 1.10, below. Distributorships shall not be acceptable as ATC Contractors.

1.10 Acceptable ATC Contractors, provided they comply with these specifications, are:

a. Siemens Building Technologies, Inc.
b. Johnson Controls, Inc.
c. Honeywell, Inc.
d. TAC Americas, Inc.

1.11 Submit engineering/wiring drawings and receive approval prior to beginning work. These drawings shall be submitted in a timely manner to provide sufficient time to review drawings so as not to hold up the project.

1.12 The Owner-furnished DDC field panels will be located in mechanical rooms as shown on the drawings. All sensor and start/stop wiring will be brought back to the panel responsible for controlling/monitoring the mechanical/electrical equipment for which the sensor, start/stop wiring and tubing is directly related.

1.13 Division 16 shall provide power to a duplex receptacle inside each DDC panel. Power shall be provided from a breakered, 20 amp

dedicated circuit having an insulated ground wire from the power panel ground buss wired to the duplex receptacle.

1.14 Furnish and install a network communications trunk (N.C.T.) between DDC panels, and a separate LAN communications network between each terminal unit controller (or group of controllers) back to the DDC panel associated with the AHU which serves the terminal units(2). Trunks shall be connected to the panels/controllers in a daisy-chain fashion, with no "T" connections permitted. In addition, the N.C.T. trunk shall be extended from the nearest Panel to an Owner-provided, dedicated line junction box.

1.15 The Owner shall provide the dedicated line between the junction box and the Campus Energy Management System, as well as program the panels with operational sequences and set-points specified.

1.16 Furnish, install and make connections of all interlock, power for sensors (if required), 24 volt, 40 va power source for each TEC, line and low-voltage wiring external to DDC panels. Wiring and tubing into panels shall require a minimum of 5 feet extra length with which the Owner will make final terminations inside the DDC panels. All wiring shall be clearly and permanently labeled as outlined in Section 1.17E below. Tubing will be labeled in a similar fashion as well.

1.17 Automatic Temperature Control/Engineering Management System wiring:

A. All wiring and conduit shall be installed in accordance with related Specification Section Division 16 Electrical.

B. The conduit/wiring system required for the ATC/Energy Management System shall be a complete, separate, independent system. Conduit sharing with other unrelated electrical systems is not permitted. All control wiring shall be in conduit, 3/4 inch minimum.

C. Conduit fill limit shall not exceed 40 percent in any portion of the conduit system.

D. In order to facilitate maintenance, where multiple sensors or devices are connected to a common raceway or conduit, each

sensor or device shall be individually connected to a common (non-sensor or device) junction box, which shall then be attached to the common conduit. Under no circumstances shall sensor or device wiring or tubing be routed through any other sensor or device's specific enclosure or junction box.

E. All wiring shall be labeled at both ends and at any spliced joint in between. Wire and tubing shall be tagged using 3M, ScotchCode WriteOn Wire Marker Tape Identification System; product number SWD-R-11954 with 3/4 inch x 5/16 inch write-on area or SLW 12177 with 1 inch x 3/4 inch write on area with 3M ScotchCode SMP Marking Pen. In addition to tagging at field device end and at spliced joints, a tag shall be placed 6 inches after entering each DDC panel. Identification and tag information shall be included in engineering/wiring submittal which must be submitted for Owner approval prior to beginning work. Tag information shall coincide with equipment/point information as written in the specification input/output summary.

F. Digital Input (D.I.) wiring (Class 2) may be run in a common conduit with Digital Output (D.O.) wiring (Class 1) where local codes permit.

G. Analog Input (A.I.), Analog Output (A.O.), Digital Input (D.I.), and Network Communications Trunk (N.C.T.) wiring may be run in a common conduit.

H. Digital Output (D.O.) wiring run in a common conduit with Analog Input (A.I.), Analog Output (A.O.), or Network Communications Trunk (N.C.T.) is not permitted under any circumstances.

I. AC line power to DDC panel shall be No. 12 THHN.

J. Digital Output (D.O.) wiring shall be No. 14 THHN.

K. Digital Input (D.I.), Analog Input 4-20 mA (A.I), and Analog Output (A.O.) wiring shall be No. 18 TSP (twisted, shielded pair with drain wire, stranded).

L. Analog Input/Thermistor/or voltage types (A.I.) wiring shall be

No. 18 TSP (twisted shielded pair with drain wire, stranded).

M. Network Communications Trunk (N.C.T.) between DDC panels shall be two (2) individual No. 24 awg TSP (twisted, shielded pair, stranded) cables, not to exceed 12 pf capacitance per foot, wire-to-wire. Terminal Unit controller LAN networks shall be one (1) No. 24 awg TSP of the same type.

N. Field devices requiring a 4-20 mA DC input signal shall be non-ground referenced.

1.18 System Verification--Procedure to be followed:

A. Upon completion of all external sensor mounting, terminations, and wiring/air--piping into and out of the DDC panels, the Owner shall inspect and approved this work. The ATC Contractor shall make his Representative(s) available and coordinate with the Owner during this inspection process.

B. Upon such approval being achieved, the Owner shall make terminations within the DDC panels.

C. Following completion of the work and the Owner's DDC panel tie-in, a performance test shall be conducted by the Owner in the presence of the ATC Contractor. The ATC Contractor's representative shall be present at all times during the point-to-point checkout of the work, to quickly correct any wiring, tubing, and/or end device problems which may be uncovered during system startup.

D. Upon conclusion of final checkout and acceptance, the Contractor's responsibility reverts to warranty of materials and installation herein specified. System shall be warranted for a period of two (2) years.

1.19 Coordination of Effort: It is the responsibility of the Contractor to schedule and coordinate with the installer of owner furnished equipment. The ATC Contractor shall notify the Owner's DDC representative in writing when each panel or section of work is complete and ready for startup. Sufficient notice shall be given as described below. If any deficiencies are subsequently encountered by the Owner's DDC representative, the Owner's DDC representative,

in order to expedite the progress of the project, may at his option, either correct the deficiency, or notify the ATC Contractor of the deficiency. Any costs incurred by the Owner's DDC representative due to having to correct any deficiency, or due to delays or multiple trips to the project site, shall be billed to the Owner, and forwarded to the ATC Contractor.

A. The Contractor shall schedule his construction activities so that all his work is verified and completed in due time to allow for the owner to install the DDC panels, make terminations, and prove the system. A minimum of 8 working days per panel shall be allowed in the project schedule for this purpose.

B. Coordination of activities is the responsibility of the Contractor. The Owners installer shall be notified a minimum of 7 days prior to the completion of Contractor work at the DDC box.

C. It is the Contractor's responsibility to schedule the accomplishment of these activities to allow for nominal system checkout, performance tests and balancing within the contract performance period.

1.20 Input/Output Summary: The following I/O Summary is provided as a summary of the minimum points required by this contract for connection to the Owner's Energy Management system. Furnish all devices, wiring, tubing, etc., necessary to serve and transmit to the Owner's panels. Any points not shown on the I/O Summary yet required to accomplish the sequence of operation shall be provided under this contract at no additional cost to the Owner.

[A/E SHALL INCLUDE AN INPUT/OUTPUT SUMMARY FOR THE PROJECT. (SAMPLE ATTACHED). THE FOLLOWING SCHEDULE IS REPRESENTATIVE OF THE POINTS TO BE MONITORED AND CONTROLLED AND WILL BE USED AS A GUIDE FOR PREPARING THE SUMMARY]

A. Temperature Monitoring:

1. Outside Air.
2. Return Air.
3. Mixed Air.
4. Discharge Air Each Single Zone Unit.

5. Cold Deck Each Multizone Unit.
6. Hot Deck Each Multizone Unit.
7. Multizone unit--supply air temperature each zone.
8. Space Temperature of each Multizone Thermostat.
9. Chilled Water Supply and Return from Central Plant.
10. Hot Water Supply and Return from Central Plant.
11. Domestic Hot Water Supply from Central Plant.

B. Humidity Monitoring:

1. As required and as directed by Owner.

C. Start/Stop Functions (Differential Pressure):

1. Each Hot Water Pump.
2. Each Chilled Water Pump.
3. Each Air Handling Unit.
4. Each Domestic Hot Water Pump (as directed by owner).

D. Flow Monitoring (GPM):

1. Chilled Water Supply from Central Plant.
2. Hot Water Supply from Central Plant.
3. Domestic Hot Water Supply and return from Central Plant (as directed by owner).

E. Pressure Monitoring:

1. Duct Static Pressure of Each VAV System.
2. Chilled Water Supply and Return from Central Plant.
3. Heating Water Supply and Return from Central Plant.
4. Domestic Hot Water Supply from Central Plant (as directed by owner).
5. Differential Pressure across air filters (major units only).

F. Miscellaneous Monitoring:

1. Total Building Electrical (Volt, Amps, KW).
2. Electrical Usage (KW) of Each Motor (chilled water pumps, heat pumps, domestic hot water pumps, air handling unit (25 HP or larger).

PART 2 Products

2.01 FIELD DEVICES

A. Temperature Sensors: Platinum Resistance Temperature Detector, 0 degrees F to 400 degrees F range, 100 ohms at 0 degrees C, 316 stainless steel sheath, single element, 1/4 inch diameter sheath. For water sensing provide 316 stainless steel thermowells. Use 304 stainless steel extension fitting to extend assemblies through insulating materials. Spring-loaded. sensors to ensure good surface contact in thermowells. Accuracy of + / - 0.1 degrees F from 20 degrees F to 70 degrees F for chilled water monitoring, accuracy of + / - 0.5 degrees F from 30 degrees F to 250 degrees F for condenser water, hot water, or domestic water monitoring, and accuracy of + / - 0.5 degrees F from 20 degrees F to 120 degrees F for all other temperature monitoring. Install on chilled water lines such that condensation does not collect in connection head. Duct temperature sensors shall be averaging type. Water sensors shall be provided with a separable stainless steel well. Outside air wall mounted sensors shall be provided with a sun shield. Accuracy of transmitter shall be unaffected by wiring distances up to 700 feet. Siemens Building Technologies, Inc., Minco, Hy-Cal only.

B. Room Sensors:

1. Each room temperature sensor shall come complete with a terminal jack and override switch integral to the sensor assembly. The terminal jack shall be used to connect the portable operator's terminal to control and monitor all hardware and software point associated with the terminal unit.

2. An override switch will initiate override of the night setback or unoccupied mode to normal (day) operation when activated by the occupant. The switch function may be locked out, canceled or limited as to time or temperature in software by an authorized operator or a central or remote operator's terminal.

3. Space temperature sensors may be Thermistor or 4-20 mA output RTD. The room sensor shall be firmly attached to the

wall using approved construction techniques. Double-sided adhesive tape in lieu of screws is not acceptable.

4. The room sensor shall be accurate to within + / - 0.5 degrees F (+ / - .3 degrees C) and have a set point adjustment range of 45 degrees to 85 degrees (5 degrees to 30 degrees C).

5. Room sensors shall be blank cover in all areas.

6. Siemens Building Technologies, Inc., Minco, or Hy-Cal only.

C. Flow Sensors: Flow sensors shall be constructed of stainless steel with no moving parts introduced into the flow medium. The sensor shall be a multiple tube, rigid structure that provides dual-averaging chambers with a diamond-shaped cross section. Each sensor shall be sized specifically for the pipe or elliptical in which it is to be installed, and shall be provide with individual flow calculation sheets stating so. Provide the proper instrument valve connections so that the differential pressure-sensing equipment can be removed while the system is pressurized. Instrument valve and tubing shall be stainless steel. Flow sensors shall be Dieterich Standard Annubar Model DMT PRESO or equal, installed in accordance with manufacturer's recommendations for an accuracy of + / - 1.05 percent of flow. Venturi or orifice flow sensing devices may be used for special applications.

D. Temperature Transmitters: Temperature transmitters shall be designed for 4-20 mA DC output for Platinum RTD millivolt input sensor (as specified in Paragraph 2.1 above). Accuracy and range shall be the same as specified for the temperature sensors. Stability shall be + /- 0.2 percent of calibrated span for 6 months. Transmitter shall be a part of the temperature sensor assembly and shall be in a moisture-proof housing with a moisture-proof seal between the sensor and transmitter. Siemens Building Technologies, Inc., Minco, or Hy-Cal only.

E. Water Flow Transmitters: Flow transmitters shall provide a 4-20 mA DC signal output proportional to flow. Accuracy of + / - 0.25 percent of calibrated span. Temperature Limits: -40 degrees F to +220 degrees F. Stability of + / 0.25 percent of upper range limit

for 6 months. Range of transmitter shall be individually calibrated to match each flow meter's flow conditions, and shall be provided with individual flow calculation sheets stating so. Flow transmitters shall be Rosemont, Foxboro or Gould, only.

F. Pressure Transmitters: Transmitters for water flow and pressure shall provide a 4-20 mA DC signal output directly proportional to pressure. Accuracy of + / - 0.5 percent of calibrated span. Span not over 200 percent of sensed pressure. Stability + / - 0.5 percent of upper range limit for 6 months. Stainless steel diaphragm, viton 0-rings. Temperature limits: -20 degrees F to 220 degrees F. Rosemount, Setra, or Bristol, only.

G. Fan proof-of-flow switches shall be UL listed adjustable sepoint and

differential pressure type. Switches shall be piped to fan discharge except where fans operate at less that one inch WG, they shall be piped across the fan. For fractional horse power and non-ducted fans, relays or auxiliary contacts may be used. Maximum pressure rating shall be at least 10 inches WC.

H. Pump proof-of-flow switches shall be UL listed adjustable differential pressure or flow type as specified in the sequence of operation or data point summary. Devices shall be 150 psi rated except chilled water flow switches shall be provided with totally sealed vapor tight switch enclosure on 150 psi body. Differential pressure switches shall have valved manifold for servicing. Current monitor relays, properly sized for the associated load and having an adjustable switching set point, may be used in lieu of pressure switches on pumps; Hawkeye or equivalent.

I. Air flow and static pressure analog transmitters shall be high accuracy suitable for the low velocity pressures to be encountered, be selected for approximately 50 percent over-range, and have an electronic 4 to 20 mA analog output. Transmitters shall have an accuracy of + / - 0.5 percent of calibrated span. These differential pressure sensors shall be connected to the air flow measuring station (where applicable) with valved lines for testing and calibration, and shall have adjustments for zero and span. Rosemount, Dresser Industries/Ashcroft XLDP or Setra C-264, only.

J. Flow Switches shall be packless construction with all wetted parts made of brass and designed for mounting in pipe sensing wells. Device shall be capable of being mounted in pipe sensing wells 1 inch and larger. Paddle shall be provided with removable segments to accommodate required pipe size and flow. Switching action shall be single-pole, double-throw with a rating of 7.4 amps full load with 115 volts AC.

K. Electric Low Limit Duct Thermostat: Snap-acting, two pole, single throw, manual reset switch which trips if temperature sensed across any 12 inches of bulb length is equal to or below set point, requiring minimum 15 feet length of bulb. Provide one thermostat for every 20 square feet of coil surface.

L. Air Flow Measurement Station: Averaging "pitot" array per ASHRAE traversing guidelines, utilizing integral flow straighteners. Brandt Instruments B-DSK9000, Air Monitor FAN-E, or equivalent. The AFMS shall have total static pressure sensors for sensing multiple velocity pressures in the air stream profile.

M. Carbon Dioxide Sensor: C02 sensor shall be Horiba model number APBA-250E or approved equal. The unit shall be self contained for wall mounting application. The unit shall have a small pump for sampling point and fast response and shall have 0-1 percent range corresponding to an isolated 4-20 mA output. Visula alarm is not to be provided. The monitor shall utilize the non-dispersive infrared (NDIR) method.

N. Humidity Sensor: Sensor shall provide a 0 to 100 percent range corresponding to an isolated 4 to 20 MA output. Accuracy of + / - 2 percent RH, with maximum drift of 1 percent per year.

O. Static outside air probe shall be utilized where outdoor static pressures are to be measured. Provide a probe by Air Monitor, S. O. A. P., or approved equal. Probe shall be constructed of 10 gauge anodized aluminum with a 2 inch diameter FPT connection. The probe shall have a + / - 2 percent accuracy when subject to radial wind velocities of up to 80 miles per hour with approach angles up to 30 degrees to the horizontal.

P. Electric Room Thermostats: Provide line voltage room thermostats with cover. Set point must be adjustable from approximately 50 to 100 Deg. F. Minimum rating is 6 amps at 120 vac. Provide removable setting knob. Housings shall not contain thermometers.

Q. TEMPERATURE CONTROL VALVES

1. Valves shall be two way. Valves 2 inches and smaller shall have screwed bronze or brass bodies. Valves 2-1/2 inches or larger shall have flanged iron bodies. The assembled valves shall be rated for ANSI Class 125 operating pressure. All valves shall be sized for full flow and with a maximum pressure drop of 5 psi unless specified otherwise hereinafter. All straight through water valves shall have modified equal percentage flow characteristics. Valves shall close off against the full head of the system pumps.

2. Provide control valves with a chart indicating the valve constant (CV) rating of all valves referenced to the drawings so that the valve pressure drop may be used for balancing and performance tests.

3. Pneumatic valve operators shall have replaceable neoprene diaphragms, stainless steel stem, adjustable spring, replaceable EPT disk, shall be spring loaded, self adjusting packing. Actuator shall have metal housing. Operating temperature range shall be 25 to 300 degree F. Valves which are used in sequence with another on the same pneumatic signal shall be provided with positive positioners.

R. BUTTERFLY VALVE ACTUATORS

1. Butterfly valves shall be straight-through type, as described elsewhere. Operators shall be capable of receiving 60-80 psi air signal for on/off service and for modulating service shall be equipped with a positioner capable of receiving 3-15 psi air signal and transmitting 60-80 psi signal to operator. Valves shall be suitable for 150 psi bubble tight shut-off. Valve construction shall be as specified elsewhere. Valves shall be available with field interchangeable powered actuators. The actuator-to-shaft connection shall be designed to shear and

prevent internal valve damage if the disc closes on foreign material in the pipeline. All actuators shall provide external indication of disc position.

2. All units to have adjustable open and close position stops with provision to prevent accidental changes. Operating shaft to be supported axially and radially at input end by permanently lubricated bronze thrust and sleeve bearings.

3. Cylinder actuators shall have gear actuator in weatherproof enclosure with integral double-acting pneumatic cylinder sized for maximum differential of 150 psi working mechanism fully enclosed, and shall be sized for oeprations using 80 psi pneumatic supply. Cylinder actuators to be furnished with pilot valves, Bailey-type positioners, limit switches, manual override, speed control valves. All units shall have adjustable open position stops. Damper-motor-type actuators shall not be acceptable for butterfly valve actuation.

S. PNEUMATIC DAMPER ACTUATORS

Pneumatic damper actuators shall be of the piston type equal to Landis and Staefa AP 331 Series actuator. Actuators of plastic will not be acceptable.

T. AIR FLOW CONTROL DAMPERS

1. The Temperature Control Contractor shall provide all control dampers of the type indicated on the plans. Frames shall not be less than 13 gauge galvanized steel. Blades must not be over 8 inches wide nor less that 16 gauge galvanized steel roll formed. Bearings

shall be oilite, ball bearing or nylon with 1/2 inch shafts. Side seals shall be stainless steel of the tight-seal spring type. Dampers and seals shall be suitable for temperature ranges of -40 degrees F to 200 degrees F.

2. All proportional (modulating) control dampers shall be opposed blade type and all two-position dampers shall be parallel-blade types.

3. Dampers shall be minimum leakage type to conserve energy and the manufacturer shall submit leakage and flow characteristic data for all control dampers with the temperature control submitted. Maximum leakage shall be 3 percent at static pressure of 3 inches of WC.

U. CONTROL AIR SUPPLY

1. Provide two air compressors each sized for maximum running time of 33 percent at 80 psi with automatic alternator for temperature control usage, and one compressed air drier.

   Both compressors shall be mounted on a single storage tank of sufficient size to insure not more than six compressor operations per hour. Tank shall conform to the ASME Code for non-fired pressure vessels and so stamped. Each compressor shall be equipped with a pressure intake filter, outlet filter, belt guards and automatic trap and drain for each tank. The compressor motors shall be suitable for operation on 460 AC, 3-phase, 60 Hertz. Furnish an Allen-Bradley, or approved equal, automatic electric alternator for the units which will operate first one compressor and then the other, but will operate both compressors in the event air pressure fall too low. Provide override switch to omit alternator and allow either compressor to operate individually in the event one compressor is inoperable. Control voltage shall be 120 volts AC.

2. Compressed Air Drier shall be Ingersoll-Rand, Zeks, or approved equal, refrigerated moisture condenser. The air piping from each compressor duplex unit shall be so piped that air from either compressor will pass through the drier. The moisture condenser shall come with a wall bracket and automatic trap. The condenser shall be sized to maintain a 10 degree F dewpoint of the air supply to the system.

3. Main Air Pressure Reducing Stations: Provide a combination sub-micron filter-pressure reducing station. The filter shall be capable of the removal of entrained oil and shall be rated for 97 percent efficiency at rated air flow Air reducing valve shall be sized for quantity of air required and be capable of reducing air supply form 60 psi to control air pressure. The entire air

supply at the air compressor shall be piped in parallel to permit shut down of a compressor without feedback in any part of the system which has been shut down. Provide high pressure main air to each DDC panel location, with PRV to serve DDC pneumatic transducers (one PRV per DDC panel location). Provide 2 inch diameter air pressure gauges upstream and downstream of reducing station.

V. PNEUMATIC INSTALLATION

The pneumatic portion of the temperature control system shall be installed by men regularly employed by the ATC Contractor. User of subcontractors by the ATC Contractor shall be unacceptable. Pneumatic piping shall be concealed wherever practical. Hard-drawn copper tubing or poly encased in raceway is to be used for all areas. Copper tubing shall be installed in neat and workmanlike manner and shall be as inconspicuous as possible. Bulkhead fittings shall be utilized for all penetrations through enclosures, raceways, and the like. Poly tubing, where employed as flexible connections within hard
copper runs, shall be limited in length to 6 inches. The entire system shall be tested under applicable operating air pressure for a period of twenty-four (24) hours during which the pressure drop shall not exceed 2 psig.

