1. **GENERAL REQUIREMENTS**: It is the nature of University Design & Construction projects to involve the full range of project activities.

1.1 *Campus Master Plan* - Project start up can involve programming and conceptual design studies as well as coordination and resolution with the campus master plans. As appropriate to the size and scale of the project, the Architect shall work with the University’s Project Manager to familiarize themselves with those master plan documents to which their project must respond. Master plan documents that may be maintained by the University include, but are not limited to:

1.1.1 Comprehensive Campus Master Plan  
1.1.2 Campus Landscape Master Plan  
1.1.3 Campus Parking Master Plan  
1.1.4 Campus Signage Master Plan  
1.1.5 Infrastructure Master Plan

1.2 *Space Standards* – Architect and design consultants shall coordinate with the University’s Project Manager to identify the applicable space standards to be used for their project. Area calculations shall be done in accordance with the current University methods and criteria. See the attached area calculation standards in Appendix A – Rice University Space Standards.

1.3 *Collaborative Input* – In order to achieve a project that best responds to the University’s overall needs and interests, the University’s Project Manager will regularly solicit input from various University departments, and occasionally independent consultants, will include department representatives in project meetings and will organize formal document reviews. Architect and design consultants shall cooperate and coordinate with the Project Manager to respond to and integrate this input into the project. The University’s Project Manager will have final authority to resolve any conflicting issues or requirements.

1.4 *Room Numbers* – It is the desire of the University to have the construction room numbering and room numbering after occupancy be the same. Architect shall review numbering scheme options with the University’s Project Manager, develop draft numbering based on the selected option and coordinate final scheme in response to review comments by the University.

1.5 *Storm Water Detention* – The University, in response to the City’s storm water detention requirements, has built a master storm water Detention System to meet the current obligations and some additional capacity to cover the future obligations as the Campus grows. The Architect and his civil consultant will work with the University’s Project Manager to assess the detention requirements generated by their project and the impact it has on the Detention System’s current excess capacity.
2. RELATED WORK

2.1 Consultant Related Work – The University reserves the right to establish separate contracts for various portions of the work associated with the overall project. The Architect shall review with the University’s Project Manager the scopes of work for all contract requirements needed for delivery of the project, and coordinate appropriate interface activities within their scope of services to support and coordinate with those contractors in the delivery of their services. Such services include, but are not limited to: Architectural Signage, Landscape Services, Move Coordinators and Furniture.

2.2 Contractor Related Work – The University reserves the right to establish separate contracts for various portions of the project that serves the best interests of the University for which the General Contractor will be responsible for the coordination and accommodation on site. These contracts include, but are not limited to: Air Balance Testing, Signage Fabrication, and Installation, Furniture and Furnishings, Information Systems Cabling and Equipment, Audio Visual Systems, Telephone, Geotechnical Services and various construction testing services.

The Architect shall review and establish with the University’s Project Manager the list of contracts that the General Contractor will be required to accommodate and coordinate and shall incorporate appropriate requirements within the contract documents.

3. ICONOGRAPHY – The University has a longstanding tradition of including custom project specific architectural ornament (Iconography) permanently incorporated within the building construction. Projects may also include specific design requirements to accommodate artwork. The Architect shall review and define all project requirements for iconography and art accommodation with the University’s Project Manager.

4. EXISTING CONDITION DOCUMENTATION

4.1 Utilities – The University maintains documents of underground campus utilities. These documents are available for use by the design team and may be requested through the University’s Project Manager. The design consultants shall work with the University’s Project Manager to determine which utilities need to be documented in a project specific site survey, including requirements for probing or digging for location verifications.

4.2 Utilities – Design consultant shall include in construction documents a requirement that the General Contractor use all appropriate resources, including utility companies, utility company sponsored facilitating organizations such as Texas One Call at 1-800-245-4545 or the Utility Coordination Committee at 1-800-669-8344 and University resources when constructing near or connecting to underground campus utilities.
4.3 Utilities – The Architect will work with the University’s Project Manager to initiate requests to appropriate University departments to identify and mark locations and tie-in points for University utility infrastructure including telecom, network, video or security cabling, irrigation water mains, and other underground utilities or services.