PART 3 Execution

2.01 SEQUENCE OF OPERATION

[A/E TO INCLUDE CONTROL SEQUENCE OF OPERATION]

Refer to the I/O Summary for any additional points required.

Guide Specification for TAMU Projects

Automatic Temperature Controls & Energy Management System

PART I General

A. The bidding and Contract Requirements and General Requirements apply to this work.

B. Furnish and install all components but not limited to all temperature, pressure and flow sensors, transmitters, relays, switches, wire and conduit external to the DDC panels. Also furnish all controls, operators, power supplies, control valves, air and water flow measuring stations, transducers and wiring to connect components. Submit for approval, appropriate product data cut sheets for all material/components intended for use prior to beginning work. Where EMS is used in specification and drawings, it is understood to be same as DDC. In addition, provide a complete installation of the owner furnished Siemens DDC System. In addition, install the owner furnished Siemens Laboratory Control System (LCS).

C. Owner shall furnish all Siemens Direct Digital Control (DDC) panels with all microprocessors, software, terminal strips, tranducers, relays, and regulated power supply with battery backup. Empty panel boxes will be furnished by the Owner for mounting by the Automatic Temperature Controls Subcontractor.

D. Owner shall furnish a Siemens HVAC Terminal Equipment Controller (TEC), electronic damper actuator(s), and electronic HW valve's and actuator's for installation on each VAV terminal unit and fan coil unit, as applicable, by the terminal equipment manufacturer. These DDC devices shall be delivered to the manufacturer's factory in sufficient time for the equipment manufacturer to meet their scheduled delivery obligations. Owner shall furnish all Siemens DDC lab control system components, including TECs, Lab Supply Air Terminal Units with reheat coils (duct mounted), General Air Fume Hood Exhaust Terminals, and all other associated controls components. Installation of all air terminals shall be by the mechanical contractor.

E. The terminal equipment manufacturer shall provide for each VAV box an inlet flow sensor suitable for interfacing with the Siemens TEC. For VAV boxes and all other terminal equipment (fan coil units, etc.) a 24 vac, 40 va

transformer, any necessary pilot control relays will be provided by the ATC, and installed by the ATC, and connect these devices to the DDC controller as required for proper operation as required under this section. The cost of factory mounting shall be included in the cost of the terminal equipment. All other wiring and terminations related to the DDC controller (TEC) shall be provided by the ATC contractor. All other wiring and terminations related to the lab control system components shall be provided by the ATC contractor.

G. The ATC Contractor shall provide for each TEC, a 24 vac 40 va power source, and mount and connect these devices and the DDC controller as required for proper operation as required under this section. All other wiring and terminations related to the TEC shall be provided by the ATC contractor.

H. Room temperature sensors, CO_2 sensors, and sensor and humidity mounting plates shall be provided by the Owner for Installation by the ATC contractor. Terminal Unit Control Valves provided by Owner will be installed by Mechanical Contractor. Humidity sensors provided by Owner will be installed by ATC Contractor.

I. Temperature controls and non-DDC accessories that are standard catalog products as manufactured by Siemens Building Technologies, Inc., Johnson Controls, Inc., or Honeywell will be acceptable. Industrial instrumentation supplied shall be standard catalog products of Rosemount, Honeywell, Bristol, Foxboro, Leeds and Northrup, Taylor or Brown. All coordination and execution of work pertaining to the installation, service, and guarantee, under this section of the specifications, shall be the sole responsibility of the ATC.

J. All controls to be installed, calibrated and adjusted by trained instrument technicians in the full-time employ of the Automatic Temperature Controls Subcontractor.

K. Mechanical contractor shall not serve as ATC contractor. Acceptable ATC contractors, provided they comply with these specifications are:
   1. Siemens Building Technologies, Inc.
   2. Johnson Controls, Inc.
   3. TAC Control Systems.
   4. No exceptions

L. Submit engineering/wiring drawings receive approval prior to beginning work. These drawings shall be submitted in a timely manner provide sufficient time to review drawings so as not to hold up the project.

M. The Owner-furnished DDC field panels will be located in mechanical rooms as shown on the drawings. All sensor and start/stop wiring will be brought back to the panel responsible for controlling / monitoring the mechanical / electrical equipment for which the sensor, start/stop wiring is directly related. The location of the panels may not be shown on the drawings. Locate Laboratory Control Panels as indicated on drawings.

N. Division 26 shall provide emergency power to a duplex receptacle inside each panel. Emergency power shall be provided from a breakered, 20 amp dedicated circuit having an insulated ground wire from the power panel ground buss wired to the duplex receptacle.

O. Furnish and install a dedicated Ethernet cabling network for the DDC system, all exposed wiring shall be in conduit, as per division 26 specifications. Concealed wiring shall be plenum rated. All active Ethernet switches, hubs, and routers shall be Owner-provided and installed (by Siemens).

Furnish, install and terminate individual Cat-6 cable assemblies to interconnect each mechanical room in a star configuration. A star configuration is designed with each main building panel connected directly to a network switch. Data is passed through the switch before continuing to its destination to other main building panels and to the front end. Each cable shall originate and terminate within one designated DDC panel in each mechanical room, as shown on the plans. Additionally, furnish, install and terminate individual Cat-6 cable assemblies to connect each DDC panel within the mechanical room(s) with the others in that same room, in a star configuration.

Each cable assembly shall originate and terminate within the DDC panel enclosure(s), with 5 feet of extra length at each end, so that no spicing, jumpers or extensions are required to complete the network between panels. Each cable shall be clearly labeled, identifying the DDC panel of origin, and the DDC panel to which it is to be connected.

All cable runs between mechanical rooms and/or DDC panels shall be no longer than allowed as specified in section 16700. Where runs are required that will be longer than section 27 allow, furnish and install an additional

enclosure near the midpoint (coordinate location with architect), to be used as a network junction box, complete with a 120 VAC emergency power source. Terminate and label the cables within this junction box as directed for each DDC panel.

Refer to section 27 specifications for complete network cable specifications.Furnish and install a network communications trunk (N.C.T.) between DDC panels, and a separate LAN communications network between each terminal equipment controller (or group of controllers) back to the DDC panel associated with the AHU which serves the terminal unit (or lab-trac system). Trunks shall be connected to the panels/controllers in a daisy-chain fashion, with no "T" connections permitted. A maximum of 32 TECs per LAN trunk shall be permitted.

P. Furnish, install and make connections of all Interlock, power for sensors (if required), line and low-voltage wiring external to DDC panels. Wiring into panels shall require a minimum of 5 feet extra length which the Owner will make final terminations inside the DDC panels. All wiring shall be clearly and permanently labeled as outlined below.

Q. The ATC Contractor shall provide a dedicated line between the junction box and the Campus (University) Energy Management System, as well as program the panels with operational sequences and set-points specified.

1.02 SUBMITTALS:

A. Manufacturer's Product Data: All equipment components

B. Shop Drawings:
   1. System wiring diagrams with sequence of operation for each system as specified.
   2. Submit manufacturer's product information on all hardware items along with descriptive literature for all software programs to show compliance with specifications.
   3. System configuration diagram showing all panel types and locations as well as communication network and workstations.

1.03 AUTOMATIC TEMPERATURE CONTROL / ENGINEERING MANAGEMENT SYSTEM WIRING:

A. All wiring and conduit shall be installed in accordance with related Specification Section Division 26 Electrical.

B. The conduit / wiring system required for the ATC/Energy specification Input/Out summary.

C. Digital Input (D.I.) wiring (Class 2) may be run in a common conduit with Digital Output (D.O.) wiring (Class1) where local codes permit.

D. Analog Input (A.I.), Analog Output (A.O.), Digital Input (D.I.), and Network Communications Trunk (N.C.T.) wiring may be run in a common conduit.

E. Digital Output (D.O.) wiring run in a common conduit with Analog Input (A.I.), Analog Output (A.O.), is not permitted under any circumstances.

F. AC line power to DDC panel shall be #12 THHN.

G. Digital Output (D.O.) wiring shall be #14 THHN.

H. Digital Input (D.I.), Analog Input 4-20 mA (A.I.), Analog Output (A.O.) wiring shall be #20 TSP (twisted shielded stranded pair with drain wire).

I. Analog Input/Thermistor/or voltage types (A.I.) wiring shall be #20 TSP (twisted shielded stranded pair with drain wire).

J. Field devices requiring 4-20 mA DC input signal shall be non-ground referenced.

1.04 SYSTEM VERIFICATION—PROCEDURE TO BE FOLLOWED:

A. Provide minimum 2 week written notice for all inspections.

B. The system verification also includes the Laboratory Control System.

C. Upon completion of all external sensor mounting, terminations, and wiring into and out of the DDC panels, the Owner shall inspect and approve this work. The ATC Subcontractor shall make his Representative(s) available and coordinate with the Owner during this inspection process. At the successful conclusion of this inspection, contractor shall provide a written report stating all work is complete. ATC Subcontractor, General Contractor and Owner's Rep shall sign. This should be filed with Project Commissioning/Startup documents.

D. Upon such approval being achieved, the Owners repersentative shall make terminations within the DDC panels.

E. Following completion of the work and the Owner's DDC panel tie-in, a performance test shall be conducted by the Owner in the presence of the Contractor and his appropriate Subcontractors.

F. The ATC shall be present for the testing of proper operation of each and every physical system point to which the ATC has provided devices, wiring, in order to verify the equipment and installation provided by them (their portion of the work), i.e., when the Owners representative commands a point, the ATC verifies in the field that the commanded point operates properly. At the successful conclusion of this inspection, contractor shall provide a written report stating all work is complete, calibrated and functioning property per the specified sequences of operation. ATC Subcontractor, General Contractor and Owner's Rep shall sign. This should be filed with Project Commissioning/Startup documents.

G. Owner's represestative shall attend initial inspection and verification of completed punch list of items in paragraphs C. and F. of this section. Further inspections required due to incomplete/incorrect work shall be at ATC expense.

H. Upon conclusion of final checkout and acceptance, the ATC responsibility reverts to warranty of materials and installation herein specified. System shall be warranted for a period of two (2) years.

1.05 COORDINATION OF EFFORT:

A. It is the responsibility of the ATC to schedule and coordinate with the installer of owner furnished equipment.

B. The ATC shall schedule his construction activities so that all his work is verified and completed in due time to allow for the Owners representative to install electronic components in the DDC panels, make terminations, and prove the system. A minimum of 8 working days per panel shall be allowed in the project schedule for this purpose.

C. Coordination of activities is the responsibility of the ATC. The Owners installer shall be notified a minimum of 7 days prior to the completion of the ATC work at the DDC can.

D. It is the ATC responsibility to schedule the accomplishment of these activities to allow for nominal system checkout, performance tests and balancing within the contract performance period.

E. The ATC shall notify the Owners representative in writing when each panel or section of work is complete and ready for startup, meaning that fans are ready to run, VFD's have been started up, CHW is available, all devices are functional, power is on to all devices and panels, etc. Sufficient notice shall be given as described above.

F. If any deficiencies are subsequently encountered by the Owners representative in work identified in writing by the ATC as complete and ready for startup, in order to expedite the progress of the project, the Owners representative may, at their option, either correct the deficiency, or notify the ATC of the deficiency and have them correct it. Any costs incurred by the Owners representative due to having to correct any deficiency, or due to delays or multiple trips to the project site, shall be billed to the ATC.

Metering

All projects shall have all utilities metered and remotely monitored in the Physical Plant Department Energy Office. The metering shall be accomplished by the following:

1. The electrical contractor shall furnish and install at least one (1) Square D 'Powerlogic" model #3250 electric meter at the electrical service entrance for each building that will read the entire building electrical load. Double ended substations or additional services entrances shall require and additional model #3250 meter.

2. The electrical contractor shall furnish and install additional Square D meters as required for sub-metering electric loads as required to meet LEED verification requirements. These meters can be "Power Meters", "Intercept Meters" or similar four wire digital meters manufactured by Square D that can be networked with the main "PowerLogic" meter(s). If auxiliary enterprise areas are included in the building, those areas shall have the electrical load isolated and measured by a revenue quality Square D four wire digital meter. All meters shall have a local display.

3. The electrical contractor shall provide and install all interconnect wiring to all meters regardless of their location. All wiring shall meet Square D standards for type, length, installation and connection.

4. The electrical contractor shall furnish and install an EGX-400 internet interface module mounted in its own enclosure mounted on a wall inside the main electrical room. This module shall be connected to emergency power (if a generator is included in the design) and to a category 6 data connection served from the nearest data/telecom room.

5. The electrical contractor shall furnish and install a Square D "WAGES" (Water, Air, Gas, Electric, Steam) box that is to be mounted in the building pump room. All inputs listed in the points list related to metering a utility (except electric) shall be routed to the WAGES box by the ATC using appropriate cables and left labeled but unterminated. The ATC shall also install an additional set of cables from the WAGES box to the Siemens main DDC enclosure for termination.

6. Prior to energizing the main electric switchgear the contractor shall schedule and pay a Square D technician to commission the main electric meter(s) and all other meters located in the main switchgear. This commissioning will include a complete setup of the meter(s), termination of all meter interconnecting cables located in the main switchgear, entering all required security codes and flags as directed by the Physical Plant Energy Office and verification that the meter(s) are reading correctly.

7. Prior to any Substantial Completion the contractor must arrange and pay for a second commissioning trip from Square D to complete all connections to the Square D meters, all connections to the WAGES box and verify proper operation of both systems. This verification shall include the modification of the head end equipment located at the Energy Office. Data connections must be installed and functional so that Square D can verify the communication between the project meters and the Energy Office. This commissioning may require multiple days and multiple trips from Square D.

General Information

The medium voltage distribution system on System Member campuses generally consists of multiple circuits of medium voltage cables routed through underground ductbanks and manholes. Each building is connected to the system through a 12kv oil insulated vacuum switch. The distribution system is typically a radial system, however each circuit can be looped to an adjacent circuit to provide a temporary backup.

Unless specifically noted otherwise in the POR, all projects shall include the extension of the medium voltage distribution system to the project site including all required manholes, switches and transformers.

The electrical service entrance shall be determined concurrently with the development of Schematic Design space planning. Locations of transformers, vaults, meters and other electrical items must be coordinated with architectural features such as main entrances and must consider equipment ventilation and equipment removal.

A detailed load study, including connected loads and anticipated maximum demand loads, as well as the estimated size of the largest motor shall be prepared for 50% Construction Documents review for discussions relative to the required capacity of new electrical service. The study shall be prepared utilizing ETAP software and should include a short circuit and arc flash analysis. Arc Flash Labels shall be attached to required electrical equipment per NFPA guidelines. The electronic copy of the model shall be turned over to System Member Physical Plant Department.

The routing of site electrical and location of manholes shall be determined during Schematic Design and coordinated with the Project Civil Engineer. The building location may not be closer than 20 feet to an existing electrical ductbank. If the building location is within 20 feet of an existing electrical ductbank than the project shall relocate the electrical ductbank.

Provide conduit for all control wiring.

Metering

All building shall be designed for metering of campus electrical utilities. All auxiliary areas in a building shall be sub-metered.

Main & Satellite Electrical Equipment Rooms

All electrical panelboards, switchboards, transformers, transfer switches, contractors, etc., shall be located in dedicated electrical rooms. There will be one main service entrance electrical room with satellite electrical rooms as required. All rooms shall have direct access from a corridor. No room may be accessed through an electrical equipment room. Service entrance switchgear shall be front and rear accessible. Satellite electrical equipment rooms shall stack vertically in the building.

Exceptions: Motor control centers, disconnect switches and panelboards that serve mechanical equipment located in a mechanical or pump room may be located inside a mechanical room. Variable frequency drives may be located in mechanical rooms providing that these rooms are conditioned spaces. A panelboard serving a laboratory can be located in the laboratory or in the corridor near a door to the laboratory.

Provide two means of egress from main electrical equipment room if required by the National Electrical Code.

Electrical loads shall be served by panelboards and branch circuits located on the same floor. All electrical equipment rooms shall be sized to accommodate the required electrical equipment plus reasonable future growth. The minimum clear size for satellite electrical equipments rooms shall be 8 foot by 10 foot.

Grounding will be in accordance with provisions of the National Electric Code. Low resistance ground fields will be provided for computers, electronics and as required. Provide a grounding riser diagram that shows the interconnection of all grounded and ground connectors to ground rods and the counterpoise system.

Voltages listed in this Program of Requirements are nominal values. Exact electrical requirements for all outlets and equipment connections listed in the Requested Facilities section of the Program of Requirements will be determined by the Project A/E in consultation with the User Coordinator and Physical Plant Department.

Electrical Outlets and Power Connections

Provide outlets in all spaces in accordance with the National Electric Code and for fixed and movable equipment listed in the Program of Requirements. Provide exterior outlets as required for grounds maintenance.

All branch circuits serving computer loads shall originate from a computer grade panelboard.

Electrical outlets should be distributed throughout the building. However, the

requested flexibility will require particular consideration for placement, especially of special purpose outlets.

Surge Suppression

Provide a Transient Voltage Surge Suppression and high frequency filter system for the electrical service entrance and computer power panels or distribution panel that serves the computer power panels.

Variable Frequency Drives

Pulse Width Modulated (PWM) Variable Frequency Drives (VFD) using Insulated Gate Bipolar Technology (IGBT) are acceptable.

Due to a number of motor failures, VFD's are now required to be furnished with a 3% impedance output filter.

All VFD's will comply with IEEE 519 latest edition.

Power Factor Correction

The A/E shall design the electrical power system such that it operates at a 95 to 97% lagging power factor during peak estimated demand load conditions. The power factor must not become leading under minimum load conditions.

Lighting

The lighting and daylighting systems of a building represent one of the most critical components of the building aesthetics, performance of the function of the spaces and the annual energy consumption. The lighting design shall be in accordance with applicable codes and standards. General lighting levels shall be in accordance with ASHRAE/IES Standard 90.1-2004 lighting power requirements. In addition, the lighting design shall attempt to minimize maintenance requirements.

The lighting system design must consider reducing glare, minimizing contrast ratios and providing proper color rendering ar recommended in the IES Lighting Handbook, latest edition.

Lighting shall be a combination of direct/indirect energy efficient fluorescent fixtures either recessed or pendant mounted.

All recessed 2' x 2' and 2' x 4' light fixtures shall be supported by hanger wires attached to opposite diagonal corners and to the building structure.

The use of custom fixtures is discouraged.

All linear fluorescent lamps shall be T8 or T5 (verify with Physical Plant Department), low mercury lamps with efficacies above 90 lumens/watt. The maximum lumen depreciation must be 5%. Lamp color temperature must be either 3500K or 4100K and be consistent throughout the building. Lamps must have a color rendering index (CRI) greater than or equal to 80. Minimum rated lamp life must be 20,000 hours.

All compact fluorescents lamps (CFL) must have a minimum efficacies of 60 lumens/watt and maximum lumen depreciation of 15%. Minimum rated lamp life must be 10,000 hours. Lamp color and CRI must be consistent with linear fluorescent lamps. No CFLs below 13W shall be used.

All ceramic metal halide lamps used in interior finished spaces shall have a CRI greater than 75.

All ballasts shall be UL rated CMB Certified, rapid start electronic and generate less than 10% THD. Instant start ballasts are not allowed. Electronic ballast shall have a sound rating of "A" for 430MA lamps, "B" for 800 MA lamps and "C" for 1500 MA lamps. Program start ballasts are acceptable.

Use of incandescent lighting will not be allowed. Where dimming is required, use fluorescent fixtures and electronic ballast that can dim to 10% of full light output.

Lighting Description for Classroom Areas

Widely varying illumination levels are necessary for various project types. Fluorescent fixtures shall be wired so that separate switches control banks of lights in rows (width wise) running from front to back of room. The front row of lights can be turned off when the overhead or video project is used. The next row of lights can be turned off during slide/filmstrip viewing, leaving the last switch to turn off last row of lights for opaque projection and 16mm projection. Thus, ambient light levels can be maintained as high as possible for visual comfort and note taking without compromising the quality of the project image. Directionality and resultant glare on screens, TV monitors must be considered. Lighting controls must be easily accessed by presenter and should be positioned at both the front and rear of room.

Switching

Provide multiple switching of interior lighting as required for flexibility and economy of operation.

Any exterior lights and site lighting will be controlled by the energy management system with a hand off auto switch override or by photo cell.

Exterior and Site Lighting

Provide exterior lighting at entrances, pedestrian walkways, and other locations as required. Use System approved site lighting fixtures and standards where appropriate. Owner must approve other site lighting fixtures.

Emergency Lighting and Power

Provide emergency lighting and exit lights as required. Emergency lighting shall comply with current fire and safety codes. Provide emergency power to areas and equipment required by regulation and guideline. A/E shall determine the full extent of emergency power needs with the User and FPC Electrical Engineer. The Project A/E shall perform a code analysis and a life cycle cost economic evaluation of the source for emergency power to determine if an emergency generator is required. Generator fuel type shall match campus standards. If diesel powered provide an independently mounted 24 hour double walled diesel fuel tank. Provide a load bank if an emergency standby generator is required. Emergency generators shall be screened within a service yard.

Generator testing shall be in accordance with NFPA 110.

Petroleum Products or Hazardous Chemical Storage Tanks

Emergency generators which supply only life safety code required loads will be equipped with skid mounted fuel tanks sized to provide a 24 hour supply of fuel. Generators supplying power to process type equipment may be furnished with 60 hr. fuel supply. Above ground tanks shall not exceed 1100 gallons unless approved by the FPC Project Manager.

When a Fuel Storage Tank (above ground) is required the A/E is required to design the facility to comply with the requirements of Texas Commission on Environmental Quality (TCEQ).

The storage tank subcontractor must have a valid certificate of registration and

his installer or on-site supervisor must have a valid license issued by the Texas Water Commission.

Installation of storage tank is to be in accordance with accepted industry standard and manufacturers' recommendation.

Automatic tank gauging and low level alarm signal to EMS System and a high level alarm on a local horn or bell mounted at or near the tank vent approximately 8 ft. above grade.

Provide manhole, fill nozzle, level alarm and other nozzles as required.