4.4 Record Drawings – The University maintains “record” and “as-built” documentation on the majority of its buildings. The design consultants shall review the available resources as they relate to their project with the University’s Project Manager to identify and request copies of appropriate documents.

5. **WORK SEQUENCE** – Development of an appropriate work sequence for a project is important for cost considerations and/or can facilitate project’s implementation and minimize or eliminate negative impacts. The Architect shall work with the University’s Project Manager and the General Contractor (if available) to identify, resolve and coordinate work sequence issues important to the project.

6. **CONTRACTOR’S USE OF PREMISES** – The Architect shall work with the University’s Project Manager and the General Contractor (when available) to define appropriate limits and requirements for the Contractor’s use of the project site. Where appropriate, the Architect shall include such requirements within the contract documents.
1. **GENERAL REQUIREMENTS:** It is the preference of the University to avoid the use of allowances by making all necessary project systems product, materials and finish selections prior to bid of the complete project scope. Exceptions are as follows:

1.1 Where the Design Consultants find in the course of documenting the project for bidding that there are outstanding issues that may prevent the final selection of a product or finish, the Design Consultant(s) will review the possible use of an allowance with the University’s Project Manager. The University’s Project Manager will either approve the use of an allowance or assist in resolving issues and achieving all final selections.

1.2 To be considered, allowances shall only be applied to simple products or finish materials that a contractor would purchase and install, and such that in a final selection, post bid, will not unnecessarily alter other aspects of the contractor’s work opening the University to non-competitive pricing.
1. **GENERAL REQUIREMENTS:** Prior to the issue of Contract Documents for bids or final pricing, the Architect shall review with the University’s Project Manager areas of the project where there may be benefit to the Owner to establishing unit prices due to the possibility of an increase, decrease or other changes in the project scope. The Architect will further work with the Project Manager to clearly define the components of each unit price. (i.e., Cost of material, freight, installation, insurance, overhead, and applicable taxes that will best protect the University’s interests.) The University is a tax exempt Texas non-profit corporation.
1. **GENERAL REQUIREMENTS:** If, during the development of the project design and documentation, the University requests formal pricing of alternate scopes of work, the Architect and his consultants will work with the University’s Project Manager to determine which scope of work would be best as the base scope and which as the alternate; i.e., if the alternates are best established as “additive” or “deductive” alternates.

1.1 Alternate pricing shall represent complete costs associated with the change, including fees, overhead, profit and general conditions.

1.2 The Architect will include a requirement in the bid documents for the General Contractor to identify the time frame during which the alternate pricing is valid.
1. **GENERAL REQUIREMENTS:** Rice University’s campus has experienced flooding over its history. Through studies and computer modeling, the University has established design criteria to set First Floor elevations above anticipated flood water levels.

1.1 All new construction will be designed to provide, to the extent possible, full “passive” protection against flooding to First or Main Floor elevations established by the University. There are two flood protection elevations established for the campus based on the 1987 datum: 48.0’ and 47.5’. The line of separation is established as College Way. Elevation 48.0’ shall be used north of College Way and 47.5’ South of College Way as shown on Appendix B – Flood Protection Elevation Map.

1.2 During the development of the design, the Architect shall confirm with the University’s Project Manager the most appropriate, secure, reliable, easy to operate, cost effective and aesthetic means of achieving each measure of flood protection at vulnerable points.

1.3 Where “active” flood protection options are selected for use on the project, the Architect shall ensure that clear written instructions for putting the flood protection devices in place are part of the project record documents and that University personnel designated by the Project Manager receive appropriate training for the activation/installation of flood protection devices.

2. **SURVEY DATUM:** There are several USGS datum control systems available for use by survey engineers for production of topographic land surveys on the campus. The most typical are: The 1973 and the 1987/88 control systems. Due to subsidence in the area, the 1987/88 elevations are approximately 24” lower than 1973 elevations at the same location. Subsequent revisions to the datum are possible. Architect and design consultants shall discuss with the University’s Project Manager and identify which datum is to be used on their project.