Cable Testing

The Owner shall secure and pay for the services of a testing agency for the following systems:

Medium Voltage Cable - The testing agency shall perform a high potential proof test using a non-destructible DC testing device such as a "Kenotron" Westinghouse "High Pot Tester", or approved equal capable of generating approximately 100,000 VDC under normal leakage conditions of acceptable cable.

All cables shall be tested in place with all splices and pothead terminations made up but not connected to switchgear or any other load device or dead end seal. Cables with dead end seals shall be temporarily opened and then resealed.

In case of failure during the test, the Contractor shall locate the faulty splice, termination or cable section, as the case may be. The Owner shall be notified before repairs are made.

Shall submit five copies of all reports on high potential proof tests performed on the high voltage cable to the Architect.

Should the test reports indicate the condition of the new cable is unsatisfactory (in the opinion of the Owner); the Contractor shall make all repairs and/or replacements as necessary. Additional tests using the same testing agency shall be made at the Contractor's expense on all repaired sections. Cable installations will not be accepted until satisfactory certified proof test reports are obtained.

Electric Motors

Definite-purpose inverter-Fed motors shall meet the requirements of NEMA, MG-1, Section IV, Part 31.

All other motors shall meet the requirements of NEMA, MG-1.

All motors shall meet the energy efficiency requirements of the Texas State "Energy Conservation design standards for New State Buildings" and shall meet or exceed the applicable portions of the National Electric Code and Underwriters Laboratory.

Campus Specific Information

Texas A&M University

General

The medium voltage distribution system is 12470 volts wye with a high resistance ground. The selection of all materials shall be appropriate for this system.

Campus express feeders may not be tapped for distribution to campus buildings.

Medium voltage relays shall be manufactured by Schweitzer.

Metering

All projects shall have all utilities metered and remotely monitored in the Physical Plant Department Energy Office. The metering shall be accomplished by the following:

The primary main meter (s) shall be the type manufactured by Square D under the product umbrella “Power Logic Series 3250 circuit meter with a remote display”. Additional Secondary digital meters shall be of the type manufactured by Square D and shall include a display, the size and type of the meter to be determined by the engineer. Secondary meters shall be connected together with communications cable to allow for integration and communication with the main meter (s). The main electric meter (s) (3250) shall include a separate Ethernet gateway (model type EGX 400). Each Meter shall be installed per the manufactures specifications and shall be commissioned and integrated with the existing university metering system by a Square D employee during start-up. This commissioning process shall be witnessed by Physical Plant – Utilities

personnel. An Ethernet cat 6 cable shall be ran from the nearest telecom room to provide communication to the EGX 400.

Furnish a Square D PowerLogic WAGES utility metering panel, part number Q2C-19180117, complete with all microprocessors, software, programming, point data base, trends, terminal strips, and regulated power supply with battery backup. The WAGES panel will require sensor wiring from the panel to primary supply and return temperature sensors in the Chilled Water, Heating Hot Water, and Domestic Cold Water, to be included as part of the ATC responsibilities. This WAGES panel will require a dedicated 110volt, 20 amp, single phase emergency electric circuit source installed by division 26. This WAGES panel will require a category 6 Ethernet cable installed by the ATC. A meeting between the TAMU Energy Office and the ATC contractor will be held as early as possible, prior to installation, to review the installation and finalize panel and wiring locations. Each WAGES panel shall be installed per the manufactures specifications and shall be commissioned and integrated with the existing university metering system by a Square D employee during start-up..

Emergency Power

General

- This generator equipment should be supplied by a single manufacturer who has been regularly engaged in the sales and service of engine-generator sets, generators, engine auxiliaries, and controls for a minimum of fifteen years.
- transfer switches,
- The manufacturer must have a local representative who can provide factory-trained service, required stock of replacement parts, and technical assistance.
- Accessiblity to the generator for service and fueling is critical. Coordinate each emergency generator installation with TAMU Physical Plant – Utilities Electrical Distribution

Fuel Tank

- The fuel shall be diesel with a 24-hour double wall tank.

Life Safety Transfer Switch

- Life safety loads are to be on a separate transfer switch from the legally required and optional generator loads.
- The switch shall be fed from a separate over current protective device in the generator
- The switch shall have its own feeder directly to it.

Approved Generator Manufacturers

- Caterpillar
- Onan
- Kohler

Approved Transfer Switch Manufacturers

- Russelectric
- ASCO
- Zenith

Tarleton State University

Metering

Square D meters only

West Texas A&M University

Color Coding

West Texas A&M University has adopted the following standard color coding for all electrical 3-phase circuits

240V 3-Phase		480V 3-Phase	
a	Black	a	Brown
b	Red	b	Orange
c	Blue	c	Yellow
neutral	White	neutral	Grey

Guide Specification

Electric Motors

Scope

This specification addresses some of the mechanical and electrical design, electrical insulation system and testing requirements of Premium Efficiency low voltage electric motors. All motors conform to the following provisions:

Motors in NEMA frames 143T through 445T are 3 phase, 60 hertz, 230/460 volts. Frames 447T and larger are 460 volt. All frames are also available in 575 volt.

Motors are suitable for continuous duty in ambient temperatures from -15°C to 40°C. Operating altitude is 3300 feet or less.

All motors have a Service Factor of 1.15.

Electrical

All motors are the manufacturer's premium efficiency design. The nominal efficiency and the minimum guaranteed efficiency are stamped on the nameplate of the motor. All efficiency testing and labeling are done in accordance with the NEMA MG 1 standard.

All motors are capable of developing NEMA Design B locked rotor and pull up torque with 90% of rated voltage applied.

Conductors have increased cross sectional area for increased efficiency. Low-loss electric grade silicon steel is used with interlamination insulation capable of withstanding of 1000°F burnout temperature.

The insulation system is Class F or better with a Class B rise at a 1.0 service factor. Motors are multi-dipped and baked in Class H varnish.

Stator windings are copper. Motor leads are stranded copper and are permanently identified and are brought out into the motor terminal box through a neoprene gasket.

Mechanical

Stator frame and end brackets are a minimum of grade 25 cast iron construction.

The terminal box volume is one size larger than NEMA requirements and rotatable in 90° increments.

External cooling fans are non sparking corrosion resistant material.

Drain holes (Qty 2) are provided at the lowest points in the motor frame.

Bearings are either ball bearings or cylindrical roller bearings selected to provide a L-10 life of 40,000 hours with an external load per NEMA MG 1-14 and a L-10 life of 100,000 hours in direct coupled applications.

The motor nameplate is stamped on 304 stainless steel and fastened to the motor frame with four stainless steel drive pins.

All hardware is zinc-dichromate plated.

The motor is dynamically balanced to 0.6 mils peak to peak maximum displacement.

Motors are capable of all positioning mounting and operation.

Applicable Standards & Tests

NEMA Publication MG 1-1993 Revision 1.

Testing per NEMA MG 1-12 (IEEE 112 Test Standard, Method B with segregated loss analysis).

All motors are given a routine test per NEMA MG-1, Section 12.

Class F insulation system is UL Safety Standard 1004 recognized.

Frame assignment per NEMA MG 1-13.

General Information

Cable trays shall not to be installed over light fixtures.

Telecommunications Facilities

The following paragraphs set forth the general telecommunications systems' design criteria for a campus major building. Adjustments will be necessary to meet the needs of lesser size buildings and special function buildings. Verify all special telecommunications (telephone and computer) requirements through the FPC Project Manager.

Telecom Equipment Rooms

Telecom Equipment rooms shall comply with the following requirements:

Comply with Telecommunications Industry Association/Electronics Industry Association (TIA/EIA) Telecommunications Building Wiring Standards in every respect.

Minimum telecom room size. 10' x 9' - Reference: TIA/EIA 569 Table 7.2-1. A/E size the MDF room according to TIA/EIA for the services to be located in this room. Provide a scaled layout of this room at the Preliminary Design review.

All walls to be lined with 3/4" marine plywood painted off white and back primed.

As stated in TIA/EIA 568A Section 4.3 the maximum horizontal run shall be 90 meters (295 feet) however experience has shown that cables fail the required Category 5 test when longer than 270 feet due to the twist in the pairs. Maximum cable length shall be 270 feet measured form the punch down block in the telecom room to the most distant telecom outlet in the work area. This requirement determines the telecom room(s) locations.

Provide a minimum of one fourplex isolated ground 120-volt power outlet on each wall with a maximum of two fourplex outlets per circuit. These circuits are to be dedicated to the telecom room and are not allowed to serve any other load.

Provide one 30-amp 120-volt single phase outlet inside each telecom room (two in the MDF room) and Owner designated server rooms to serve an owner furnished and installed UPS.

Provide the ground bus required by TIA/EIA-607.

Provide 7’ x 19" racks and patch panels as appropriate to serve this building.

All telecom room walls must stack exactly with the telecom room located on the floor above and below it.

Telecom rooms shall not serve outlets on other floors.

No ceiling permitted in this room.

No means of liquid conveyance (water lines, sanitary or roof drain pipes, thermal, water, etc) may pass through electrical or telecom rooms. Exception: Sprinklers may be installed telecom rooms as required by NFPA Code.

Do not locate a fan powered box in any of electrical or telecom rooms. Telecom rooms shall be air conditioned.

Do not locate ductwork or plumbing clean outs in electrical or telecom rooms.

No crawl space access from electrical or telecom rooms.

Building Telecommunications Entrance Facilities:

Provide a minimum of four, four inch schedule 40 PVC (or equivalent) conduits between the building primary telecommunications terminal room and the telecommunications manhole, tunnel, or other service point as designated by FPC Project Manager and Physical Plant Department.

Building Primary Terminal Room Facilities:

Provide a building primary telecommunications terminal room MDF sized in accordance with EIA/TIA-569 to terminate telecommunications entrance cables. This room shall house all fiber and copper service entrance equipment for the telephone, data and cable television distribution system, and all necessary wide area network equipment. Transformers, sound equipment, etc. that may generate objectionable electromagnetic radiation shall not be located in or adjacent to this room. As a minimum provide the following in this room.

Cover all walls with 4' x 8' marine plywood panel, painted light gray.

Four 20 amp, 120V, grounded, standard fourplex convenience outlets. Maximum of two per circuit.

Ground (in accordance with NEC requirements) bonded to power ground with no more than five OHMS resistance.

Lighting, 30 foot candles.

HVAC on a separate VAV box with no heating water coil.

Telecom racks and patch panels as required.

Line protectors for outside plant telephone cables.

Two 30 amp 208 volt single phase outlet for future UPS.

Equipment outlets mounted 7'-6" above finished floor as required to serve rack equipment power strips.

Termination point for a telephone and fiber riser cables to each floor.

Provide an emergency panelboard for this room.

Floor/zone Terminal Closet Facilities:

Provide a minimum of one telecommunications terminal closet per floor sized in accordance with EIA/TIA-569 to terminate telecommunications building distribution cables. As a minimum, provide the following in each closet:

Cover all walls with 4' x 8' marine plywood panel, painted off white both sides.

Four 20 amp, 120V, grounded, standard fourplex convenience outlets. Maximum of two per circuit.

Minimum of four, four-inch conduit sleeves to terminal room and other closets for both data and telecom cables. Conduits bend radius to be not less than thirty inches.

Termination point for station cable distribution facilities from each telecommunications outlet served by a particular floor/zone closet.

Lighting, 30 foot candles.

HVAC as required.

Telecom racks and patch panels as required.

One 30 amp 120 volt single phase outlet for future UPS.

Terminal closets should be located such that the physical wiring distance does not exceed 270 circuit feet to the most remote outlet.

Terminal closets should be stacked vertically. Provide 12-strand multi mode and 6-strand single mode fiber optic backbone cable between MDF room and all IDF rooms in a star configuration.

Station Telecommunications Cable Distribution Facilities:

Provide overhead cable tray raceway (or equivalent) from each floor/zone closet as the distribution backbone for all station outlets being served by a particular closet. Provide 1" EMT (or equivalent) conduit (not more than 100 feet long) connecting each station outlet box with the serving raceway. Where tele/power poles are used, they should be similarly connected to the raceway. All telephone and data cables shall be separated in the cable trays and stove piped from the entrance of each telecom rm. to the patch panel.

All outlet jacks, patch panels, racks, cables, shall meet the requirements of TIA/EIA 568-A Category 6. Pinout to be 568a.

Install pull wire in all spare conduits.

Station Telecommunications Outlet Facilities:

Unless noted otherwise, telecommunication workstations shall all have the following items provided:

Adequate lighting for office work throughout the room, and 120 volt duplex convenient outlets located where necessary by consultation with User and in compliance with National Electric Code. Provide special CRT diffusers on lighting fixtures.

One-15/20 amp, 120 VAC, isolated ground, duplex convenience outlet where deemed necessary after consultations with the User (PC outlet).

One-15/20 amp, 120 VAC, standard duplex convenience outlet where deemed necessary after consultations with the User.

Two computer and two telephone outlets and category 6 cables (4 total). Box and conduit properly grounded.

Cable Testing

Telephone and Data Systems - The Contractor shall test the computer (data) and telephone wiring systems for conformance with the TIA/EIA 568-A category 6 wiring standards. Provide written test results and the point to point wire schedule in Excel format on CD

Intercom and Audio Video Systems

Coordinate all requirements for intercom, video, and audio equipment with FPC Project Manager and User Coordinator. Provide power outlets, conduit, wire and grounding as required. Provide a cable television distribution system. As a minimum, provide a complete sound system including ADA/TAS hearing assistance system and all reasonable infrastructure for audio-visual equipment and appurtenances for all classrooms, meeting rooms, and auditoriums whose seating capacity exceeds 50 seats.

Cable Television System

Provide all cabling, RF Amplifiers, RF Passives, and all appropriate accessories to for a complete and operating RF distribution system capable of delivering distortion free Video, Audio, and Data signals.

The RF distribution system should be capable of delivering CATV Channels 2 through 135. The RF distribution system begins at the centralized demarcation point in the MDF Room and ends at the wall outlet locations.

The RF distribution System should Be two way compatible with the ability to transmit from the wall plate back to the demarcation point all frequencies between 5 and 40 MHz.

All amplifiers, splitters, and multiport directional couplers should be located in a telecom room. All cables shall be home run between the telecom room and wall outlets with cable lengths limited to a maximum of 300 feet.

All forward amplifiers shall have a minimum of 30 db gain and a minimum bandwidth of 54 – 862 MHZ with a flat frequency response no greater than 1.5 db.

All reverse amplifiers shall have a minimum of 16 db of gain and a minimum bandwidth of 5 – 40 MHZ with a flat frequency response no greater than 1.5 db.

All cables between the demarcation point, amplifiers, splitters, and multiport directional coupler locations shall be RG-11 plenum rated, bonded foil tri-shield construction coaxial cable.

All cables between multiport directional coupler locations and wall outlets shall be RG-6 plenum rated, bonded foil tri-shield construction coaxial cable.

All splitters used to divide trunk runs and Multiport Directional Couplers used to feed wall outlets shall be 5 MHZ to 1 GHZ, 130 db RFI shielding with precision machined F ports and solder sealed.

Connectors shall be F-type connectors and designed to be used with the installed cable.

Non locking 75 ohm terminators shall be installed on all unused ports on splitters and multiport directional couplers.

The forward signal level at each wall outlet shall have no greater than a 10db tilt across the bandwidth of the distribution system, 54 to 862 MHZ. The signal level shall not fall below 0 dbmv and shall not exceed 15 dbmv.

Campus Specific Information

Texas A&M University

Telecommunications and Computer Infrastructure Requirements

This section is intended to provide guidance to the A/E to provide infrastructure wiring to support both voice and date communications and is not intended to form a complete specification. The scope of this section extends from the cross connection blocks in the communications closets to the communication jacks mounted in the offices.

Cable--communications cabling shall be of a fire retardant "open air plenum" type; meeting all federal and state fire codes. The cable shall be four pair, 24 AWG cable compliant with Underwriters Laboratories, Inc. (UL) LAB Cable

Certification Program for Category 5 wiring. Category 5 data cable complies with the transmission requirements in the Electrical Industries Association/Telecommunications Industry Association (EIA/TIA) 568 Commercial Building Telecommunications Wiring Standard for Horizontal Unshielded Twisted-Pair (UTP) Cable and with the requirements for Category 5 cable in the proposed EIA/TIA Technical Systems Bulletin PN-2841. Cable sheath shall be plainly marked with UL approved cable surface markings. Individual wire pairs will be colored using the industry standard color codes of

Pair 1	White/Blue	Blue/White
Pair 2	White/Orange	Orange/White
Pair 3	White/Green	Green/White
Pair 4	White/Brown	Brown/White

Cross Connection Blocks:

All computer wiring shall terminate on 110 style connecting blocks (Siemon #S110AB1-100 FT) with termination strips. Blocks shall be 4 pair category 5 rated complete with detachable legs and label holders.

Provide 25% spare or one spare block which ever is greater.

All field wiring will be terminated on the bottom of the block leaving the top open for crossconnecting jumper cables.

Provide sufficient M-66-B terminal blocks to terminate all telephone cables (3 pair) with 50% spare capacity.

Blocks shall be mounted on 3/4" marine plywood painted light gray. Computer and telephone shall be terminated on separate blocks.

Cable shall be terminated at the terminal block in sequential order as follows:

Cable	Block Position
White/Blue	1
Blue/White	2
White/Orange	3
Orange/White	4
White/Green	5
Green/White	6
White/Brown	7

Brown/White 8

Pair twist shall be mounted to within 1/2" of termination.

Communication jacks--an appropriate number of voice and data communications jacks are to be installed in the offices as per the user requirements. The voice jacks will be furnished and installed by others. The data jacks are to have dual 4 pair RJ-45 jacks mounted on the upper portions of the jack. This RJ-45 jack will comply with the EIA 568-B or AT&A 258A WECO connection scheme. The lower portion of the jack is to have at least one blank plate. This jack is to be as follows:

1. Typical Faculty Office

Computer jack to be Leviton Quick Port TR+@ Platform with two RJ-45, 8 Conductor, Keyed, Category 5 Jacks, Leviton No. 41108-KL5. Jacks to be wired EIA/TIA 568 B.

2. Computer Area

Computer jack to be Leviton Quick Port Quad 106 Platform with Four RJ- 45, 8 Conductor, Keyed , Category 5 Jacks, Leviton No. 41108-KL5. Jacks to be wired EIA/TIA 568 B.

Wires are to connect via 110 type punch connection. Jacks are to be the type that can be covered by a standard four gang electrical cover plate. Jacks for wall phone shall be furnished and installed by others.

Installation--All installation shall be performed as follows:

All computer wiring shall be installed, terminated, and tested for category 5 compliance.

A single four pair category 5 cable shall be installed for each computer jack provided. Each data outlet has at least two computer jacks and two telephone jacks. Some data outlets have four or more computer jacks.

All 110 blocks shall be plainly marked depicting the room number and location of the corresponding cable. Permanent marker shall be used.

All cables shall be terminated on both ends, even if depicted for future use.

All cables are to be run to a communications closet on the same floor.

All cables are to be marked on both ends with a permanent marker.

Metering & Building Automation Communications

All buildings will have meters installed that record consumption. These meters will utilize the campus Ethernet and the cat-6 communication cabling within the building. The PowerLogic electric meters and the WAGES PLC will utilize a cat-6 Ethernet cable to a EGX-400 Ethernet gateway. The Siemens DDC systems will communicate with a cat-6 communication cable to a designated DDC panel, a separate additional communications network, specifically for the DDC system, using cat-6 cable will be installed for communications between the DDC panels. This separate DDC communication network will have the cat-6 wiring installed by the ATC. Any switches, terminations, and set-up and integration will be provided by the owners Siemens representative as part of the owner provided DDC system. This separate network will be managed and maintained by the Physical Plant Office of Energy Management.

West Texas A&M University

Telecommunications and Computer Infrastructure Requirements

Data Outlets	Ortronics Series II & fully compliant with EIA/TIA 568A Data jacks will be 8 pin keyed RJ-45 Voice Jacks will be 6 pin RJ25C
Connecting Blocks	Ortronics OR-851044562 with trough for data termination Ortronics OR-30200020 for voice termination

General Information

Fire Detection and Alarm Systems

The Fire Detection and Alarm System shall be designed in accordance with NFPA 72 by a firm registered in the State of Texas and whose employees have a valid fire alarm planning superintendent's license or fire alarm technician license issued by the state fire marshal. All material shall be approved by Factory Mutual Laboratories and Listed by Underwriters Laboratories. Compliance with article 5.43-2, Texas Insurance Code is required.

All fire alarm systems shall be addressable systems.

Campus Specific Information

Tarleton State University

Fire Alarm System

Fire Alarm System shall be Notifier, no substitutions allowed.

Texas A&M University-Commerce

Fire Alarm System

Fire Alarm System shall be Notifier, no substitutions allowed.

Guide Specification

Texas A&M University

Fire Alarms Specifications

Section One: General

1.1 The work covered under this section of the specifications includes the furnishing of all labor, materials and performance of all operations and setup in connection with the installation of the fire alarm system (FAS) as shown on the technical drawings, National Fire Protection Association (NFPA) requirements and as herein specified.

1.2 The complete installations shall conform to the applicable sections of the most current edition of NFPA-72, Americans with Disabilities Act (ADA), and the National Electrical Code. In addition, the entire installed system shall be within the guidelines of the International Building Code and the Texas Accessibility Standard (TAS).

1.3 Contractor shall contact Area Maintenance and Building Proctor before work is started.

1.4 Contractor shall get clarification from University Project Manager/AHJ, if a question or discrepancy arises.

Section Two: Quality Assurance Controls

2.1 All components of the fire alarm system shall be products of an Underwriters Laboratories Inc. listed fire alarm manufacturer, and shall bear the UL label. Partial listing **shall not** be acceptable.

2.2 All components of the fire alarm systems shall use the most current technology available.

2.3 All devices shall be tested and certified that they meet or exceed the "Service Life Expectancy Rating" outlined by UL and NFPA.

2.4 The equipment and installation supervision furnished under this specifications to be provided by a manufacturer who has been engaged in production of this type of equipment (software-driven) for at least 5 years and

has a fully-equipped service organization within 150 miles of the installation site. Service shall be provided within 24 hours of problem notification.

2.5 All conductors shall be uniformly and consistently color-coded and labeled throughout.

2.6 All fire control equipment shall have transient protection devices on all power supplies that comply with UL864.

2.7 Furnish and install Isolated Loop Circuit Protector (ILCP) devices on all devices that extend beyond the main building (i.e. walkways, aerial, or underground methods). The ILCP shall be located as close as practically possible to the point where circuits leave the building. The ILCP shall have a line to line response time of less than one nanosecond capable of accepting 2000 amps to earth. Spark gap devices are not acceptable. All ILCP devices shall comply with UL497B, and NEC 760.

2.8 A maximum of 80% capacity of initiating devices is allowed per loop.

2.9 All conductors in the fire alarm system (main panel, all devices and any peripheral devices) shall be marked and remain the same color and size of wire throughout all circuits.

2.10 The fire alarm system shall use closed loop initiating device circuits with individual zone (device) supervision, individual notification device supervision, and primary and standby power supervision. The fire alarm system shall have three available alarm and trouble outputs for connecting to other building systems.

2.11 Each device shall be labeled and the label designations shall be accurate and consistent with those on the prints, the annunciators, the points list, and message displays.

2.12 The manufacturer shall provide 8 hours of training on the installed Fire Alarm System. This includes device identification, as-built drawings and software training.

Section Three: Fire Panel and Devices

3.1 Only new parts shall be installed at the time of initial installation and to repair the system during the warranty period. No reconditioned parts shall be used.

3.2 All device, panels and auxiliary panels shall be mounted in easily accessible locations. The top of all panels shall be mounted no more than six (6) feet above floor level. Locations of all panels shall be approved by the area maintenance technician.

3.3 The main fire panel (FAP) will consist of a control center utilizing state of the art electronics with microprocessor-based technology and a minimum of four zone (loop) capability. The FAP shall be software controlled with the capability of owner programming. The installer will supply all programming data (complete program, data list) software and all updates to the software. Software media shall be MS-DOS or Windows compatible using the most current version.

3.4 Unless otherwise approved by the Authority Having Jurisdiction (AHJ), the FAP shall have software that will enable the system to be addressable.

3.5 The FAP shall have software capable of self-restoring troubles.

3.6 Unless otherwise approved by the AHJ, the FAP shall be equipped with voice notification.

3.7 The FAP will have an audible device and separate LEDs indicating ALARM, TROUBLE and SUPERVISORY conditions with each having a separate and distinguishable sound. The FAP shall have a backlit LCD display of three lines at 40 characters each. An indication of POWER, TROUBLE and PARTIAL DISABLE shall be included as a LED output.

3.8 The FAP equipment cabinet shall be of sufficient size to accommodate the main fire panel, main and standby power supplies (battery), cable and wire harness and any auxiliary relays. All electronic components shall be secured in a locked cabinet.

3.9 There shall be a separate box located next to the FAP of sufficient size to accommodate spare detectors and paperwork (16" x 16" x 6" min.). This box shall be matching color as the FAP cabinet and shall be keyed the same as the FAP.

3.10 Remote annunciators shall follow the same guidelines as the FAP in all respects. No point-wired annunciators will be acceptable.

3.11 All indicating appliances shall be polarized and operate on 24vdc.
- 3.11.1 Each audible assembly shall:
  - 3.11.1.1 Include separate wire leads for in/out wiring.

3.11.1.2 Emit the current code upon activation at a minimum of 85dBA at 10 feet.
3.11.1.3 Utilize chime in areas that are tone sensitive.
3.11.1.4 Utilize "California Code" pulses when voice annunciation is not required.
3.11.1.5 Be tapped to an adequate wattage capable of achieving the minimum required dB reading.
3.11.1.6 Be tapped at the highest wattage in all mechanical rooms.

3.11.2 Each visual device shall:
3.11.2.1 Comply with all requirements of ADA for flash rate and sequence.
3.11.2.2 Consist of Xenon strobes and be entirely solid state.
3.11.2.3 Have lenses constructed of Lexan or structural equal that is pyramidal in shape.
3.11.2.4 Use high intensity strobes.
3.11.2.5 Utilize incandescence in strobe sensitive areas.

3.12 All water flow switches shall be time adjustable complying with NFPA-72.

3.13 Valve tamper switches shall comply with NFPA 72. A supervisory condition shall result from tamper switch activation.

3.14 Detectors **shall not** be installed until all construction operations causing dust have been completed.

3.15 Beam detectors shall:
3.15.1 Comply with UL268.
3.15.2 Be 24vdc operation.
3.15.3 Have automatic contamination compensation.
3.15.4 Be able to reset from the main fire panel.

3.16 Detector bases shall:
3.16.1 Be low profile, surface, or flush mounted into a standard four inch square electrical box.
3.16.2 Be able to accept heat, ion, or photoelectric devices interchangeably.

3.17 Smoke detectors shall:
3.17.1 Be UL listed and operate on 24vdc.
3.17.2 Have an LED that flashes during normal operation.
3.17.3 Ion detectors shall be dual chamber and be scaled against

rear airflow.
3.17.4 Be self-adjusting for airborne contaminants.
3.17.5 Have clear, distinct visual alarm indication.
3.17.6 Allow device interchangeability, from photoelectric to ionization.
3.17.7 Be mounted in easily accessible locations.
3.17.8 Be programmed to have alarm verification.

3.18 Duct detectors shall:
3.18.1 Be UL listed and operate on 24vdc.
3.18.2 Be of photoelectric type.
3.18.3 Have an insect screen to prevent false alarms.
3.18.4 Have clear, distinct visual power and alarm indications.
3.18.5 Be restorable from the FAP.
3.18.6 Be programmed to have alarm verification.
3.18.7 Have extended visual indicators at eye level if mounted above 5 feet.
3.18.8 Remote LED closest to duct detector as possible.
3.18.9 Report to FAP as a Supervisory Alarm.

3.19 Heat detectors shall:
3.19.1 Be of the dual element, self-restoring type.
3.19.2 Have a flashing LED for normal operation.
3.19.3 Have clear, distinct visual alarm indication.

3.20 Manual pull stations shall:
3.20.1 Comply with ADA.
3.20.2 Operate on 24vdc.
3.20.3 Be restorable with a standard key.
3.20.4 Be cast aluminum or high impact plastic and be red in color.
3.20.5 Be zoned separately if not addressable.
3.20.6 Provide a clear visual indication when activated.
3.20.7 Not require consumable parts to reset to normal condition.

3.21 Door holders shall:
3.21.1 Be magnetic with a holding power of at least 35 pounds.
3.21.2 Be UL listed and operate on 24vdc controlled by the main fire panel.

3.22 Printer interface modules shall be installed in all systems.

3.23 The contractor shall provide three sets of any special tools required for any installed components. (Need to be determined at acceptance by AHJ)

Section Four: System Design Requirements

4.1 All fire alarm systems shall provide the following:
- 4.1.1 Be easily expandable.
- 4.1.2 One switch "Manual Evacuation" which is:
  - 4.1.2.1 Distinct in size, color, and location on the panel.
  - 4.1.2.2 Initiates indicating appliances on all floors.
  - 4.1.2.3 Supervised-addressed and/or zoned.

4.2 One drill switch (for maintenance only) that initiates indicating appliances on all floors.

4.3 Programmable "Bypass" switches for:
- 4.3.1 AHU shut down.
- 4.3.2 Elevator recall.
- 4.3.3 Stairwell pressurization fans.
- 4.3.4 Supervisory circuits (hardwired system only).
- 4.3.5 Separate switch for visual and audible devices.
- 4.3.6 Alarm verification.

4.4 Software that:
- 4.4.1 Is password protected.
- 4.4.2 Offers computer driven device calibration test and reporting features, by device, loop, or system.
- 4.4.3 Latches all Alarm, Trouble and Alert signals, unless otherwise requested by AHJ.

4.5 Maintains supervision of all system power supplies.

4.6 Allows all controlled systems to "auto reset," (i.e., AHUs and elevators).

4.7 Allows all system devices, except manual pull stations, to be restorable from the FAP, including duct detectors.

4.8 Supply all programming according to TAMU request.

4.9 Power for the FAS (FAP and all components) shall be from one electrical panel unless approved by the AHJ.

4.10 Conduits shall not be filled to more than 40% capacity. Conduits shall have a J-box no further than 100 feet or at each 270° turn, whichever occurs first. All J-boxes shall be painted red or have the letters FAP in red on the cover. All J-boxes shall be easily accessible.

Section Five: Installation, Testing, and Acceptance

5.1 The contractor shall provide all instruments, labor and materials required for all installations start-up tests, including a qualified technician to conduct the test.

5.2 Installation and testing shall be inspected and certified by a contractor supplied NICET II (minimum) Technician.

5.3 Acceptance tests shall include, but are not limited to the following (as per NFPA 72):

- 5.3.1 Operation of each alarm initiating device.
- 5.3.2 Operation of each notification appliance.
- 5.3.3 Operation of all control features.
- 5.3.4 Operation of all supervisory features.
- 5.3.5 Testing of all device circuits for trouble indication.

5.4 Any deficiencies noted during acceptance testing shall be corrected and a retest shall be scheduled for all devices, circuitry and/or wiring necessary to assure system integrity.

5.5 Depending on the project, system acceptance is contingent upon approval by the Environmental Health and Safety Department, Facilities Planning and Construction, and a Physical Plant representative.

5.6 Upon completion of testing, the installer shall provide a certification to the State Fire Marshal's office attesting to the fact that he has tested and adjusted the system. The installer shall provide a copy of NFPA 72 Record of Completion to the AHJ.

5.7 The contractor shall identify circuit breakers on main and emergency power and identify electrical panel location(s) and breaker number(s) at FAP.

The contractor shall provide three (3) copies of the following documentation at time of system acceptance.

- 5.7.1 All equipment cut sheets.
- 5.7.2 All system "loop resistance readings" as required by NFPA.

5.7.3 System prints.
5.7.4 System operation and maintenance manuals.
5.7.5 Color-coded riser diagrams.
5.7.6 Point to point wiring diagram for the wiring of the FAP.

5.8 One set of record drawings shall be given directly to the Physical Plant no later than 15 calendar days after acceptance testing.

5.9 Contractor shall provide a structured training class to Physical Plant personnel on troubleshooting, maintenance and repair of the installed system as needed.

Section Six: Warranty

6.1 The system shall be guaranteed to be free from all defects of material and workmanship for a period of one year, effective upon date of acceptance.

6.2 The contractor shall guarantee parts availability for a minimum of five (5) years after installation.

General Information

Establishing the Finish Floor Elevation

In order to better ensure the proper first floor elevation, the A/E is requested to set the floor elevation from interpretations of the existing and proposed finish grades and contours and after assuring for proper drainage around the building.

Site Clearing

Clear/grub/strip of trees, roots and vegetation that portion of the site to receive landscaping and improvements. Remove roots to a minimum depth of 24". No onsite burning is allowed unless approved by Owner. Trees/vegetation to remain shall be adequately fenced and otherwise protected from damage by construction operations.

If good friable top soil exists on site, strip this material to a depth of 4" and stockpile for reuse in areas to receive grass and other landscaping. Top soil to be free of significant vegetation, rocks or other deleterious materials.

Topsoil

Topsoil shall be a natural, fertile, friable soil, possessing characteristics of representative productive soils in the vicinity. It shall be obtained from approved naturally well-drained areas. Only the top 12”(inches) of earth shall be removed and used. It shall not be excessively acid or alkaline or contain toxic substances, which may be harmful to the plant growth. Topsoil shall be without admixture of subsoil and shall contain a minimum of lumps, stones, stumps, roots, or similar substances 1” (inch) or more in diameter, quality to be determined by Physical Plant Department or its representative. Topsoil shall not be collected from sites that are infected with a growth of, or the reproductive parts of, noxious weeds (Nut Sedge, Johnson grass, Bermuda grass). Topsoil shall not be stripped, collected, or deposited while wet. It is the responsibility of the Contractor to furnish the location where the topsoil is to be obtained to FPC Project Manager or its representative in writing, as well as a one gallon sample of such soil.

Grading

Slopes of planted areas should allow easy maintenance. Turf areas shall have a slope of no more than 3:1 and no less than 1 percent. A 2 percent minimum slope

is desirable. Areas with slopes greater than 3:1 must be planted with ground cover and constructed to control erosion.

Existing trees and other plant material to be preserved shall be indicated on the grading plan. Where trees are to be preserved no grading or paving of the existing grade within the drip line is allowed.

Slopes for walkways shall comply with Texas Accessibility Standards

Proof roll and compact top 6" of all subgrade to receive embankment or paving/structural improvements to a minimum of 95% maximum density as per ASTM D-1557. Open area embankment shall be placed in maximum 12" lifts and compacted to a minimum of 90% maximum density as per ASTM D-698. Structural embankment shall be compacted in maximum 8" lifts to a minimum of 95% ASTM D-1557. Backfill around structures shall be placed uniformly and only after the elements of the structure have attained the required strength to resist the soil pressure. Heavy vibratory compaction equipment shall be used no closer than 5 feet to the structure.

Select fill where required shall be a material available in the general area of the project (if possible) having a plasticity index (PI) ranging form 7 to 15, a liquid limit of 35 or less and being free from organic matter, large rocks or other deleterious materials.

Excavation, Trenching and Backfilling for Utilities

Excavation/trenching and backfilling operation shall be coordinated such that no more than 200 linear feet of trench is open at any one time. Backfilling is to be scheduled so there is a minimum amount of open excavation left during hours of no work. All open excavation shall be properly lighted and barricaded during hours that contractor is not on site. The open ends of all utility lines shall be temporarily sealed at the end of the working day.

Adequate measures shall be taken to prevent runoff water from entering the trench without damage to surrounding facilities/properties.

De-watering systems shall be provided as required for excavation/backfill activities and to allow installation of utility lines and embedment envelope on dry stable trench bottom. Discharge from the de-watering system shall be directed to drainage facilities of adequate capacity in a manner that will not damage or interfere with the use of adjoining facilities/properties.

The embedment zone for a utility line extends from 6" below the bottom of a utility line to 12" above its top. Typically, embedment material for water, sanitary sewer and storm sewer lines is fine gradation gravel with maximum diameter of 3/4". Embedment material for pre-insulated thermal utility piping is sharp sand. Electrical duct bank is typically encased in red concrete and installed on the undisturbed trench bottom. High water table elevations may necessitate the use of an alternate embedment material and different embedment zone dimensions.

Backfill above the embedment zone for trenches in open areas shall be native material compacted in maximum 12" lifts to 90% maximum density as per ASTM D-698. Backfill above the embedment zone for trenches in areas under existing or proposed pavement or ground supported structures shall be cement stabilized sand (1 ½ sacks of cement per cubic yard of sand) compacted in maximum 8" lifts to 95% ASTM D-1557. Consolidation of trench backfill by flooding/jetting is not allowed.

An excavation/trench safety program shall be implemented which complies with OSHA trench safety standards, subpart P. A trench safety plan shall be prepared and sealed by a Texas registered Professional Engineer and submitted to the Owner prior to the start of construction.

Lime Stabilization

If lime stabilization is required, use lime slurry.

Termite Treatment

Soil treatment is required for certain TAMUS projects especially for renovation where wood framing is or was used and in project with substantial wood cabinetry, etc. All products used for the treatment of termites shall display labels bearing Environmental Protection Agency approvals and shall be mixed and applied in accordance with directions on the label.

Void Space Below Grade Beams

Provide soil retainers at face of grade beams below grade to form a void of sufficient depth to prevent expansion of earth to cause pressure on bottom of beams. Acceptable product is SureRetainer by MotzBlock.

General Information

Site Paving

Site paving shall be provided to facilitate pedestrian and vehicular access along with emergency and service vehicle access to the site and facility being designed.

Materials, parameters and methods shall be in basic conformance with the TxDOT "Standard Specifications for Construction of Highways, Streets and Bridges," latest edition and applicable ASTM standards.

Subgrade material to receive pavement sections other than pedestrian sidewalks which has a plasticity index (PI) greater than 17 shall be stabilized in place with lime prior to placing the pavement. Lime shall be placed in slurry form. With Owner approval, lime may also be dry placed as Type C pelletized quicklime (grade DS). Lime shall be thoroughly mixed into the subgrade with a rotary pulverizing mixer using a two step preliminary mix/final mix procedure with appropriate curing times between mixes and compaction before opening to traffic or placing additional courses. Subgrade material to receive pavement sections other than pedestrian sidewalks which has a plasticity index (PI) less than 5 shall be stabilized in place with Type I Portland cement. The cement shall be dry mixed into the subgrade using a rotary pulverizing mixer, appropriate water added and then thoroughly mixed with the cement and soil until a full depth uniform mix has been obtained. Appropriate compaction and curing shall occur prior to opening to traffic or placing additional courses. Stabilized subgrade shall be compacted full depth to a minimum of 95% of the maximum density as per ASTM D-1557 a minimum of 12" beyond the supported pavement section. The amount of lime or cement to be added to the subgrade and the depth of stabilization shall be determined by the geotechnical consultant based on design mix texts and anticipated traffic loadings.

Pavement sections subject to vehicular traffic shall be either a rigid section of portland cement reinforced concrete (PCRC) or a flexible section consisting of hot mix asphaltic concrete (HMAC) surface over an approved flexible base material (coordinate pavement type selection with Owner). PCRC pavement sections shall be a minimum of 6" thick. Finish shall be broom or burlap drag. HMAC shall be Type "D" and the flexible base material shall be Type A, grade 1 or 2 as defined in the TxDOT standard specifications. The flexible base shall be compacted in maximum 8" lifts to a minimum density of 95% of the maximum density as per ASTM D-1557 and shall be primed with a cutback asphaltic material such as MC-30 at a rate established by the team and shown on the

plans prior to HMAC placement. The HMAC surface course shall be compacted to contain 3 to 8 percent air voids when tested in accordance with Tex-207-F and Tex-227-F.

The thickness of the pavement section elements shall be recommended by the geotechnical consultant based on soil conditions and anticipated traffic loadings. Pavement at trash dumpsters, loading docks, etc. subject to heavy vehicular maneuvering and turning shall be PCRC.

Pedestrian sidewalks shall be PCRC with a minimum thickness of 4" and a minimum width of 4'. Pedestrian sidewalks that may also be service and/or emergency vehicle pathways shall be a minimum of 6" thick and appropriate width. The finish shall typically be a light broom finish but shall be coordinated with any campus standard finish schemes. Sidewalks shall be cross-sloped (max. 2%) in the direction of site drainage patterns. Sidewalks adjoining concrete curb and gutter shall be doweled into the curb and gutter section. Sidewalks adjoining foundations at doors and other points of pedestrian circulation shall be doweled to the foundation in a manner to prevent differential movement.

Concrete pavement shall typically be edged with a 6" concrete curb. Preferably the curb shall be poured monolithically with the pavement but doweled curb sections are allowed. If poured separately the curb section shall be recessed 1" into the pavement and attached with dowels of sufficient spacing and length to hold the curb firmly to the pavement.

HMAC flexible pavement sections shall typically be edged by reinforced concrete curb and gutter to receive storm drainage from the pavement and to stabilize the pavement edge. Curb and gutter section shall be 1' tall from bottom to top-of-curb and 2' in width, have a 1 - 1 ½" lip above the gutter and be reinforced with 3 deformed reinforcing bars. Curb and gutter section shall be a minimum of 6" thick with a thicker section to form the lip. Place doweled expansion joints in curb and gutter as a minimum at end of radius returns, at curb inlets and at maximum 40' centers in straight runs. Expansion joints in curbs with adjoining sidewalks shall match the joint location and spacing in the sidewalk. Contraction joints a minimum depth of 3/4" or 1/4 slab depth whichever is greater shall be placed at 10' intervals. Curb and gutter section shall be placed on 4" of flexible base material compacted to the same requirements as the pavement section.

Reinforced concrete valley gutters shall be placed in areas of concentrated storm water runoff across HMAC pavement such as at street/driveway intersections. Valley gutters at street intersections shall be 6' wide with 1 - 1 ½" lips above the

flowline on each side. The valley gutter shall be minimum of 6" thick with a thicker section to form the lips. The valley gutter section shall be placed on 4" of flexible base material compacted to the same density requirements as the pavement section. Doweled expansion joints shall be placed in valley gutters at maximum 40' centers.

All pavement/surfaces and gutters shall be crowned and/or sloped sufficiently to positively direct storm runoff to points of discharge or collection as to eliminate 'birdbaths". Minimum cross slopes for open pavement areas shall be 1% ; minimum crown for streets shall be 6" above the gutter line; minimum slopes for curb and gutter shall be 0.5%.

A jointing plan shall be prepared as part of the design plans showing the type and location of joints in all PCRC pavements including sidewalks and curbs/valley gutters. The expansion joints in sidewalks shall be placed at walk intersections and at maximum 20' centers in straight runs. Expansion joints in street sections shall be placed at maximum 60' centers and at maximum 40' centers in parking lots and shall extend through the curb section. Expansion joints, contraction joints, construction joints and isolation joints shall be placed in accordance with good engineering practice as required to control cracking and other distress in the concrete pavement and to facilitate construction.

Concrete for all site paving/curbs/gutters shall have a minimum compressive strength of 3,000 psi at 28 days. Reinforcement shall be new deformed steel bars conforming to ASTM A615, Grade 60 minimum No. 4 bar in size. No welded wire fabric shall be used as reinforcement except in unique situations as approved by Owner. All concrete shall be adequately cured by protecting it against moisture loss for a period of not less than 72 hours beginning immediately upon completion of finishing operations and initial set of concrete.

Expansion joints shall consist of smooth bar dowel assemblies conforming to ASTM A615, grade 60 with a PVC sheath over the free end, asphalt impregnated fiber board filler and two part, cold applied self leveling polyurethane sealant with closed cell polyethylene backer rod.

The basic configuration of parking lots shall be as follows:

Parking Angle:	90 degrees
Stall Width:	9' - 0" (8' - 6" at TAMU only)
Module Width:	62' - 0" (stripe to stripe), 60' - 0" (face of curb to stripe), 58' - 0" (face of curb to face of curb)
Stripe Width:	4"

Stripe Length: 16' - 0"
Stripe Colors: White for general parking. Yellow for no parking, and loading. Blue for disabled.