2.1 Currently, the majority, but not all, of the record topographic surveys of areas of the campus are based on the 1973 datum control. Design Consultants shall confirm with the University’s Project Manager which datum, 1973 or 1987/88 will be used for the project.

2.2 **All drawings, documents or correspondence including elevation references must include reference to the datum upon which the elevations are based.**

3. **PROJECT SURVEY** – The contractor shall be required to use a registered surveyor to document the building location at the start of construction. The document shall include appropriate plot lines, site elevations for basis of construction, control lines and benchmarks.

4. **FINAL SURVEY** – The University’s Project Manager may hire an independent registered surveyor at the completion of the project to complete a final survey for verification of project criteria and University record. The cost of this survey will be in Project Manager’s budget.
1. **GENERAL REQUIREMENTS**: It is the University’s desire that all renovation and remodeling construction activity be carried out in a manner that minimizes the inconvenience and disruption to ongoing campus activities and to the building occupants. The Architect will work with the University’s Project Manager to develop a comprehensive approach for the project and identify needs for specific documentation of construction limitations and requirements.

2. **DESIGN REQUIREMENTS**:

   2.1 Where the scope of renovation or remodeling has impact on life safety issues, the Architect and Design Consultant(s) will provide appropriate life safety plans that show the existing building’s life safety provisions, including such things as rated walls, existing, fire resistant construction (with ratings) and areas provided with automatic fire protection systems (sprinklers). Plans will then indicate additions and modifications created by the new construction and how they integrate with the original and the applicable current code requirements.

   2.2 Design Consultant shall work with the University’s Project Manager, and Contractor (when brought onto the project team) to develop a construction sequence and/or phasing and project schedule that support the University’s objectives. Include in this planning process: points of site access, hours of construction, construction delivery criteria, etc.

   2.3 The Architect, working through the University’s Project Manager, shall review the performance and maintenance requirements of existing finishes in areas affected by the proposed construction. The Architect shall research and verify the availability and compatibility of new materials intended to match the existing.

   2.4 The Architect shall include in the contract documents specific guidelines for the contractor to coordinate any utility outages, change of building access or other actions with potential for disruption to normal campus activities.

   2.5 The Architect shall work closely with the University with regard to all accessibility and recommended changes for accommodation to verify the approach is consistent with University’s policy.

   2.6 The University actively manages all activities that deal with materials classified as hazardous. The Architect and the University’s Project Manager shall work with the Rice Environmental Health and Safety department to secure a hazardous materials survey for the subject area of the project.
1. **GENERAL REQUIREMENTS:** It is the University’s desire to minimize the visual impact and disruption of a construction project on the normal campus activities. In addition, the University will request contractors take additional steps, from site clean up to possible total suspension of construction activities during special campus activities such as but not limited to orientation week, homecoming and graduation.

1.1 The Contractor shall be required to submit for approval by the University’s Project Manager a construction site plan showing, but not limited to:

- Construction limits
- Access points
- Temporary facilities
- Utility requirements
- Fence construction
- Protection of existing conditions
- Temporary pedestrian and vehicular access accommodations

1.2 The Contractor shall be required to comply with the University’s parking requirements, including the limitation of on-site parking and the required use of remote parking with job sponsored shuttle.
   - The contractor shall never drive or park, even temporarily, in the University’s cloisters or Sallyports.
   - The Contractor shall review all access routes to the construction site with the University’s Project Manager and shall never access the site over side walks, grass lawns or tree root areas unless specifically approved by the Project Manager.

1.3 **Emergency Situations** – Contractor shall be required for all emergency situations, including natural disaster, fire, crime, act of terrorism, injuries or life safety, to make calls to Rice authorities in the following priority:

   - Campus Police
     - Dispatcher or Chief Bill Taylor 713-348-6000
   - University Project Manager
     - Project Specific  Identify numbers
   - Environmental Health and Safety
     - Kathryn Cavender or Brian Galloy 713-348-4444
   - Risk Management
     - Rene Block 713-348-4751
   - Campus Crisis Mngt. Leader
     - Neill Binfoerd (asst. Joan) 713-348-6088
   - Director of Project Management
     - John Posch 713-348-5367
1. **GENERAL REQUIREMENTS:**

1.1 *Design Phase Meetings*

1.1.1 Architect will coordinate the frequency, agendas and attendees with the University’s Project Manager for all project meetings involving University personnel. The University’s Project Manager will coordinate the attendance by University personnel and the lead Architect will coordinate attendance of the consultant team members. All meetings should have published agendas. All meetings shall be documented by published minutes. If an external Project Manager is on the project, he will run and document all meetings with the University; otherwise, the Architect will do so.