Landscaped Medians: Planted, irrigated, and spaced appropriate to the design.
Concrete Mow Strips: 2'-0" wide back of curb for head-in parking
Lighting: 1 foot candle

Concrete Walks

Concrete sidewalks shall generally be minimum 8 feet in width

Concrete sidewalks are generally medium broom finish.

Avoid surface drainage of storm water across sidewalks.

Concrete sidewalks on the Prairie View A&M University campus should make maximum use of exposed aggregate finishes such as in the quadrangle landscape area.

Concrete Joints

Concrete joints shall be saw cut "green" as soon as the concrete hardens to support the weight of an early entry type concrete saw and operator and avoid raveling.

Bicycle Racks

Show bicycle racks in sufficient quantity near but not in front of entrances. Use standard ribbon hot dipped galvanized pipe type embedded in concrete.

These details shall be incorporated in the drawings. The number of racks required will be determined during the schematic design stage with the FPC Project Manager.

Trash Removal

Trash receptacle location should be at grade level and should be placed so that they can be loaded from top as well as side and screened from public view. Verify method of disposal at various research centers/stations and other Universities.

Front loading trucks used at TAMU and TAMUG.

Side loading trucks are used at Texas A&M University-Kingsville

Rear loading trucks are used at WTAMU with rolling toters, there are no dumpsters.

Receptacle area should be adequately lighted for night use.

At dumpster locations, provide a concrete pad of sufficient size and strength to accommodate the dumpster and truck.

Porches and Steps

All stoops, porches, docks and steps, exterior and interior should have built-in abrasive surfaces. Slope exterior porches and treads to drain water 1/4" per foot. Exposed concrete finished work shall be accomplished in two pours: the first structural and the second being a two inch minimum finish topping poured near completion of project. WTAMU prefers a single pour system, to avoid potential freeze thaw damage. Primary entry floors may be constructed using brick, tile, pavers or other permanent floor materials.

Landscaping

All landscaping plantings shall be planned and designed to be compatible with the overall campus landscaping scheme. Emphasis shall be placed on durability and low maintenance characteristics.

Planting Mixture- Premixed blend of topsoil, organic matter, and sand in a ratio suited for the area and plant material specified. Seasonal color beds shall have 2” depth of peat moss tilled into top layer of planting mix before installation of plant material.

Planters- 12” Minimum of planting mix placed in planter. Crown surface for drainage.

Turf Areas- 3-4” of topsoil placed and fine graded before placement of turf.

Concrete Mow Strip- Planter areas that are adjacent to turf areas shall have a 12” wide x 4” thick, reinforced concrete mow strip. Reinforcing shall be No. 3 rebar. Medium broom finish. Concrete shall be 5 sack mix, 3000 PSI at 28 days,

minimum.

All disturbed areas shall be graded to properly drain and seeded or sodded with a permanent grass.
Sod- Sod shall be variety approved by Texas A&M University representative.
Sod shall be composed of certified, approved, or nursery grown grass and shall be true to name/ variety. Sod shall be substantially free of noxious weeds, disease, insects, thatch and undesirable grasses. Sod shall have a sufficient density so that no surface soil is visible at a mowing height of 1.5 "(inches). Sod shall be neatly mowed and mature enough that when grasped at one end it can be lifted and handled without damage to the sod. Maximum mowing height shall be 2.5 "(inches).

Sod shall be cut to provide a sufficient root zone and stand of live grass. Sod shall be cut with a uniform soil portion of a ½" thickness, plus or minus ¼ inches.

Sod shall be cut, delivered and installed within 24 hours of cutting. Sod shall be cut by mechanical means such as sod cutters. Sod shall be cut when the moisture content (either excessively wet or dry) will effect the lifespan of the sod.

Area to designated for sod, shall fine graded, smoothed, with topsoil placed before final grading. If soil is dry, lightly moisten before placement of sod.

First row of sod shall be placed in straight line with additional placement of rows shall be parallel and tightly placed against each row. Staggered lateral joints butted tightly shall be used. Sod shall not be stretched or overlapped.

Sod on slopes greater than 3:1 shall be placed perpendicular to slope. Sod on slopes shall be temporally fastened to ground by stakes, staples, pegs or other approved methods. After sod has become established, contractor shall remove fasteners.

Sod shall be lightly rolled after section is placed. Once sod has been placed, immediately water sod to prevent excessive drying. Thoroughly water sod so that underside of sod and soil are completely wet.

Irrigation

Design and installation must meet TCEQ (Texas Commission on Environment Quality) irrigation laws and requirements. Irrigation systems shall be installed under the supervision of a Licensed Irrigator.

Materials used in the system shall be new and without flaws or defects and shall be the best of their class and kind.

The irrigation system shall be positively separated from the domestic water system by a double check or reduced pressure type backflow preventer meeting the requirements of AWWA C506. Type chosen shall be suitable to the installation location and conditions. Backflow preventers may be placed in the mechanical space of the building when appropriate. Double check valve backflow preventers located in the landscape, when placed underground shall be in valve boxes or vaults with adequate room for testing. Backflow preventers placed above ground, should be located to minimize visibility, and or concealed with plants or landscaping features to maintain aesthetics.

Enclose pipe and wiring beneath roadways, walks, curbs, etc., in sleeves. Extend sleeve ends 24" beyond the edge of paved surface. Mark sleeve location with 3/8" X 3" brass or stainless steel stove bolt embedded in the concrete at each end. Sleeving pipe beneath pedestrian pavements shall be PVC Class 200 with solvent welded joints. Sleeving pipe beneath drives and streets shall be Schedule 40 with solvent welded joints. Sleeves installed under pavement for future irrigation installation shall be loose capped on each end and marked with stove bolts as above. Size and depth of sleeve should be coordinated with the landscape architect, with a minimum size being 4".

Mainline and lateral pipe shall be PVC Class 200 and have bell ends. Mainline and lateral fittings shall be PVC Schedule 40. All PVC pipe and slip fittings shall be joined with primer and solvent cement. Cure time for cement should be in accordance with manufacturer's instructions. For threaded PVC connections, use only Teflon-type tape. When connection is PVC to metal, the PVC component shall have male threads and the metal component shall have female threads.

The satellite irrigation controllers should be located outside the building. Controller units shall be compatible with the existing campus controller system. For controller, provide quick disconnect from power source next to controller.

Electric wire from the satellite controller to each remote control valve and the common wire shall be AWG No. 14 solid copper, type UF cable, UL approved for direct underground burial. Wire color should be continuous over its entire length. Use white for common ground wire. Use easily distinguishable colors for other control wires. Control wire splices shall be made with 3M-DBY or equal direct burial splice kit. If multiple splices are made in one location, splices are to

be placed in a valve box. Install a control wire from controller to each remote control valve. Multiple valves on a single control wire are not permitted. Control wires shall be in same trench as constant pressure lines. Provide an isolation valve for each zone; however, it is acceptable to install 2 zones to an isolation valve if necessary. Remote control valves shall be placed in valve boxes.

Remote control valves and irrigation heads should be compatible with existing campus irrigation system. Head to head spacing is required. Spacing must not exceed manufacturer's recommended spacing. All heads shall be adjusted to factory specifications.

Excavated material is generally satisfactory for backfill. Backfill shall be free from rubbish, vegetation, frozen materials, and stones larger than 2 inches in dimension. Backfill placed next to pipe shall be free of sharp objects which may damage the pipe. Contractor shall be responsible for adding soil to trenches after settling has occurred.

Upon completion of work, remove from the site all tools, excess materials, and rubbish.

Contractor shall provide a demonstration and walk through of entire irrigation system with Owner and Owner's Representative.

Contractor shall supply record drawings ("as builts") of all irrigation as installed in ground to Owner or Owner's representative. Zones, back flow preventer, and controllers as well as the zone flow measurement for each zone shall be included and shown on the drawings. Drawings shall be at a scale no smaller than one inch equals thirty feet. Drawings shall be sealed, dated and signed by licensed irrigator in the State of Texas. Operation manuals for controller and other irrigation equipment shall be submitted at time of record drawings.

Schedule 40 PVC irrigation sleeves, "loose capped" on each end, shall be provided under all site paving to allow for later installation of a site irrigation system. The location and size of sleeves shall be coordinated with the landscape architect with a minimum size being 4". Sleeve locations shall be permanently marked with a 3/8" x 3" brass stove bolt embedded in the concrete over each end of the sleeve. The bolt shall be in the top of curb at street crossings and the top of paving on flatwork (3" in from edge of pavement). Sleeves shall have a minimum cover of 18" and extend a minimum of 2' beyond the edge of pavement/back of curb. Sleeve depth shall be coordinated with pavement section.

The irrigation system shall be installed with water supply being provided from the building with backflow prevention and controls in the building mechanical space.

Where the water system pressure is not adequate for proper operation and function of the irrigation system a heavy duty duplex booster pump station shall be provided in this project. A positive "air break" shall be provided between the station and the water system.

The irrigation system shall be positively separated from the domestic water system by a double check or reduced pressure type backflow preventer meeting the requirements of AWWAC 506. Type chosen shall be suitable to the installation location and conditions.

Campus Specific Information

Texas A&M University

Irrigation Materials

Spray Heads - Up to 17' Radius, Lawn and Shrub Areas
Toro 570 Series with pressure compensating device (PCD)
Shrub heads shall be 6" or 12" Hi-Pop Body. Turf areas shall be 4" Hi-Pop Body.

Rotary Heads-
Hunter PGP
Hunter I-40

Electric Control Valves
Rainbird PEB Series

Gate Valves- Brass
Ball Valves - PVC

Quick Coupling Valves
Rainbird #44

Back Flow Preventer-
Double Check Valve
½" to 2" Febco 805Y or equal
2 ½" and greater Febco 850 or equal

Fittings-
Lasco or equal

Wire-Direct Burial Wire
Connectors- 3M – DBY or equal

Valve Boxes-
AMTEK or Equal

Plant Materials

Trees

Texas Red Oak	Crepe Myrtle
Shumard Oak (non irrigation)	Aristocrat Pear
White Oak	Mexican Plum
Bur Oak	Texas Pistache
Easter Red Cedar	Chinese Pistache
Nutall Oak	Golden Rain Tree
Live Oak	Texas Ash
Monterrey Oak	Texas Persimmon
Cedar Elm	Texas Redbud
Pecan	Mexican Redbud
Chinese Elm	Elderica Pine
Bald Cypress	Bradford Pear
Pond Cypress	Western Soapberry
Monterrey Cypress	Japanese Yew (by building)
Texas Mountain Laurel	

Shrubs

Indian Hawthorn
Dwarf Yaupon
Dwarf Burford Holly
Burford Holly
Green Texas Sage
Sliver Texas Sage
Mediland Rose
Knock Out Roxe
Oleander
Dwarf Chinese Holly
Chinese Photinia

Groundcover

- Liriope
  - Big Blue
  - Silvery Sunproof
- Liriope Spicata
  - Sliver Dragon
  - Giantea
- Asiatic Jasmine
- Dwarf Asiatic Jasmine
- Confederate Jasmine
- Carolina Jessamine
- Creeping Euonymus
- Creeping Lantana
- Lantana

General Information

All connections to campus distribution systems or public utilities shall be accurately located by dimensions or coordinates. Depth of piping shall be shown and inverts must be shown at manholes and other critical points.

Sanitary Sewer

Gravity sanitary sewer mainlines shall be no less than 6" and services lines shall be no less than 4". All gravity sanitary sewer piping shall be SDR 26 PVC (ASTM D 3034) or heavier. Exposed piping shall be ductile iron with appropriate coating protection. PVC and ductile iron piping shall have watertight push-on joints using elastomeric gaskets meeting the requirements of ASTM F 477 and AWWA C111 respectively. Fittings shall be of equal strength as the piping.

Manholes on sanitary sewer mainlines shall be spaced no further than 350 feet apart and be placed at all piping intersections and significant angle points with the exception of 4" service lines. Appropriate wye fittings shall be used at such service connections. Sanitary sewer manholes shall be either cast-in-place of pre-cast (ASTM C478)) with a reinforced concrete foundation. Minimum 28 day concrete strength shall be 3,000 psi. The invert of the manhole shall be sloped and smooth finished sufficiently to prevent deposition of solids. If the elevation difference between an entering pipe and the exiting pipe is more than 2 feet, a drop type manhole shall be used.

Sanitary sewer and storm sewer shall be shown on separate sheets along with profiles.

All pipes penetrating exterior walls below grade must be installed properly to prevent breakage due to building settlement or expansive soil.

Provide 30 inch diameter minimum size access openings for all sanitary manholes.

Cleanouts shall be provided for all service laterals and be located at each bend, at connections to manholes and every 100 ft. in straight pipe runs. Cleanouts shall be installed on all 4" sanitary sewer service lines as required to facilitate line cleaning.

Profiles on sewer lines shall be shown for all pipe sizes 6” and greater. The profiles shall show as a minimum, depth of cover, other utility crossings, slope, inverts, pipe material and class of pipe.

Sanitary sewer lift stations shall consist of precast (ASTM C478) or cast-in place reinforced concrete wet well containing a heavy-duty duplex pumping system readily accessible/removable for replacement/maintenance. A lockable hatch system of adequate size for maintenance/access shall be provided. A reliable level control system shall be provided to start/stop the pumps including a high level alarm. The basic control system shall consist of a remote disconnect, combination starter for each motor, H-O-A switches, run lights and seal failure sensors. All Conduit connections to the wet well will be adequately sealed to sewer gases/moisture. Pump discharge piping for each pump shall be flanged ductile iron containing a check valve and plug valve located in a valve pit exterior to the wet well. Metal surfaces inside the wet well and the inside surfaces of the wet well shall be protected by appropriate coatings. Valve pit shall have a lockable hatch of adequate size for operation and maintenance of valves.

Sanitary sewer force mains shall be SDR 26 (Class 160) PVC complying with ASTM D2241. Appropriately coated and protected mechanical joint ductile iron fittings shall be used. All angles, bends, tees etc shall be stabilized with concrete thrust blocks, sized by the Project A/E. Appropriately spliced and terminated tracer wire shall be laid with all non-metallic force man.

The sanitary sewer system shall be designed, installed and tested in accordance with Texas Commission on Environmental Quality (TCEQ) requirements. Leakage test on PVC pipe shall be a low pressure air test performed as set forth by the Uni-Bell PVC Pipe Association. Deflection tests shall be by a mandrel pull 30 days following trench backfill. All tests shall be witnessed by the Owner.

Storm Sewer

Storm sewer shall either be RCP Class III (ASTM C76) for 12" and above or SDR 26 PVC (ASTM D3034) or heavier for less than 12". RCP shall be tongue and groove with watertight joints formed with a field installed sealant such as "RamNek" or o-ring gaskets (ASTM C443). PVC pipe shall have water tight push-on joints meeting the requirements of ASTM F477.

Storm roof drains shall be run separately from all other storm water sources to the outside of the building.

Both sanitary and storm sewers sizes shall be determined by a Texas licensed professional engineer (PE) and is to be based on existing/future sewer capacities and a drainage study for storm sewers. If the existing infrastructure can not

accommodate the increased loads, then an estimate shall be presented to the Owner to determine if additional funds need to be appropriated for any up-sizing.

Manholes and/or junction boxes with access openings shall be installed on the storm sewer system at all piping intersections and significant angle points with the exception of small drain leads which may use appropriate wye fittings. Manholes shall be either pre-cast (ASTM C 478) or cast-in-place with a reinforced concrete foundation. Junction boxes shall be of reinforced pre-cast or cast-in-place construction. Minimum 28 day concrete strength shall be 3,000 psi.

Provide 30 inch diameter minimum size access openings for all manholes. Iron castings for manhole rings and covers shall conform to ASTM A 48, Class 30 and be traffic rated.

Area inlets for the storm sewer system shall be either pre-cast or cast-in-place reinforced concrete with frame and grate iron castings conforming to ASTM A48 Class 30 and shall be traffic rated. Curb inlets shall also be either pre-cast or cast-in-place with a manhole frame and cover installed in the top to allow access. In high visibility areas near buildings or at pedestrian drop off points, inlet tops shall be cast-in-place. Minimum concrete 28 day compressive strength for inlets shall be 3,000 psi. Typically storm sewer discharge points shall be stabilized with either a pre-cast or cast-in-place headwall structure with adequate surrounding rip-rap to control erosion. Minimum concrete 28 day compressive strength for headwalls shall be 3,000 psi.

Domestic Water

The domestic water system shall be designed and installed in accordance with TCEQ requirements.

Domestic water piping 4" and larger shall be AWWA C-900, Class 200 PVC with elastomeric gasketed push-on joints. Fittings shall be cement mortar lined and appropriately coated and protected mechanical joint ductile iron. Piping smaller than 4" shall be SDR 21 Class 200 ASTM D2241, PVC with elastomeric gasketed push on joints. Fittings shall be PVC of equal strength.

All angles, bends, tees etc. shall be stabilized with concrete thrust blocks sized by the Project A/E. Appropriately spliced and terminated tracer wire shall be laid with all non metallic water line.

Line valves shall be placed at all points of connection to existing water lines, at branch intersections and any other location necessary for adequate control of the

water system. Typically the number of valves at an intersection will equal the number of branches less one. "In line" valves shall be placed in long runs of pipe at approximate 2000 foot spacing. Adequately supported air/vacuum relief valves shall be installed as required along the main in enclosures to facilitate draining and maintenance/inspection.

Line valves 3" and larger shall be direct bury resilient wedge gate valves meeting the requirements of AWWA C509 with mechanical joint connectors and non rising stem nut operator. Valves shall be poly wrapped in accordance with AWWA C105.

Line valves smaller than 3" shall be bronze body ball valves with threaded connectors, stainless steel ball and stem, lever operated with a rated working pressure of 200 psi.

Cast iron adjustable valve boxes with surface reinforced concrete collar shall provided over all buried valves to provide access from ground surface to valve operating nut.

Adequate fire hydrants shall be placed around the facility such that no portion of the building is over 300 feet from a hydrant. Fire hydrants shall be 5 1/4" main valve opening with 2 ~ 2-1/2" hose nozzles and a 4 ½" pumper nozzle. Coordinate nozzle size and thread requirements with entity providing fire protection. Hydrants shall be dry-top compression type hydrants, traffic model, complying with AWWA C502. Auxiliary gate valves shall be placed in all hydrant leads.

Where necessary, connections to existing water mains shall be a "hot" tap using a tapping sleeve and valve appropriate to the type of pipe being tapped. No full size taps shall be made without approval by the Owner.

The domestic water supply to a facility shall be metered unless directed otherwise by the Owner.

The complete site domestic water system installed for the project shall be pressure tested for leakage in accordance with TCEQ requirements along with applicable fire protection codes and shall be disinfected in accordance with the requirements of AWWA C601.

Concrete Utility Boxes

Concrete boxes required by the mechanical, plumbing, civil site work and/or electrical divisions must be properly dimensioned, reinforced and/or detailed.

Chilled water and heating water valves in underground systems shall have as an enclosure a concrete valve box with sufficient space to maintain and operate valves. Direct buried valves may be considered if acceptable to the System Mechanical Engineer.

Chilled and Heating Water Distribution

Chilled water and heating water distribution piping shall be pre-insulated ductile iron. All straight section shall be factory insulated. Fittings and joints shall be provided with field insulation kits compatible with the factory insulation. The insulation shall be protected by an HDPE outer shell. Pipe shall be listed suitable for use with 43 degree chiller water and 180 degree heating water. Ductile iron pipe shall be Class 50 thickness, restrained joint conforming to ANSI A 21.512 or AWWA C 151-75. Pipe and fittings shall be cement lined and have an external bitumastic/tar coating and no internal coating. Pipe and fittings shall be U.S. Pipe TR FLEX or Clow Super Lok.

Spacing between chilled and heating pipes should be at least 10 – 12 inches.

Direct burial of steam piping is not acceptable. Some form of concrete or metal duct shall be provided.

Use Cor-ten© bolts or corrosion resistant alloy bolts on underground piping especially heating water piping.

All underground direct buried valves shall be ductile iron butterfly with a "Ground Hog" gear box.

Electrical Distribution

This project shall receive its electrical power from the owners or power company's existing medium voltage electrical distribution system. The A/E shall determine this project's electrical load requirements as soon as possible so that the owner can determine the physical point of connection and the 12 KV circuit to be used. The contractor shall be responsible for the extension of the medium voltage distribution system from this point to the project location. The duct bank route shall be approved by the owner.

The contractor shall furnish and install the 12KV transformer as a part of this project. The owner shall review the contractor furnished electrical connected load and the anticipated electrical demand for this project and shall approve the

contractor recommended transformer size.

All crossings of an existing 12kv ductbank must be made at 90 degrees with the ductbank supported at all times while exposed.

All existing manholes must be kept accessible at all times during construction.

Data/Telecomm Distribution

The contractor shall furnish and install a telecommunications ductbank consisting of 4 four inch conduits surrounded by reinforced concrete similar to the 12KV ductbanks except the concrete shall not be dyed red. This duct bank shall ixclude a No. 2/10 bare ground wire cast inside the concrete envelope. The duct bank shall run from the building's main telecom room (MDF room) to the Owner designated telecom manhole. Sand shall not be used as a backfill.

Site Lighting

All roadways, parking lots and pedestrian ways, shall be illuminated during the hours of darkness. Bollards and building mounted flood lights shall not be used. Form cast concrete poles shall not be used. All site and exterior lighting shall use campus standard lamps. All site lighting fixtures and poles shall be in accordance with the campus standard fixtures.

Site lighting shall be controlled through a mechanically held contactor using photo cell off and on with a hand-off-auto (HOA) switch override. All site lighting fixtures shall be individually fused at each pole. Each pole shall be grounded with a 3/4" x 10' ground rod.

Site telephones

Provide at least two exterior emergency telephones. Each location shall be ADA accessible. Contractor to provide one telephone conduit, one power conduit and power line, and foundation with anchor bolts. Conduit shall be one inch minimum size. Verify exact location with Owner. Comply with campuses standard for emergency telephones.

Manholes

Provide precast manholes for all site 12 KV power distribution. The maximum allowed spacing is 400 feet and at all 90° horizontal changes in direction.

Power and telephone manholes shall be 8' x 10' x 8' and consistent with existing

Power Manholes.

Provide the following minimum manhole appurtenances:

- Fiberglass ladder with flat rungs attached to floor and side of manhole.
- H-20 rated manhole ring and cover.
- Sump pit with grate adjacent to ladder.
- BILCO "Ladder Up" safety post.
- Ground bus and ground wire to all manhole grounds.
- Ground rod.
- Wire cable racks.
- Pulling eyes

Campus Specific Information

Texas A&M University

Medium Voltage Electrical Equipment

All underground distribution medium voltage electrical switchgear shall be manufactured by Trayer Engineering Corporation. Typically, a new construction project will require a 4 or 5-way 15kV Vacuum Load Interrupter or Vacuum Fault Interrupters with visible disconnects.

Only the use of new copper wound, loop fed transformers are permitted for use in the 12.5kV TAMU electrical distribution (aluminum wound transformers are not acceptable for use).

Only use drain wire type cable with the following specifications:
description conductor: anealed bare copper
compact class b extruded strand shield
extruded black conducting stress control
layer over conductor. insulation ethelene
propylene rubber (epr)insulation colored to composite with
black conducting shield layers.composite insulation shield
and jacket six corrugatedcopper drain wires embedded
in an extruded black conducting black chlorinated
polyethylene (cpe-130)composite insulation shield and
jacket trade name: unishield 15kv 133% .220mil mv105

Manholes

Manhole Cabling

- All cables are to be wrapped one time around manhole.
- Every wall shall have two support racks mounted in order to support cable.
- Insulators shall be put on every support arm and zip tied down.
- Fire taping shall be used from duct to the termination.

Grounding

- All manholes shall have a minimum of two 5/8" by 10' grounding rods.
- All racks are to be grounded into a contact point.
- All switches and electrical equipment mounted in manholes shall be grounded.
- The ladder and racks shall be grounded.

Sump Pump

- All manholes with switches will have sump pumps installed in them.
- An extra 2" PVC pipe shall be used for sump pump circuit.
- All manholes shall have a sump pit that is a minimum of 1 foot deep, and 18" x 18" in width and length.

General Installation Procedures:

- Manholes shall have a minimum of a 42" hole opening.
- Ladder ups will be mounted in the center of every ladder.
- All 600 amp T-bodies and 200 amp elbows will have test points.
- All manholes will be clean at the completion of the project.
- Stabilizing sand shall be used for installation of all manholes.
- A minimum of 10 feet of rigid conduit with galvanized bell ends shall be required on each duct bank coming in and going out of the manhole.
- All conduits shall be cut off flush with the wall in the manholes
- All electrical manhole covers shall be labeled with 'ELECTRIC' on the top of them.
- All cables shall be labeled with feeder number and bldg numbers, cables should be marked with red and blue marking tape to identify the phases
- All switches shall be anchor down and set so that it can be operated from manhole lid opening
- Any position on the switch that is not used shall have a bushing well insert on the switch and a dust cover on the bushing and shall be grounded.
- Any terminations in the manhole shall be supported between the rack in the manhole and as close the wall as possible.
- All empty ducts coming into manholes shall be sealed off

- All fire taping shall be wrapped with cloth taping (3M 27cloth tape)
- All ducts shall be swapped before sealing or pulling cable and shall have a pull string in each conduit
- All racks shall be as high as possible in manhole
- Manhole lids shall be 4" above final grade

Precast concrete TAMU electrical manholes 8` X 10` X 8' including thin-wall knockout, pull irons, sump box with grate, ground rod sleeve, "Safrail" fiberglass

Precast concrete TAMU electrical manholes 8` X 10` X 8' including thin-wall knockout, pull irons, sump box with grate, ground rod sleeve, "Safrail" fiberglass ladder, "Bilco" ladder up. 1 neck extension and a McKinely #SS38l ring & a ductile iron cover marked "ELECTRIC" cast bin to a 42" diameter precast concrete neck extension X21" high.

Site Lighting

Materials

- All fixtures must be dark-sky compliant as required by state law.
- All exterior lighting applications will use high-pressure sodium lamps. Depending on the type application, only 150/400/1000 Watts Lamps shall be used.
- All materials shall be hot-dipped galvanized including nuts, bolts, and others.
- Manufacturer specifications for fixture and poles are available at TAMU Physical Plant Utilities Electrical Distribution at 979-845-3234.

Pedestrian Lighting

- All pedestrian lighting applications shall have poles at least 10 feet tall. Ten foot pole mounted fixtures are preferred, Fifteen foot poles are an acceptable alternative if site lighting needs require the additional height.

Gardco Pedestrian Lighting Equipment Specification	
Pole Type	**Pole code**
Luminaire	TAMU-P22-Q-150HPS-480-BRA-311
15' light pole	TAMU-TRA-CB-15L-D1-BRA-311
10' light pole	TAMU-TRA-CB-10L-D1-BRA-311

Note 1: Lamp wattage may vary depending on site specific lighting requirements
Note 2: D1- Light Duty Pole – engineer to review and specify correct relative strength based on site wind load factors.

Parking and Roadway Lighting

- All parking lighting applications shall have poles no more than 39 feet tall.
- All parking lighting applications for small and medium sized parking areas and the perimeter of large parking areas shall have a cutoff high pressure sodium fixture.

Parking and Roadway Lighting Equipment Spec	
Pole Type	**Pole code**
Luminaire	TAMU-EH19-1-4X-400HPS-480-BRA311
30' light pole	TAMU-TRA-CB-30L-D1-BRA-311

Note 1: Lamp wattage may vary depending on site specific lighting requirements
Note 2: D1- Light Duty Pole – engineer to review and specify correct relative strength based on site wind load factors.

Typical Design Lighting Level

TAMU follows the lighting level chart below as a guide, refer to IESNA, TXDOT, and local codes requirements for new installations.

Lighting Levels					
Location	**Min. Horiz. Footcandles**	**Avg. Horiz. Footcandles**	**Min. Vert. Footcandles**	**Avg. Vert. Footcandles**	**Uniformity Ratio**
General Area					
Non-designated Pedestrian Ways	0.5	…	…	…	…
Large Open Areas Requiring Surveillance Only	…	…	0.05	0.2	…
Confined Areas Requiring Surveillance Only	…	…	0.1	0.5	…
Pedestrian Ways					
Type A - Roadside	1.0	…	…	2.2	5:1
Type B - Distant from Roadway	0.5	…	…	0.5	5:1
Areas 6.5' to 16' on Each Side of Type B ways	0.2	…	…	0.2	…
Parking Areas Open Facilities	0.9	…	…	…	4:1
Covered Facilities	…	5.0	…	…	4:1
Roadways					

Major	…	1.2	…	…	3:1
Collector	…	0.8	…	…	4:1
Local	…	0.6	…	…	6:1

Overhead Distribution

Poles shall be used only at the discretion of the University. Overhead distribution is generally being replaced by underground lines.

Materials

- All poles shall use S&C brand cutouts.
- All materials shall be hot-dipped galvanized including nuts, bolts, and others.
- Rebuilds (refurbished poles) are prohibited.
  All Poles shall be creosote pressure treated.
- All Poles, regardless of length, shall be of Class 2 (C-2) designation.

Grounding

- All poles shall be butt wrap grounded and ground-rod attached.

Plain Poles

Riser Poles

- Any primary riser poll shall have no other equipment mounted onto it including transformers.
- All riser poles shall have riser brackets designed for use on overhead systems (i.e. use of unistrut or standoffs is not acceptable) .
- Any primary or secondary riser shall have a OZ bushing

Dead End Pole

- One guy-strain insulator shall be used in each respective guy.
- Conductor size shall depend on anchor size.
- Clearance shall be 20 feet wide and clear of all potential obstructions.

Overhead Poles with Transformers:

- Transformer mounted poles shall not have a device arm installed.
- Single transformer installations may be bolt-mounted. However, any transformer bank cluster consisting of two or more transformers shall utilize an aluminum-form transformer bank rack.
- No transformers larger than 75kva shall be mounted on the poles.

Prairie View A&M University

Site Lighting

All exterior light fixtures shall be 277 volt and receive their power from an emergency generator.

General

The Design Process described in this section is primarily for Construction Manager at Risk and Design-Build delivery process. Items specific to Competitive Sealed Proposal or other delivery methods are so noted.

Integrated Design

Representatives from all parties to the design and construction of the project, the Architect/Engineer team, the Contractor team, the System Member team and the FPC team are expected to work very collaboratively and openly sharing information, knowledge and experience from the beginning of Schematic Design through the completion of construction. Representatives from all teams and all disciplines are expected attend and actively participate in all design meetings.

Schematic Design

The A/E team and the Contractor team shall make professional evaluations of design problems and issues related to this project, analyze the advantages and disadvantages of each evaluation, and recommend cost effective solutions in the Schematic Design phase. The A/E is responsible for the design and arrangement of building components and spaces to provide aesthetically pleasing and functional spaces for the university or agency. Detailed studies by the A/E and Contractor will be required during this design phase to establish the most economical and efficient use of the site, use of materials and construction methods in order to accomplish the System Member's requirements for the project within the approved budget.

It is anticipated that several meetings involving all participants from the A/E team, the Contractor team, the System Member team and the FPC team will be required to develop a design that satisfies the Program of Requirements within the project budget.

For a typical building project the first Schematic Design meeting will explore possible ways to place the building on the site and begin to explore the building mass. Other Schematic Design meetings will explore arrangements of the individual spaces, including required support spaces, massing and building elevations. The FPC Project Manager shall receive a copy of all presentation materials a minimum of two (2) days prior to each of these Schematic Design meetings. Each Schematic Design meeting may involve multiple presentations to various groups and committees. Refer to the FPC Project Manager for

specifics of each Schematic Design presentation.

Drawings for these first Schematic Design meetings can be in rough form, such as butter-paper sketches, since revisions will probably occur. Computer imaging and modeling is encouraged. Hardcopies of all concepts to be presented are required. All members from the A/E team and the Contractor team shall be present and participate at these meetings.

At each of these Schematic Design meetings the Project A/E shall prepare and present a minimum of three (3) different schemes. At the end of each of the meetings the Project A/E will have a direction from the Owner and User as to a design direction for the next Schematic Design meeting.

The final Schematic Design review meeting will determine the arrangements of all building spaces as well as the exterior appearance of the building. The final Schematic Design review meeting will occur a minimum of one (1) week after the submission of all required materials.

Some projects may be able to accomplish Schematic Design in fewer meetings; other projects may take more meetings. The A/E will not proceed to Design Development until all requirements for Schematic Design have been satisfied and approval of Schematic Design has been received.

Minimum Requirements for final Schematic Design Submittal

Drawings

General

- All sheets shall have a text scale and graphic scale.
- All applicable sheets shall have a north arrow in a consistent orientation.
- If the site plan(s) and/or floor plan(s) is divided over multiple sheets than a key map near the title block is required.
- Plotted sheet size cannot exceed ANSI E Size Sheet (34" by 44")
- All text on drawing must be legible on half size sets of drawings.

Hazardous Materials

- Plan(s) showing location of hazardous materials found during survey.

Civil

- Site plan(s) at the same scale and orientation as the architectural site plan showing existing and new vehicular and pedestrian circulation, existing and new civil utilities, site drainage areas and calculations of runoff, existing and new contours, existing and new site features, limits of construction and construction staging area.

Landscape

- Site plan(s) at the same scale and orientation as other site plan(s) showing existing and new planting, existing and new irrigation zones and other site features.

Structural

- Floor plan of all levels showing column grid, preliminary location of beams with sizes, location of openings and shear walls and floor depressions.
- Preliminary foundation plan
- Preliminary roof framing plan showing major roof slopes.

Architectural

- Architectural site plan showing all existing and new site features as well as limits of construction and construction staging area.
- Floor plan of all levels showing fire walls, hazard level occupancies and travel distances.
- Floor plan of all levels showing room names, capacity information (occupancy), relative wall thicknesses, door swings, fixed casework and equipment, floor elevation, column grid, wall fire ratings, travel distances.
- Floor plan of all areas showing room names, preliminary furnishings and movable equipment, indication of floor and wall finishes.
- All elevations showing materials, floor elevations, fenestration, exposed mechanical and electrical equipment, finish grades and significant site features
- Major building sections showing relative thickness of floors and walls, floor elevations, finish grades, room names, and significant mechanical and electrical equipment.
- Exterior and interior perspectives and/or animations to illustrate design.

Equipment

- Floor plan of typical laboratories showing laboratory casework and laboratory equipment.

Plumbing

- Floor plan of all levels showing all plumbing equipment and preliminary routing of main horizontal and vertical runs.

Mechanical

- Site plan(s) at the same scale and orientation as other site plan(s) showing existing and new thermal and gas lines as well as limits of construction.
- Typical enlarged mechanical room plan showing equipment and required maintenance access.

Electrical

- Site plan(s) at the same scale and orientation as other site plan(s) showing existing and new electrical distribution as well as limits of construction and construction staging area.
- Typical enlarged electrical room plans showing equipment and code required access
- One line diagram of electrical system

Telecommunications

- Site plan(s) at the same scale and orientation as other site plan(s) showing existing and new telecommunications, data and cable television distribution as well as limits of construction.
- Floor plan showing typical means of cable distribution.
- Typical enlarged data/telecomm room plan showing equipment and access.
- Typical enlarged plans showing location of audio-visual equipment.
- One line diagram of data, telecommunications, broadband distribution and audio-visual systems.

Reports

Reports shall be on letter size paper and all bound together in a three-ring binder or spiral bound. All reports shall also be delivered in Acrobat "pdf" format.

Basis of Design

The Basis of Design is a narrative description of the project containing the basic

information, criteria, logic, major decisions, evaluations and considerations developed in the following applicable categories to prepare the Schematic Design submittal.

- Hazardous Materials Survey Narrative
- Civil and Landscape Design Narrative
- Structural Design Narrative
- Architectural Design Narrative
- Mechanical Design Narrative
- Plumbing Design Narrative
- Electrical Design Narrative
- Data/Telecommunications Design Narrative
- Audio Visual Design Narrative
- Sustainable Design Narrative using LEED 2.2 Summary
- Listing and size of spaces comparing POR with Schematic Design

Cost Estimate

- Cost estimate in Uniformat 98 (Assemblies) format.

Completion of Schematic Design

Completed final Schematic Design documents are a result of a completed product and are not a function of time or duration of work.

Final Schematic Design documents that are "on average" 100% complete are not acceptable.

Upon completion of Schematic Design the following are established

- The project scope, form and spatial relationships are defined.
- The selection and initial design of major building systems such as exterior envelope, structure, mechanical, plumbing and electrical are finalized.
- A preliminary construction schedule is established.
- The project as defined is achievable within the established Amount Available for the Construction Contract based on continuous input from the Construction Manager at Risk.

Design Development

The approved Schematic Design shall be developed into Design Development documents sufficient to fully reveal all aspects of the project. This will include

all items to meet the System Member's needs, and development of all facility components to fully illustrate the proposed aesthetics, construction, systems, utilities, services, and accessories.

Between the Schematic Design approval and the submission of Design Development most projects will require various meetings to identify the full requirements for basic components of the design as well as special or unique components such as data/telecommunications, audio visual systems, security systems, food service requirements, laboratory design, etc. It is anticipated that these meetings will occur, at a minimum, monthly.

Results of these meetings must be documented in a narrative describing systems and identifying the scope that will be in the project.

All submitted documents shall be complete and coordinated between design disciplines.

All documents will address all comments from Schematic Design phase.

Design Development documents shall be submitted to FMGlobal for review of roof systems and fire protection systems. Project A/E shall coordinate with FPC Project Manager for this submittal. Project A/E shall include filled out FMGlobal's Application for Acceptance of Roofing System with submittal.

Minimum Requirements for Design Development Submittal

(Includes requirements for Schematic Design Submittal)

Drawings

General

- General Information Sheet(s) showing design criteria, net and gross square foot per floor, legend of symbols, abbreviations, drawing conventions, vicinity map & project location map.

Hazardous Materials

- Plan(s) showing location of hazardous materials found during survey.

Civil

- Demolition Site Plan containing all site demolition.
- Overall site plan(s) showing all new civil construction with demolished items removed including spot elevations and dimensions.
- Separate plans showing site grading.
- Separate plans showing new vehicular paving with jointing and dimensions.
- Separate plans showing pedestrian paving with jointing and dimensions.
- Composite utility map including site mechanical, electrical and telecommunications.
- Separate plan and profile sheets for site water, sanitary and storm drainage.
- Drainage plan with calculations.
- SWPPP plan and details.
- Typical detail sheets.

Landscape

- Overall site plan(s) showing all new landscape construction with demolished items removed.
- Separate plans showing landscape features with spot elevations and dimensions.
- Separate plans showing new plantings.
- Separate plans showing new irrigation areas with type of heads and flow rates.
- Typical detail sheets.

Structural

- Foundation plan with pier sizes.
- Crawl Space grading plan showing drainage.
- Floor plan of all levels showing column grid, location of beams and shear walls.
- Column and beam schedules.
- Typical detail sheets.

Architectural

- Floor plan of all levels showing room names, room numbers, capacity information (occupancy), actual wall thicknesses, floor elevation, structural grid, equipment, casework, vertical transportation and dimensions.
- Floor plan of all levels showing fire protection elements and egress plan

with travel distances
- Floor plan of all areas showing room names, room numbers, all furnishings and equipment, indication of finishes
- Reflected ceiling plans
- Roof plan showing major rooftop equipment
- Interior Finish Schedules
- Door Schedules
- Window/Glazing Schedules
- All elevations showing materials, floor elevations, exposed mechanical and electrical equipment, finish grades and significant site features
- Interior elevations of typical spaces like restrooms and casework and major spaces like lobbies and ballrooms.
- Major building sections showing actual thickness of floors and walls, floor elevations, finish grades, room names, and significant mechanical and electrical equipment.
- Typical wall sections and details
- Enlarged stairways plan and section with railing details
- Enlarged plan of restrooms with interior elevations
- Enlarged plan and interior elevations of auditoriums and tiered lecture halls
- Typical detail sheets.

Equipment

- Floor plan of all laboratories showing laboratory casework and laboratory equipment.
- Enlarged plan and elevations of typical laboratory spaces

Plumbing

- Floor plan of all levels showing all plumbing fixtures/equipment and routing of horizontal and vertical runs
- Details of major equipment and special conditions.

Mechanical

- Site plan(s) at the same scale as other site plan(s) showing existing and new thermal and gas lines as well as limits of construction and construction staging area.
- Floor plans showing single line duct layout for supply air, return air and exhaust air and location of mixing boxes, coils, dampers, etc
- Enlarged mechanical room plans showing equipment, maintenance access

- Preliminary mechanical equipment schedules
- Typical details

Electrical

- Site plan(s) at the same scale as other site plan(s) showing existing and new electrical distribution as well as limits of construction and construction staging area.
- Floor plans showing typical light fixture layouts.
- Floor plans showing typical power outlet layouts
- Enlarged electrical room plans showing equipment and code required access
- One line diagram of electrical system

Telecommunications

- Site plan(s) at the same scale as other site plan(s) showing existing and new telecommunications, data and cable television distribution as well as limits of construction and construction staging area.
- Floor plans showing means of cable distribution location of all devices and outlets
- Enlarged data/telecomm room plan showing equipment and access
- Enlarged plans showing location of audio-visual equipment
- One line diagram of data and telecomm systems

Reports

Basis of Design

The Basis of Design report from Schematic Design shall be updated to include the basic information, criteria, logic, major decisions, evaluations and considerations developed in the following applicable categories to prepare the Design Development submittal.

- Hazardous Materials Survey Narrative
- Civil and Landscape Design Narrative
- Structural Design Narrative
- Architectural Design Narrative
- Interior Design Narrative
- Mechanical Design Narrative
- Plumbing Design Narrative
- Electrical Design Narrative

- Data/Telecommunications Design Narrative
- Audio Visual Design Narrative
- Sustainable Design Narrative using LEED 2.2 Summary
- Listing and size of spaces comparing POR with Schematic Design and Design Development
- Code Analysis

  Life Safety Code Analysis: Provide a code analysis of the design utilizing the Life Safety Code, latest edition (NFPA 101) and all referenced codes.

  Building Code Analysis: Provide a code analysis of the design utilizing the International Building Code, latest edition covering only those elements not covered by the Life Safety Code (no duplicate items).
- Energy Conservation

  Provide a report on energy conservation provisions at Design Development that shall consist of compliance documentation that the building envelope meets the code. The report shall also include the manufacturer's performance data for building envelope components. The report shall address all other code sections including HVAC, service water heating, power, lighting and other equipment.

  To summarize the report shall cover the following ASHRAE 90.1 applicable areas and include all Compliance forms:

  5.0 Envelope
  6.0 HVAC
  7.0 Service Water Heating
  8.0 Power (Specification Item)
  9.0 Lighting
  10.0 Other Equipment (Specification Item)

  Note: 8.0 and 10.0 will only be indicated in the project specifications.

  OR

  11.0 Energy Cost Budget Method

  The SECO Compliance Certification form(s) shall be included in the front of the report. There maybe one or more certification forms, depending on how many separate professionals take responsibility for the various disciplines. The Certification form must be preliminary at this point in the design.
- Life Cycle Cost Analysis
- Wind Tunnel Analysis
- Design Calculations

Specifications

- Specifications for significant architectural materials and engineering systems and equipment indicating quality of materials used in project

Cost Estimate

- Cost estimate in Masterformat 2004 and Uniformat 98 (Assemblies) format.

Completion of Design Development

Completed Design Development documents are a result of a completed product and are not a function of time or duration of work.

Final Design Development documents that are "on average" 100% complete are not acceptable.

Upon completion of Design Development the following are established such that the Construction Manager at Risk can provide a Guaranteed Maximum Price for the project.

- The project scope, form and spatial relationships are finalized.
- The design of all major building systems such as civil, landscape, site utilities, exterior envelope, interior finishes, structure, mechanical, plumbing, electrical and special systems such as telecommunications, data, audio-visual and security are completed.
- A construction schedule is established.
- The project as designed is achievable within the established Amount Available for the Construction Contract based on continuous input from the Construction Manager at Risk.