1.1.2 The Architect shall inform the University’s Project Manager of all consultant meetings sufficiently in advance to allow them to attend at their discretion.

1.2 *Construction Phase Meetings*

1.2.1 The contract documents shall require the Contractor to conduct regular project meetings. The frequency, time and location of the meetings shall be coordinated and approved by the University’s Project Manager.

1.2.2 The University requires pre-construction meetings with the Contractor, appropriate vendors or subcontractors, the Architect and his consultants and select University personnel. The Architect and consultants shall review and confirm the desired list of special pre-construction meetings for inclusion in the contract documents.

1.2.3 The Contractor shall be required in the contract documents to publish meeting minutes of all construction meetings involving the University’s personnel, and to have current proposed change, change order, RFI and submittal logs.

1.2.4 The Contractor shall be required to provide a comprehensive Critical Path Method (CPM) project schedule to be updated monthly or as otherwise required by the University’s construction contract. The Architect shall confirm requirements with the University’s Project Manager. Schedule shall identify all proposed utility disruptions and outages.

1.2.5 The Contractor shall be required to provide a two-week “look-a-head” schedule of job site activities and proposed utility outages.
1.2.6 The Architect shall be present at all regularly scheduled construction project meetings and is responsible for coordinating construction issues and responses with the other project consultants. Where requested by the University’s Project Manager, Architect will arrange for consultant representative to attend the construction project meetings.
1. **GENERAL REQUIREMENTS:** The University will participate in the review of selected submittals. The specific set of submittals and the routing procedures shall be coordinated with the University Project Manager; the general outline of the process is as follows:

1.1 The University and design consultants will establish a preliminary list of submittals (categories) that the University wishes to review. The design consultants will identify these in their contract documents as requiring additional review time. During the start up of construction, the University will finalize the list of submittals they will review by marking up the Contractor’s submittal schedule.

1.2 **Typical Submittal Routing:**

1.2.1 The Contractor will transmit the required number of copies of the submittal to the design consultants for review.

1.2.2 The design consultants will review the submittal and mark “Revise and Resubmit”; it is returned to the Contractor. Otherwise, a copy of the submittal is forwarded to the University’s Project Manager for distribution to appropriate staff for review. The Project Manager will assemble staff comments and forward them to the design consultants.

1.2.3 The design consultants will incorporate the University staff’s comments and retain their record copy, forward a record copy to the University’s Project Manager and returns the balance to the Contractor.

1.2.4 Where the review time for submittals only designated to be reviewed by consultants may be two weeks, the Contractor shall allow three weeks minimum for all submittals identified for consultant and University review.

1.2.5 The consultants shall allow the University one week to review and return comments on submittals. The Architect shall keep the University’s Project Manager apprised of all outstanding submittals in for University review. If no comments are received from the University after one week, the consultants may proceed to return the submittal to the Contractor.

1.3 The Contractor shall be required to submit a comprehensive submittal schedule that includes project and fabrication lead times where applicable.

1.4 The Architect and Contractor shall both be required to maintain a current submittal log that identifies the status and disposition of all submittals in process or completed, and shall present the log at each construction meeting for review.
1.5 The Architect and consultants shall work with the University’s Project Manager to identify each specified product for which the University wants a physical sample submitted. The design consultants will include the University’s requirements in addition to any sample requirements they may require.
1. **GENERAL REQUIREMENTS:** Schedules for both the design and construction phases are important tools used by the University’s Project Manager to guide, facilitate and control the interaction between the University and the Project Team. These schedules shall establish adequate opportunity and timeframes for critical meetings, and periodic drawing and site reviews.

1.1 **Design Schedule:**

1.1.1 The Architect will work closely with the Project Manager at the start of the project to establish a Design Schedule that balances the consultant work effort with needed meeting and review times for the University faculty, staff and students.

1.1.2 The Design Schedule will accommodate critical campus dates, activities, events and holidays.

1.1.3 Drawing reviews shall typically occur a minimum of once per phase, including phases such as: conceptual design, schematic design, design development and construction documents. For large projects the construction document phase may need several reviews. Each review requires two weeks, allowing for distribution of the drawings, review time, and a meeting or workshop format for the review and resolution of the comments.

1.1.4 The Design Schedule shall be updated to reflect changes on a periodic basis as agreed upon with the University’s Project Manager.

1.2 **Construction Schedule:**

1.2.1 The Architect will work with the University’s Project Manager and the Contractor (when brought into the Project Team) to establish a construction schedule that acknowledges critical campus dates, activities, events and holidays. For special campus events such as graduation and homecoming the University may require the Contractor to curtail or even suspend operations.
1. **GENERAL REQUIREMENTS:** The Contractor’s Schedule of Values is an important tool for evaluating the progress of the project construction. Prior to issuing the project for bids the Architect shall review the project with the University’s Project Manager to identify any unique aspects to the project that will require special accounting during the construction, and include such instructions in the contract documents.

1.1 The schedule of values for a project shall be structured to acknowledge the project funding, including appropriate separations in scope where lines of funding are different.

1.2 In all cases there shall be no more than one subcontractor or vendor represented in each line item of cost in the Schedule of Values.

1.3 Where a subcontractor or vendor expects to bill for off-site or stored material, the value of such must be identified in a separate line item.

1.4 The Schedule of Values shall follow the University’s format for Schedule of Values as shown in the template in Appendix “C.”

1.4.1 Note that the University’s format includes a column titled “Base Contract” that shall be the original bid or GMP price that will never change. The “Buy-out” column will reflect the actual cost of the work as contracted.

1.4.2 Percent complete for applications for payment shall be based on the “Buy-out” value.
1. GENERAL REQUIREMENTS: The University values the use of independent contractors and service providers for inspecting, testing and verification to ensure the quality and performance of new construction. The Architect and consultants shall work with the University’s Project Manager and appropriate staff to review and define the inspections and testing requirements for their project prior to issuing construction documents for bid.

1.1 The Architect and consultants will review their recommendations for standard and customary inspection and testing requirements for items such as, but not limited to:

- Fireproofing
- Reinforcing placement
- Pre-stressed tendon placement and stressing
- Precast erection
- Soils testing
- Welding inspection
- Steel erection and bolting

1.2 The Architect will also review recommendations for additional inspection and testing that may be to the University’s benefit for elements of the project such as:

- Complex assemblies
- Innovative assemblies or use of material
- Assemblies with critical performance requirements

1.3 Where test results could have implications on the construction process and techniques consideration should be given to constructing and testing of representative field mockups – see Section 01430 – Field Constructed Mockups.
1. GENERAL REQUIREMENTS: The University values the benefits of field mockups as a means of confirming the aesthetic and quality of an assembly, as a means of reducing problems and maintenance through proof of performance. The Architect and consultants shall review the scope of the project with the University’s Project Manager to identify any system, assembly or detail of the construction that may warrant the use of a field constructed mockup.

1.1 The following are examples of such items:

- Exterior wall with window
- Roof edge with roof tile, soffit and gutter
- Interior millwork or paneling,
- Special flooring or floor patterning

1.2 The timing of construction for mockups is critical to allow the University adequate opportunity to respond. Prior to the ordering of materials and construction components, the Architect and Project Manager shall address both the scheduling and site placement criteria of mockups in the construction documents. The Contractor shall include in his GMP or bid all costs associated with the construction and demolition of required mockups.
1. **GENERAL REQUIREMENTS:** The University recognizes the importance of adequate temporary facilities and staging areas for the support of new construction and renovation projects while at the same time desires to fully minimize the physical, visual and operational impact to the normal campus.