After approval of Design Development, the A/E shall develop a PowerPoint presentation of the project that includes campus plan, site plan, floor plan(s), building sections, building elevations, and exterior perspectives. The exterior perspective in the PowerPoint presentation can be a digital copy of the framed perspective. The PowerPoint will be used by the FPC Managing Director to present the project to the Board of Regents for approval. The slides shall have light colored backgrounds. Black background with white line work is not allowed for PowerPoint presentation.

After approval of the Design Development, the A/E shall furnish the following if required in their agreement:

- Presentation rendering(s) shall consist of an exterior view and/or interior view, drawn in perspective, at a scale of sufficient size (24" x 30" min.) to convey a true representation of the design of the project without distortions that would give misleading impressions. Landscape features together with existing structures should be indicated in a realistic manner. The perspective, professionally prepared, may be rendered in any color media, provided suitable reproductions can be made from the media selected and it shall be glazed with non glare glass and framed. The frame shall be clear maple in a rectangular profile with dimensions approximately ¾" by 1-1/4". The name of the project, location, and the name of the A/E shall appear along the lower edge of the perspective. Photographs of models are not acceptable.
- Detailed scale model of the project, in order to give a better understanding of the project as to scale, proportion, mass, or location, indicating fenestration, exterior material, color, trim, walks, drives, parking, and major landscape features. The model shall be mounted on a wood base and protected with a plastic cover. Scale shall be determined by the A/E and the FPC Project Manager; however, the overall dimension should not exceed 48" x 48".

Guaranteed Maximum Price

In the CMAR Agreement the Construction Manager is required to submit a Guaranteed Maximum Price Proposal (GMP) based on the Design Development documents and review comments. The GMP is required to be submitted to the FPC Project Manager no later than three (3) weeks after the Design Development Review Meeting. The A/E team is expected to assist the Contractor in developing the GMP.

Construction Documents

The approved Design Development documents shall be developed into Construction Documents sufficient to construct the project.

Construction Documents shall be submitted to FMGlobal for review of roof systems and fire protection systems. Project A/E shall coordinate with FPC Project Manager for this submittal. Project A/E shall include filled out FMGlobal's Application for Acceptance of Roofing System with submittal.

Progress Meetings

The project time schedule and the agreements identify interim progress meetings

for review of Construction Documents by System Member and FPC staff generally at 25%, 50% and 75% stages of completion. These meetings do not constitute approval of documents to date, but are for the purpose of answering questions and resolving problems.

During the 25% Construction Documents meeting the Project A/E needs to present to the FPC Project Manager and others at least two interior color schemes for comments. Updates and refinements to the mechanical systems sequence of operation need to be presented for comment. Also, during the review the team must review cut-sheets of all major elements of the design and pieces of equipment with FPC personnel. Examples of these are curtain wall systems, fixed seating, laboratory equipment, audio visual equipment, air handling units, variable air volume boxes, plumbing fixtures and light fixtures. Verify list of items requiring cut-sheets with FPC Project Manager.

During the 50% Construction Documents meeting the Project A/E needs to present to the FPC Project Manager and others the revised interior color scheme for comments. Updates and refinements to the mechanical systems sequence of operation need to be presented for comment. Also, during the review the team must review revised cut-sheets of all major elements of the design and pieces of equipment with FPC personnel.

100% Construction Documents Review

Drawings for all divisions of work shall be complete and thorough in all respects, well coordinated, clear, and neatly drawn and in accordance with the Standard of Care for the professions.

Completed Construction Documents are a result of a completed product ready to be used for construction (bidding in the case of CSP delivery) and are not a function of time or duration of work.

Construction Documents shall not be submitted for review until all documents are 100% complete and a complete quality control/coordination check has been made by the Project A/E of all documents.

If the Construction Documents are missing information from team members or drawing sheets are obviously incomplete **do not submit for the 100% Detailed Design review.**

If cursory review by FPC Project Manager indicates that the documents are not 100% complete, the submittal will be returned for completion.

A Construction Documents review meeting will be scheduled by the FPC Project Manager to include representatives from the A/E team, the Contractor team, the System Member team and the FPC team for a detailed discussion of comments.

All comments from the Construction Documents review meeting shall be incorporated into the final documents prior to issuance for construction (bidding in the case of CSP delivery). No lengthy addendum to correct the CSP bid documents is acceptable.

Bidding and Contract Award Stage (CSP Only)

The FPC Project Manager will establish the dates for advertising, pre-proposal conference, and proposal opening in consultation with the Project A/E for major projects that utilize the Competitive Sealed Proposal process to procure a Contractor

The CSP process calls for a four (4) part proposal submittal. The proposal parts are identified as:

Part 1 - Competitive Sealed Proposal (Price and Time)
Part 2 - Proposer's Qualifications
Part 3 - HUB Subcontracting Plan
Part 4 - Subcontractor's Qualifications and Cost Reduction Suggestions

The Project A/E is responsible for helping to secure good competitive proposals. The Project A/E shall oversee the distribution of plans and specifications to general contractors, sub-contractors, suppliers and plan rooms. The Project A/E shall also forward to the FPC Project Manager and all plan rooms on a weekly basis a list of all plan holders.

The Request for Proposals (Bid Advertisement) will be prepared and submitted to the media by the Facilities Planning & Construction Department. A copy of the advertisement along with Division 0 and Division 1 documents will be provided by the FPC Project Manager to the Project A/E to be included in the Specifications.

In addition to the bound plans and specifications all general contractors shall be provided two (2) loose copies of the Proposal Parts 1 through 5, two (2) loose copies of the Bid Bond form, and one (1) unimailer envelope.

If addenda are issued by the Project A/E, each Addendum sheet shall be dated

with pages numbered consecutively.

The Project A/E is responsible for the distribution of all addenda to all plan holders at no additional cost.

The Project A/E and required consultants will attend the Pre-proposal Conference prepared to receive contractor's questions and conduct a site tour if necessary.

The Code "E" Estimate will be prepared and submitted 10 days before receipt of proposals and should reflect any factors affecting the cost that the Project A/E may be able to determine during the bidding period.

The FPC Project Manager will prepare a "Bid Tabulation Form", with assistance from the Project A/E, which lists all expected general contractors and provide sufficient quantities to satisfy the needs at the Bid opening.

The Project A/E is required to attend and assist with the proposal opening procedure to be conducted by the Area Manager. At the conclusion of the proposal opening the Project A/E will be provided one (1) copy of all Part 2 General Contractor Qualifications submittals. The Project A/E will also receive instructions from the Area Manager as to their responsibilities during the contractor evaluation and negotiation period. One week later the Project A/E will also be provided one (1) copy of all Part 4 Subcontractor Qualifications submittals.

The Project A/E will assist in analyzing bid proposals, and provide reports as required concerning the experience, qualifications and references of the bidders, including the named subcontractors and suppliers.

The Project A/E is required to attend the contractor evaluation meeting. The Project A/E shall bring all Part 2 and Part 4 submittals to this meeting. FPC will retain these copies and return them to the contractor.

The Project A/E will assist the Owner during negotiations with the selected Contractor by evaluating the value engineering offerings from the selected Contractor. The A/E will be required to provide any and all documentation required to adequately describe the nature and extent of all accepted value engineering items.

The Project A/E shall assemble all value engineering items from all general contractors and subcontractors into a computer spreadsheet format. This

spreadsheet shall to be emailed to the FPC Project Manager prior to the Contractor Evaluation meeting. On the spreadsheet the Project A/E team needs to indicate their opinion (yes, no or maybe) for each value engineering item. Upon receipt of the spreadsheet System Member and FPC staff will do likewise. At the end of the Contractor evaluation meeting all parties will review the list with comments do determine a final list that will be presented to the first ranked contractor at the first negotiation meeting.

The items that are listed as yes or maybe will be presented to the selected contractor for pricing. At the conclusion of the negotiations with the selected contractor the contractor will prepare a Post Proposal Amendment which will include all value engineering items that are accepted by the Owner. This Post Proposal Amendment will be signed by both the Contractor and the Project A/E and will be included in the construction contract award documentation.

Contract Award (CSP Only)

Immediately following action by the awarding authority, the successful Bidder will be notified of the award by facsimile message from and by the Owner.

The Project A/E will not incorporate any addenda into a “construction set” to be issued to the Contractor. The “Bid Sets” are to be used by all parties to construct the building and it is the responsibility of each party to post all addenda and post proposal amendment information to these “Bid Sets”.

The Owner will assemble the Contract Books and secure signatures.

When the contract books are signed and all bonds and insurance is in place the "Notice to Proceed" will be issued to the Contractor by the Managing Director of Facilities Planning & Construction.

A/E Bid Analysis (Competitive Bids Only)

The A/E will submit to the Owner a bid analysis within 48 hours after the bid opening. This analysis will provide information to the Owner for his consideration in taking action on the bids. The analysis shall be a concise evaluation of the low bidder and his bid amount(s).

Investigate the low bidder's capability, past performance, and experience, particularly in construction similar to subject project. Include this information in the analysis. (The Owner will investigate the financial status of the low bidder.)

Evaluate base Bid and Alternate Bids with respect to the Code "E" Cost Estimate and include in the analysis along with recommendation on acceptance of alternates.

If in the opinion of the Project A/E, the lower bidder is not considered qualified to perform the work, confer with the Area Manager for determination of further action.

As needed, contact the lower bidder and obtain information necessary to prepare cost comparisons of quantity take-offs and price extensions with major elements of the detailed design estimates. Include this comparison and explanations of cost differences in the analysis.

If no bids are received or only one bid is received at the time of opening the Project A/E needs to determine the reasons for lack of bidders.

Construction

Pre-construction Conference

After the construction contract has been awarded the FPC Project Manager will establish a date for the Pre-Construction Conference. The Project A/E is expected to attend. The FPC Project Manager will review Owner procedures to accomplish the terms of the construction contract.

Monthly Progress Meetings

On the same day each month a monthly progress meeting will be held. The Project A/E is expected to attend and be able to answers questions that arise.

The Project A/E is required to attend all monthly construction progress meetings. The A/E team consultants may be required to attend specific monthly meetings based on the project's requirements.

Color Boards

The Project A/E is required to develop color boards for all exterior and interior colors based on the contractor's manufacturer and/or supplier. The color boards shall be presented to the Managing Director for approval. After approval by the Managing Director the Project A/E will develop a second set of interior colors assembled into a 3-ring binder. The Project A/E shall also generate a listing of all finish materials for the FPC Project Manager and the General Contractor.

The Project A/E shall also provide an updated listing of all finish materials along with the Record Drawings.

Shop Drawings and Submittals

The Project A/E team is responsible for the timely review and processing of contractor shop drawings and submittals as indicated in the Uniform General and Supplemental Conditions included in the Design Criteria section of this manual.

Submittals for roof systems and fire protection systems shall be submitted to FMGlobal for review. Project A/E shall coordinate with FPC Project Manager for this submittal. Project A/E shall include filled out FMGlobal's Application for Acceptance of Roofing System with roof submittal.

Coordination Drawings

As required in Division 1, Section 01 31 00 the General Contractor is required to produce coordination drawings that will be submitted to the Project A/E for approval. The Project A/E shall review these like all other shop drawings and submittals.

Substitution Request

The Project A/E team is responsible for the timely review and approval or rejection of contractor substitution request. Concurrence from FPC Project Manager is required prior to the approval of any substitution request

Record Drawings

The Project A/E team is responsible for recording all items from the contractor's record prints and providing the FPC Project Manager the appropriate Record Drawings as per this manual and the A/E Services Agreement.

Terms & Definitions

The Texas A&M University System

The Texas A&M University System is composed of several universities, a health science center and several agencies.

All A&M System construction projects are assigned a two part System Project Number for identification. The first number or prefix is used to indicate which part of the system the project pertains and the last part is a unique four digit number.

The Project Number shall appear on all documents relating to the project. In the event that Federal funds are involved, a separate Federal number will also be assigned. All references to "Project Number" in that case would refer to both Federal and System numbers.

Prefix numbers are as follows with parenthesis indicating approved abbreviation:

1 - The Texas A&M University System (A&M System)
2 - Texas A&M University (Texas A&M)
3 - Not Used
4 - Tarleton State University (Tarleton)
5 - Prairie View A&M University (PVAMU)
6 - Texas AgriLife Research (AgriLife Research)
7 - Texas AgriLife Extension Service (AgriLife Extension)
8 - Texas Engineering Experiment Station (TEES)
9 - Texas Engineering Extension Service (TEEX)
10 - Texas A&M University at Galveston (TAMUG)
11 - Texas Forest Service (TFS)
12 - Texas Transportation Institute (TTI)
13 - Not Used
14 - Not Used
15 - Texas A&M University-Corpus Christi (A&M-Corpus Christi)
16 - Texas A&M International University (TAMIU)
17 - Texas A&M University-Kingsville (Texas A&M-Kingsville)
18 - West Texas A&M University (WTAMU or West Texas A&M)
19 - Not Used
20 - Texas Veterinary Medical Diagnostic Laboratory (TVMDL)
21 - Texas A&M University-Commerce (A&M-Commerce)
22 - Texas A&M University-Texarkana (A&M-Texarkana)

23 - The Texas A&M Health Science Center (Texas A&M Health Science Center)
24 - Texas A&M University-Central Texas
25 - Texas A&M University-San Antonio

Office of Facilities Planning and Construction

The Office of Facilities Planning and Construction (FPC) is a part of the A&M System Offices (SO) and manages all major construction projects for the A&M System and reports to the Chancellor of the A&M System. For the purposes of this document FPC is also the Owner.

Facilities Planning and Construction is located on the first floor, Suite 1162, of the A&M System Headquarters Building located at 200 Technology Way in College Station.

Associate Vice Chancellor for Facilities Planning and Construction is responsible for the administration, planning and construction of projects for the A&M System. The staff consists of the following:

Director of Project Delivery is responsible for coordination of the project delivery process including management of design and construction activities. Project Delivery staff includes:

Area Manager is responsible for the daily coordination and project management of the projects assigned to their teams and for successfully completing all projects in their region of the State.

Architectural Project Manager is responsible for managing the design phase under the leadership of the Area Manager and coordinating the activities of their team in accordance with policies and procedures established by the Department.

Construction Project Manager is responsible for managing the construction phase under the leadership of the Area Manager in accordance with policies and procedures established by the Department.

Project Inspector is responsible for the daily inspection of the Work.

Interior Designer is responsible for managing the furnishings programming, selection and installation and working with the Architectural Project Managers to ensure the designs accommodate the required furnishings.

Area Manager for Engineering is responsible for coordinating the activities of discipline specific System Engineers and Engineering Inspectors to assist the Area Managers during design and construction

System Engineer is responsible for providing discipline specific engineering knowledge to assist the Area Managers and their teams during design and construction.

Engineering Inspector is responsible for inspecting their discipline specific aspect of the Work.

Director of Project Planning is responsible for preparing the A&M System Capital Plan, assisting the System Members with pre-planning assistance, preparation of all project Program of Requirements and managing assigned campus master plan projects.

Director of Project Controls is responsible for maintaining departmental processes and procedures for project management, maintain the IMPACT project management system and provide assistance to Project Planning and Project Delivery.

System Offices

Office of HUB and Procurement Services

The Office of HUB and Procurement Services is a part of the A&M System Offices and is responsible for identifying and promoting the use of Historically Underutilized Businesses on projects managed by Facilities Planning and Construction. The Office of HUB and Procurement Services will assist the design teams and contractors in meeting their HUB Goals.

HUB and Procurement Services also oversees the procurement of other design and construction related services such as Construction Testing, Commissioning, Air Balancing and Furnishings.

HUB Coordinator is the individual with HUB and Procurement Services that is assigned to assist with projects in a geographic region of the State.

System Members

Chief Executive Officer is defined as the President of an academic institution

(Texas A&M University, Prairie View A&M University, Tarleton State University, Texas A&M University-Corpus Christi, Texas A&M University-Kingsville, Texas A&M International University, West Texas A&M University, Texas A&M University-Commerce, Texas A&M University-Texarkana and Texas A&M Health Science Center) or the Director of other parts of the System.

User or Using Agency is the academic institution or agency that will use the completed facility.

User Coordinator: The individual designated by the User or Using Agency as its representative during the programming, design and construction of the project. The User Coordinator will serve as the contact and representative of the department, university or agency and will be responsible for coordinating the procurement of special equipment, telephone installation and scheduling the relocation of equipment and/or personnel to/from the spaces affected by the construction. The User Coordinator has no contractual or approval authority with regards to the design and construction agreements.

Other Definitions

Project: The term "Project" may include the construction of any building or any structure or any facility or utility appurtenant thereto, including fixed equipment and furnishings thereof, and of any addition to, alteration, rehabilitation or repair of any existing building or any structure, or any facility or utility appurtenant thereto.

Program of Requirements (POR) is prepared for the project by the Project Planning Division, by a firm contracted by FPC to develop the POR or by the Project A/E as a reimbursable service. The POR shall be based on input from the User or Using Agency and/or the User Coordinator and approved by the CEO of the Using Agency. The POR is the single written source of information concerning the scope of the project and the detailed requirements to be achieved by the project. The POR identifies the project specific elements to be included in the new and/or renovated facility. It establishes basic design criteria and shall be verified by the A/E through meetings with the Users during the Schematic Design phase of the project. The POR is to be used in conjunction with the Facility Design Guidelines and the Services Agreement to establish the overall responsibilities of the design and construction team.

The POR generally consists of:

a. Project Location
b. Space Requirements and Adjacency Relationships
c. Project and Campus specific requirements
d. Fixed and Movable Equipment Lists.
e. Movable Furnishings List
f. Estimated Cost (Code "A" Cost Estimate).
g. Project Time Schedule

Contractor: The individual, corporation, company, partnership, firm or other organization that has contracted to perform the Work under the Contract with the Owner.

Record Drawings are the contract drawings, modified and/or corrected to incorporate all changes made during construction.

Additional Definitions can be found in Article I of the "Uniform General and Supplemental Conditions", located in the Appendix section of this manual.

ADMINISTRATIVE PROCEDURES & REQUIREMENTS

General

At anytime during the course of the project the A&M System reserves the right to contract on its own any of the services required to complete the project.

Payment Schedule for A/E, CMAR and D-B Services Agreement

Payments to the A/E, CMAR and D-B for work completed will be made in accordance with the Services Agreement. All invoices submitted shall be accompanied by a completed Progress Assessment Report (PAR).

Authorization for Reimbursable Services

The Services Agreements contain several items that are reimbursable services. Even though these items are listed in the Services Agreement they still need to be authorized by the Owner prior to execution of the services. The A/E, CMAR and D-B must forward to the FPC Project Manager a proposal for the services with a not to exceed amount from the consultant/vendor. The cover letter should summarize the amount and the A/E, CMAR and D-B may add an administrative

charge of not more than 10% to the consultant/vendor's amount. The FPC Project Manager will review the proposal and if the total amount is within the amount listed in reimbursable services of the Services Agreement the FPC Project Manager will authorize the service in writing. Many of the reimbursable items like site survey, soils investigation and rendering will be authorized with the instruction that their will be one "lump sum" payment made at the successful completion of the task. Other reimbursable items like special consultants, whose work is incorporated into the design documents, will be authorized and the amount will be paid by project milestones as indicated in the A/E Services Agreement or in the proposal acceptance letter.

If the proposed reimbursable services amount exceeds the amount listed in the Services Agreement than the authorization will come from the Director of Project Delivery and the reimbursable amount in the Services Agreement will be modified by a change order to the agreement.

Upon completion of a "lump sum" reimbursable item the A/E, CMAR and D-B must submit an invoice to the FPC Project manager for payment. The invoice must be from the A/E, CMAR and D-B and contain as backup a copy of the consultant/vendor's invoice. The cover letter must indicate that the services have been performed to their satisfaction and are complete.

If due to extenuating circumstances a "lump sum" reimbursable service is not able to be completed the Owner will entertain a partial payment. The A/E, CMAR and D-B must send a letter to the FPC Project Manager explaining the circumstances, indicating the amount of work complete and suggesting a partial payment amount. The FPC Project Manager will review this request with the Area Manager. Upon the concurrence of the Director of Project Delivery a partial payment will be made.

Authorization for Additional Services

The Services Agreements states the conditions for which the A/E, CMAR and D-B may receive compensation for additional services.

If the A/E, CMAR or D-B foresees that additional services should be performed because of instructions received, or unusual circumstances, they shall transmit in writing to the FPC Project Manager a statement of the services and a fee proposal for these services. The request will be evaluated by the FPC Project Manager and the Area Manager. The additional services shall not be performed or contracted by the A/E, CMAR or D-B until written authorization is received

from the Director of Project Delivery and the Services Agreement has been modified by a change order.

Approvals/Notifications

At each step in the design process the A/E, CMAR and D-B must receive approval from the Owner prior to proceeding to the next step. These approvals take different forms and can vary due to project complexity. Generally, the A/E, CMAR and D-B will be authorized to proceed by the following:

1. Begin Design: Letter transmitting fully executed Agreement
1. Schematic Design: Approval Letter for Schematic Design
2. Design Development: Approval Letter for Design Development
3. Construction Documents: Approval Letter for Construction Documents and signing of cover sheets by Associate Vice Chancellor for FPC
4. Construction Phase: Issuance of Notice to Proceed with Construction Services

On all projects the Schematic Design approval letter will come from the Area Manager. The larger and more complex projects will have an approval letter that will be first routed through the campus or agency administration for their approval prior to our approval of Schematic Design. This approval routing will also contain letter and/or tabloid size color copies of the project site plan, floor plans and exterior appearance.

The approval process for Design Development begins with an approval letter, along with letter and/or tabloid size color copies of the project site plan, floor plans and exterior appearance, that will be first routed through the campus or agency administration for their approval.

The approval process for Construction Documents begins with an approval letter, along with letter and/or tabloid size color copies of the project site plan, floor plans and exterior appearance, that will be first routed through the campus or agency administration for their approval.