2. **SETTING CONSTRUCTION STAGING PLAN**

   2.1 The consultant team will work with the University’s Project Manager to develop a conceptual approach to the construction site and staging plan and probable temporary services appropriate to the type and size of the project.

   2.2 The Contractor, when added to the project team, shall develop a formal construction site plan for the project for approval by the University’s Project Manager.

   2.3 The Construction Staging Plan will establish:

   - The limits of the construction site
   - Extent and type of perimeter fencing
   - Vehicular routing and site access
   - Internal site organization including trailer, storage, staging and parking areas
   - Types and location of utility taps or tie-ins, including but not limited to: Power, water, sanitary sewer, storm run-off, phone and/or data, etc.
   - Location, type and impact of temporary construction equipment

   2.4 *Construction Activities* – All construction related activities shall be within the defined construction site limits.

   2.5 Temporary activities, such as utility tie-in or driveway construction that are outside the construction limits shall be reviewed and approved by the University prior to commencing.

3. **COSTS AND RESPONSIBILITIES**

   3.1 The cost of all temporary building construction and utilities, except as otherwise identified, shall be the responsibility of the Contractor.

   3.2 All tie-ins to existing campus services and infrastructure must be reviewed and approved by the appropriate University department, coordinated through the University’s Project Manager.

   3.3 The following utilities, excluding the cost for the physical tie-in, maintenance and removal, will be typically provided to the Contractor at no cost. The Architect shall review and confirm with the University’s Project Manager these cost responsibilities prior to inclusion in the project specifications. Items in the list include but are not limited to:
- Electricity/power
- Domestic water
- Chilled water
- Steam
- The land line for telephone/data (Typically the University ties in to the University phone system and installs the temporary line(s) to job site trailer or office)

3.4 Contractor shall provide and maintain barricades and temporary signage as required to safely direct pedestrian and/or vehicular traffic around the site.

4. **SITE MANAGEMENT AND CLEAN-UP**

4.1 The contract documents will include a requirement for the Contractor to maintain an orderly project site with debris and waste materials ordered, contained and regularly removed from the site. Fencing shall be maintained in good order.

4.2 The Contractor shall be required to wash down trucks leaving the site to minimize dust and mud falling from trucks on University streets. Contractor shall clean dust or mud that has fallen on streets from vehicles at the end of each day, or more frequently as conditions require.
1. **GENERAL REQUIREMENTS:** The University values the trees of the campus, old and recently planted, as a physical endowment for the long-term benefit of the students, faculty, staff and alumni. All activities that may alter, threaten or suggest removal of a tree shall be reviewed with the University’s Project Manager.

1.1 *Tree Removal* – During the development of building designs for new building or expansions to existing, parking areas or other hardscape construction, the potential impact on the existing campus trees shall be a consideration. The design team shall work with the University’s Project Manager to develop specific criteria for an acceptable level of impact for the project. No tree shall be removed without express written approval by the University’s project Manager.

1.2 *Tree Preservation* – During any renovation, new construction or site activity vendors and contractors shall follow the current adopted edition of the “Tree Preservation Guidelines.” See Appendix D. The Architect will review these guidelines with the University’s Project Manager as to their specific application to their project and document any project specific requirements.
1. **GENERAL REQUIREMENTS:** The consultant team, led by the Architect, has the customary responsibilities for closing out the construction contract and for establishing the Contractor’s work is substantially complete. The University will be an active participant in this process.

1.1 **Substantial Completion**

1.1.1 Prior to initiation of project close out activities, the Architect shall work with the University’s Project Manager and Contractor to develop a strategy and associated schedule for the project close out that allows for post close out activities including, but not limited to: Furniture installation, audio visual and technology equipment installation and system commissioning.

1.1.2 The University will conduct independent close out walk-through and establish punch lists for the Contractor. It is the University’s desire to conduct their punch list reviews after the consultants have determined the areas complete and ready for review, such that their focus will be on functional and service issues.

2.2 **Final Completion**
1. **GENERAL REQUIREMENTS:** The University generally requires the following record documents be provided for each of its projects by either the consultant team or Contractor:

1.1 *Record Construction Drawings*

1.1.1 Record drawings shall be provided by each of the consultants that provided drawings created specifically for the project. The drawings shall reflect all modifications made in the course of the project for changes and RFI responses. The drawing shall also include field changes as provided by the Contractor.