At a point after the completion of Design Development and prior to the acceptance of a GMP or the award of any construction contract the project will be presented by the Associate Vice Chancellor to the Board of Regents for approval.

If reviews or approvals of documents are required by Federal agencies, the A/E may be expected to make necessary presentations with Facilities Planning

Division's assistance.

Distribution of Documents

The A/E shall furnish the FPC Project Manager the number of sets of documents as identified in the A/E Agreement at each step of the design process. The documents sent to FPC Project Manager are reviewed by FPC personnel and the documents sent to the User Representative are reviewed by representatives from the using department, Physical Plant personnel, Safety & Health personnel, Campus Police personnel, etc.

Correspondence and Reports

Communications between all parties involved in the planning and construction of a project is a requisite. Oral communications, instructions, directives, and minutes of conferences shall be confirmed in writing by the A/E and distributed to those involved in the planning and construction within five (5) working days of the meeting date.

The Project Architect/Engineer is expected to provide leadership of all design meetings and provide minutes of each meeting within five (5) working days. The meeting minutes shall separately indicate all decisions made at the meeting and all items requiring a decision, which party has responsibility for the decision and when the decision is required.

All correspondence and reports shall be dated and show clearly the project number, the name of the project, the Part of the System, the location, and the A/E contract number, if pertinent.

All correspondence and reports shall be addressed to the Project Manager of FPC during the design phase and construction Phase.

Pending Issues Report

The Project A/E shall prepare and maintain a Pending Issues Report throughout the Schematic Design, Design Development and Construction Documents phases of the project. The report shall document all items requiring decisions on the part of the design team, FP&C and the User. The report shall be updated at least monthly during the course of the project and also provided along with meeting minutes from the milestone reviews.

Data Furnished to A/E

The A/E will be furnished a copy of the Program of Requirements (POR) unless the POR development is included as a reimbursable service in the A/E Agreement, existing campus master plans and other studies and reports, soil investigation reports from surrounding buildings if available, existing utility information and existing building information if the project involves renovation.

Changes in Design

There shall be no changes made in the Scope of Work, Area Requirements, or Project Cost without approval of the FPC Project Manager. During the design process the A/E shall maintain a listing of all spaces listed in the Program of Requirements and their square footage. The listing will begin with the POR spaces and be updated at each design milestone.

Major changes to the spaces in an approved POR shall be approved by the Using Agency CEO.

Schedule of Planning

The POR for each Project contains a time schedule indicating dates for all project milestones. It is very important that these dates be followed as close as possible since it can be very difficult to reschedule around all parties existing business schedule. If changes must be made the A/E must notify the FPC Project Manager several weeks in advance. Deviations from the POR time schedule will only be made when mutually agreed to by the User, the A/E and the FPC Project Manager.

Under special conditions, the planning schedule may be dictated by the need for the Owner to place a completed project in service by an established date deadline. This may occur as a result of grant restrictions, land use or deed restrictions, or a critical need for the facility to be placed in operation to meet semester schedules. In this event, a specific construction completion date will be established by the FPC Project Manager, and the various planning stages shall be scheduled from that date.

Should the A/E find that the dates of the Planning Schedule cannot be met, they shall give prompt notice in writing to the FPC Project Manager.

Reviews

The review of any drawings and specifications by the Owner and others does not relieve A/E of any responsibility nor do they constitute approval of drawings and specifications to that date.

Drawing Requirements

The Project A/E shall produce the design for this project using a Building Information Model (BIM) computer program that can output files that are binary compatible to AutoCAD or Microstation. The Project A/E can begin using BIM as early in the design process as desired but no later than the drawings required for Design Development submittal. Maximum drawing sheet size is restricted to ANSI E size - 34" x 44". Lettering is to be of sufficient size so it can be easily read when reproduced full size and half size. Minimum size of letters on any full size printed drawing is 1/8". Use only the standard fonts supplied with the BIM program. On all drawings, provide a graphic scale in addition to the standard inch scale. On all plan sheets provide a north arrow and if a plan is divided over multiple sheets provide a key plan adjacent to the sheet number in the title block. Do not use the word "PROPOSED" in designating new work. All work shown on drawings shall be assumed to be new unless designated as existing.

All drawing sheets shall comply with the following sheet numbering format.

A	-	N	n	n

Where “A” is the discipline designator, “N” is the drawing sheet type designator, “nn” is the sheet number.

The following are the discipline designators as well as the order the drawings shall be placed in a set.

G - General
H - Hazardous Materials
C - Civil
L - Landscape
S - Structural
A - Architectural
I - Interiors
Q - Equipment
F - Fire Protection

P - Plumbing
M - Mechanical
E - Electrical
T - Telecommunications
R - Resource
X - Other Disciplines
Z - Contractor/Shop Drawings

The following are the drawing sheet type designator.

0 - General
1 - Plans
2 - Elevations
3 - Sections
4 - Large Scale Views
5 - Details
6 - Schedules and Diagrams
7 - User Defined
8 - User Defined
9 - 3D Representations

Title block shall be on the right side of the sheet extending the entire height of the sheet. All text in the title block can be orientated horizontally or vertically.

The title block shall include at a minimum, beginning from bottom of title block to top:

- Sheet number (minimum ½" text height)
- Sheet Title
- TAMUS Project Number (minimum 3/16" text height)
- Building Inventory Number (minimum 3/16" text height)
- Drawn by
- Checked by
- Name of Project
- Campus or Agency
- Location
- Firm name of Architect/Engineer under contract with owner and consultant if applicable
- Seals

All documents must be sealed or have the appropriate designation per respective

licensing board rules.

Cover sheet for the drawings shall contain

- Name of the project
- The university or agency name
- The A&M System project number
- Date
- The design team names and addresses
- Signature area for the Associate Vice Chancellor of Facilities Planning and Construction to sign as "Release for Proposals Authorized" and date.
- Copy of the project rendering or the campus/agency seal.

General Information Sheet shall contain

- Location Map showing contractor's route, construction limits and contractor lay down area
- Index of drawings
- Abbreviations used in the project
- Net and Gross square foot per floor with total and alternates separate
- Code, Structural, Mechanical, Plumbing and Electrical Design criteria
- Symbols and Legend unique to the project. Unused symbols shall not be included. Where symbols imply a specific data and/or telecom outlet provide a detail of the outlet.

Detailing shall be adequate, with sufficient schedules, keys to materials, symbols and notes to clearly indicate the work required. Abbreviations shall be held to a minimum.

All required details will be shown on the drawings, not in a separate manual.

All references to other disciplines shall indicate the appropriate sheet and detail.

Room finish, door and window schedules shall be on the drawings.

All items of mechanical and electrical equipment such as air handlers, pumps, fans, panelboards, light fixtures, etc. shall be scheduled on the drawings Include all appropriate design and operating parameters for each unit.

Electrical panelboard schedules shall list all unique characteristics of each panelboard including but not limited to each breaker size, the loading of each

circuit, circuit number, wire size, main breaker size, bussing, interrupt rating and load summary. Schedules that list quantities of breakers without scheduling each circuit shall not be used.

All panelboards, switchboards, transformers and other major electrical equipment shall have a unique identifier or tag. Panelboards shall use the following numbering scheme:

x	p	n

Where “x” is the floor number the panel is located on.
Where “p” is the panel type using “L” for low, “H” for high and “E” for emergency.
Where “n” is the panel sequence number.

Electrical oneline diagram shall show in a oneline format all medium voltage equipment including manholes, switchgear, transformers and cables. The 600 volt and below system shall be detailed to the branch circuit panelboard level. The size of all wire, conduit, breakers, starters, transformers, generators, meters and transfer switches shall be indicated. Tables may be used. The sizing of wire and conduit using only panel schedules will not be accepted.

Ground riser diagram shall show the size and interconnection of all grounding systems. In most cases ground conductors shall be sized larger than required by the National Electrical Code.
Telephone riser diagram shall show all riser cables, conduits, sleeves and line protectors in their relative relationship to the building.

Fire Alarm riser diagram shall show all equipment associated with the fire alarm system

Broadband distribution riser diagram (Cable Television) shall show all cable sizes, riser cables, amplifiers, splitters, outlets and head end equipment as may be required.

Lightning protection system drawing(s) shall show the arrangement of the lightning protection system with details for each unique connection and roof penetration. Thes details shall be coordinated and compatible with the roof system.

Specification Requirement

Specifications shall include bidding and contract documents and technical specifications and the bound document will be entitled "SPECIFICATIONS."

The importance of accurate, complete and coordinated specifications is very

important. Specifications shall be carefully checked to include all items pertaining to the project and to eliminate inclusion of items not incorporated into the project.

Specifications shall follow CSI Masterformat 2004 and be prepared on 8 1/2" x 11" paper with contents arranged in order indicated below.

Project A/E may use descriptive or performance type of specifications, naming three products by name, catalogue number and manufacturer which will meet the standards required. Care shall be taken not to adopt wording recommended by a single manufacturer if the wording will require unique or patented features of a product.

In the various specification sections where the specification is based around the performance of a specific product or model from a manufacturer (for example fixed seating, laboratory casework, laboratory equipment, air handlers, etc.) all other manufacturers listed as approved equals must also indicate comparable model numbers.

Details and schedules shall be shown on the drawings and not in the specifications

Specifications written "Install in accordance with the manufacturers specifications" are not an acceptable specification. Spell out the procedure to be used so that the FPC Project Inspector and the Contractor's Superintendent can ascertain from the Specifications the manner in which a product is to be used or applied without reference to numerous catalogues which may not be handily available.

Scope of work shall be accurately defined in each section; reference all allied work provided under other sections of work.

Clearly define work to be included under each applicable alternate in each section of work.

Omit duplication of specifications included under Uniform General and Supplemental Conditions or Special Conditions; in each instance, reference the applicable paragraph by number and expand or modify the requirement only as necessary to accomplish a specific purpose. (This is particularly applicable to Mechanical and Electrical sections).

Require delivery, acceptance and approval of all "Certificates of Manufacturer's Quality Control" before delivery of applicable equipment or material.

The specification cover shall contain the following information

- Title: "SPECIFICATIONS."
- Project Number (including Federal project number, if applicable)
- Name of Project.
- Name of University or Agency.
- Location of Project.
- Owner: "THE TEXAS A&M UNIVERSITY SYSTEM."
- Set number.
- Firm name of A/E.
- Date (same as drawings).

The title page in the specifications shall contain the following information

- Title: "SPECIFICATION."
- Project Number (including Federal project number, if applicable).
- Name of Project.
- Name of Part of System applicable.
- Location of project.
- Members of the Board of Regents, The Texas A&M University System.
- Chancellor, The Texas A&M University System.
- President or Director of the University or Agency of the System.
- Associate Vice Chancellor for Facilities Planning and Construction.
- Director of Project Delivery.
- Date (same as shown on Specification cover sheet).
- List of Design Professionals with address, phone numbers and fax numbers.

The color coding and duplexing requirement for the specifications is as follows:

Item	Name	Provided By:	Paper Color	Special Instructions
1	Cover	A/E	A/E's Choice	One-sided, cover stock. Back cover same material and color.
2	Board of Regents Title Page	FPC	White	One-sided.
3	Design Team Professional Seals	A/E	White	One-sided.

	Page:			
4	Table of Contents	A/E	White	Two-sided.
5	Schedule of Drawings	A/E	White	Two-sided.
6	Request for Competitive Sealed Proposal (CSP ONLY)	FPC	White	Two-sided.
7	Instructions for Competitive Sealed Proposal (CSP ONLY)	FPC	Pink	Two-sided.
8	Supplemental Instructions for Competitive Sealed Proposal (CSP ONLY)	FPC	Pink	Two-sided.
9	Bid/Proposal Bond (CSP ONLY)	FPC	White	One-sided. Provide two loose copies of this with proposal package to each General Contractor for bidding purposes.
10	Part 1, Competitive Sealed Proposal (CSP ONLY)	FPC	White	One-sided. Provide two loose copies of Parts 1 with proposal package to each General Contractor for bidding purposes.
11	Parts 2 through 4, Competitive Sealed Proposal (CSP ONLY)	FPC	White	One-sided. Provide one loose copy of Parts 2, through 4 with proposal package to each General Contractor for bidding purposes.
12	GMP Proposal (CMAR & DB ONLY)	CMAR/DB	White	One Sided
13	Contract Form (CSP ONLY)	FPC	White	One-sided.
14	Performance Bond	FPC	White	One-sided.
15	Payment Bond	FPC	White	One-sided.
16	Uniform General & Supplemental Conditions	FPC	Yellow	Two-sided.
17	Special Conditions:	FPC	White	Two-sided.

18	Prevailing Wage Rate Schedule	FPC	White	Two-sided.
19	Geotechnical Investigation Report	A/E	White	As received from Geotechnical Firm
20	Division 1 General Requirements	FPC & A/E	White	Two-sided.
21	Divisions 2 through 14	A/E	White	Two-sided.
22	Divisions 21 through 23	A/E	Green	Two-sided.
23	Divisions 25 through 28	A/E	Blue	Two-sided.
24	Divisions 31 through 34	A/E	White	Two-sided.

Request for Bid Proposal (CSP Only)

The Request for Bid Proposal will be prepared by the FPC Project Manager and issued to newspapers for publication by the Director of Project Delivery.

A copy of the Request for Bid Proposal as issued for publication will be furnished to the Project A/E for his inclusion in the Specifications. The Project A/E is to insert the advertisement as is, do not reformat.

The Project A/E shall provide a brief description of the Project and final list of alternates to the FPC Project Manager for use in preparing the Request for Bid Proposal and proposal documents:

Federal General Requirements

One copy of each form required by the Federal Agency concerned (General requirements, wage rates, certificates, etc.) shall be bound into the Specifications on Projects involving Federal funds.

FPC Project Manager will furnish one copy to the Project A/E for his use in reproducing necessary copies.

Alternates (CSP Only)

Provide a description of each Alternate.

Additive alternates are required for projects not involving Federal funds. For Federally funded projects deductive alternates are generally required and must be listed in order of acceptance.

Unit Prices (CSP Only)

Used for added depth of piers and pier casing only

Provide for cost separations of items, units, etc. as directed by the FPC Project Manager.

Addenda

Addenda shall be reserved for items inadvertently omitted from bidding documents. Documents shall be prepared in a comprehensive and a complete manner without use of Addenda.

Addenda sheets shall be 8-1/2" x 11", or the same size as those of the bid set drawings, numbered in sequence with the prefix "AD" and the date of issue and other required identification of the project.

Printing and Binding Requirements

All drawing review sets shall be securely bound using staples or screw post. All reports required for reviews shall be bound with spiral binding or in a 3-ring binder.

All bid set drawings shall be securely bound using staples or screw post. All bid set specifications, except for 10 copies, shall be securely bound using long staples, "VELO" plastic strip, or screw posts and securely taped (ring, spiral or GBC bindings are not acceptable).

The 10 unbound sets of Specifications will be used as the actual contract documents and shall be delivered to the FPC Project Manager. **These ten sets shall not be punched or bound in any manner of fashion**.

Electronic Drawing Files

Digital files shall follow a layer/level format that complies with the AIA CADD

Layer Guidelines. The A/E shall provide a hard copy listing of all files, levels, reference file, etc. All items in digital files shall be drawn to full scale.

During the course of the design digital files are required by FPC Interior Designer for furnishings layouts and by Project Controls Division to update campus maps for illustration purposes. These digital files shall be made available to FPC Project Manager (two weeks before each meeting) at the following project milestones:

1. Design Development (architectural floor plans & site plan)
2. 50% Design (architectural floor plans only)
3. 75% Design (architectural floor plans only)
4. 100% Design (architectural floor plans & site plan)

Electronic File Names

The file names used for all digital files delivered to Facilities Planning and Construction shall follow the following format. The file names must conform to the eight character dot three character format. The first character shall be the discipline character as described above followed by a hyphen. The next two characters shall describe the type of model file.

A	-	T	T	U	U	U	U	.	F	F	F

Model File Types "TT"

FP - Floor Plan
SP - Site Plan
DP - Demolition Plan
QP - Equipment Plan
XP - Existing Plan
EL - Elevation
SC - Section
DT - Detail
SH - Schedule
3D - Isometric/3D
DG - Diagrams

The next four characters "UUUU" are user-defined modifiers for the model types. The last three characters "FFF" will be supplied by the CADD program and either be DWG or DGN. No other formats are acceptable.

Record Drawings

All changes during the course of the design and construction shall be incorporated into the BIM file(s).

Deliver to the OWNER the original or reproducible film positive copies, corrected to be "Record Drawings" made from the contractor's "Record Prints" and one additional set of reproducible film positive copies of these drawings. Paper sepias are not acceptable. Record drawings plotted with green ink are not acceptable. All sheets from the "Bid Set" must be included in the "Record Drawing Set" and each sheet marked "Record Drawing" with date. Each sheet must be so marked regardless if there were any changes from the Contractors Record Drawing Set.

Deliver to the OWNER two (2) copies of all drawings in AutoCAD "DWG" or Microstation "DGN" digital format, corrected to be "Record Drawings" on cd-roms. The cd-rom shall be labeled with a pre-printed label that contains the name of the project the university/agency, the project number and the A/E firm name. No other digital format will be accepted. Scanning of drawings is not acceptable.

The digital version of the record drawings shall have one digital drawing file for each drawing sheet in the project bid set. All reference files and "xrefs" must be inserted into the final digital file.

Cost Control

In the Program of Requirements the project scope matches the "Base Bid Scope" line item on the Estimated Project Budget page. To achieve an awardable project, the base bid represents 90% of the funds available to award a construction contract. The Project A/E is required by contract to work with the Users and the Facilities Planning Division to keep the design within the "Base Bid Scope" and identify additive alternates to utilize all project funds. Deductive alternates will not be considered.

Throughout the design process, the Project A/E and Construction Manager at Risk or Design-Build Contractor will be required to furnish knowledgeable cost estimates for all items of construction. These estimates shall be itemized in sufficient detail so as to allow the University to make informed choices when questions of priority are considered to include or exclude an item.

Coded Estimate System

Code A Estimate: Based on completed Program of Requirements.

Code B Estimate: Based on and submitted with completed Schematic Design (A/E, CMAR, D-B responsibility). The estimate detail shall be in Uniformat 98 (Assemblies) format.

Code C Estimate: Based on and submitted with completed Design Development (A/E, CMAR, D-B responsibility). The estimate detail shall be in Uniformat 98 (Assemblies) and Masterformat 2004 format.

Code D Estimate: Based on and submitted with completed Construction Documents (A/E, CMAR, D-B responsibility). The estimate detail shall be in Masterformat 2004 format.

Code E Estimate: Submitted 10 days prior to Bid Opening (CSP Only); based on changes in Construction Documents and other events that have occurred since Code D estimate was submitted. For the Code E estimate, if there is a major change in the estimate from the Code D estimate the A/E shall also provide the estimate detail in CSI Masterformat 2004, otherwise only the summary is required.

The Project A/E is cautioned not to confuse the design contingency indicated on the team's estimate with the Bid Contingency (CSP Only) indicated in the POR. These numbers are not the same. Based on the level of completeness of the design there will be a design contingency percentage that is included by estimators. This percentage will decrease as the design proceeds towards the Construction Documents review. The Bid Contingency number is only for variations in the bidding market that were not anticipated by the A/E team's estimator and to purchase additive alternates.

Cost Estimate Format

(THE ARCHITECT/ENGINEER WILL NOTE THAT THE CONSTRUCTION COST IS ONLY A PART OF THE PROJECT COST. THE A/E SHALL SUBMIT COST ESTIMATE IN THIS FORMAT ONLY. USE ONLY ITEMS APPLICABLE TO THE PARTICULAR PROJECT. DO NOT USE "N/A." CHANGE NUMBER SEQUENCE IF A CERTAIN LINE ITEM IS OMITTED.)

(Project Name) Project No.
(System Member) Date
(City)

CODE "___" COST ESTIMATE
Total Gross Building Area: s.f.
Total Site Acreage: ac.
Total On-Site Parking Spaces:

(ITEM NUMBERS 1, 2, AND 3 BELOW INCLUDE GENERAL CONDITIONS, OVERHEAD, PROFIT AND BONDS.)

1. Building Cost		
a. General Construction--Building excavation, foundation, structure, roofing, exterior and interior walls, doors, windows, finishes, specialties, and conveying equipment except as listed below	$	xx,xxx.00
b. Plumbing--All building plumbing to five (5) feet outside of building line		xx,xxx.00
c. Mechanical--All building HVAC, including heating and chilled water lines, to five (5) feet outside of building line		xx,xxx.00
d. Electrical--All building electrical work to five (5) feet outside of building line		xx,xxx.00
e. Total Building Cost	$	xxx,xxx.00
2. Fixed Equipment Cost		
a. Built-in lockers, food service, fixed seating, casework, fume hoods, etc.		xxx,xxx.00

3. Site Development Cost

a. Demolition--All demolition; whether site, structures, mechanical, electrical or plumbing, excluding asbestos removal $ xxx,xxx.00

b. Site Development--All walks, drives, parking, grading, walls, steps, and site appurtenances from five (5) feet outside edge of building xxx,xxx.00

c. Landscaping--All trees, shrubs, sod, planting and irrigation xxx,xxx.00

d. Site Mechanical--All HVAC and plumbing lines from five (5) feet outside edge of building, including storm and sanitary sewer systems xxx,xxx.00

e. Site Electrical--All electrical work from five (5) feet outside edge of building and cost of transformers regardless of location xxx,xxx.00

f. Total Site Development $ xxx,xxx.00

4. ESTIMATED CONSTRUCTION CONTRACT AMOUNT **(SUM OF 1, 2, AND 3, Not to exceed 90% of Line 6)** x,xxx,xxx.00

5. Bid Contingency (CSP) xxx,xxx.00

6. AMOUNT AVAILABLE FOR CONSTRUCTION CONTRACT $ x,xxx,xxx.00

Building Unit Cost **(ITEM 1.e "TOTAL BUILDING COST" DIVIDED BY TOTAL GROSS SQUARE FEET) . . . . . $xx.xx Cost/G.S.F.**

Alternates **(CSP ONLY - LIST BY NUMBER WITH BRIEF DESCRIPTION AND ESTIMATED COST)**