2.1 *Operations and Maintenance Manuals*

2.1.1 Operations and Maintenance Manuals shall be required for all products, finishes, equipment, and systems included in the project. They shall include pertinent drawings & diagrams, instructions for operating, troubleshooting, and maintenance. Where appropriate they shall provide parts lists and source contact information to allow purchase for maintenance and repairs.

3.1 *Project Submittals and Shop Drawings*

3.1.1 As many shop drawings contain more detailed information on the construction of the building, they are a valuable tool for maintenance and repair of the building over its life. Review the range of shop drawings required for the project with the University’s Project Manager and determine which shop drawings will be of long term value and identify them to be included as part of the project record documents.

4.1 *Record Project Finish Schedule*

4.1.1 The Architect will provide a complete condensed record of all interior and exterior finishes to facilitate the long-term maintenance of the building. Provide in a form based on Appendix E.

5.1 *Record Equipment Inventory*

5.1.1 Covered in Divisions 15 and 16.

6.1 *Facilities Engineering and Planning Equipment Status Form*

6.1.1 Consultant to require the Contractor to provide Equipment Status Forms for all major equipment items. Prior to closeout, the contractor, Architect and University’s Project manager to meet to establish the criteria for which equipment for which Equipment Status Forms shall be submitted.
7.1  Furniture Specifications and Placement Schedule

7.1.1  Provide a record set of all documents used to locate, specify and purchase the furniture and loose accessories for the project. Provide one consolidate schedule style document that identifies each of the selected products, the options included in the purchased items and the finish selections.

8.1  Demonstration and Training

8.1.1  See Section 01810 – Demonstration and Training
1. GENERAL REQUIREMENTS:

1.1 It is the University’s desire to establish a strong and appropriate series of warranties for the general building construction, its equipment and specialized systems.

1.1.1 The Contractor will provide a general one year Project Warranty similar to Appendix F.

1.1.2 Special warranties, similar to Appendix G should be required for all special systems, equipment or construction and shall be for appropriate periods supported by the manufacturers or industry responsible. The Architect and his consultants shall review with the University’s Project Manager to determine which items will require special warranties and the time period of each such warranty.

1.2 The specifications shall make it clear that the Contractor is responsible for all warranties required in the contract documents, even if they exceed the manufacturer’s or subcontractor’s warranty.
1. **GENERAL REQUIREMENTS:** At the completion of each construction project, the University would like to acquire all appropriate information needed to operate and maintain the building or facility.

1.1 *Vendor Information* – Except as more specifically required elsewhere, the Architect shall require the Contractor to, as a part of the project close-out, provide the University with a comprehensive list of all product, material or equipment vendors (except for the most common items such as plywood, gypsum board or metal studs). See Appendix H for template of required information.

1.2 *Equipment Information* - Except as more specifically covered elsewhere, the Architect shall require the Contractor to, as a part of the project close-out, provide the University with a comprehensive list of all equipment fixtures or devices either described, scheduled or indicated in the drawings or specifications that requires maintenance, could be damaged or require repair or replacement. See Appendix J for template of required information.
1. **GENERAL REQUIREMENTS:** At the completion of each construction project, the University would like to acquire comprehensive training for the appropriate operation and maintenance of all significant systems, equipment or fixtures to prepare its personnel to maintain and/or operate the new facility.

1.1 *Basic Training and Demonstration* – The Architect and his consultants shall review with the University’s Project Manager all products, systems, fixtures and equipment to be included in the project to determine the type and level of training and demonstration the University will expect just prior to the project’s point of substantial completion. These requirements will be included in the project bid specifications.

1.1.1 Include as part of the training requirements:

- Minimum qualifications for training instructor
- Minimum requirements for handouts and instruction outline
- Minimum requirements for documenting the training sessions including if they are to be recorded, and if so, who will be responsible for taping and producing the training videos

1.1.2 Documentation of Training sessions, including pertinent training material, shall be included as part of the Owner’s Manuals. Refer to Section 01720.
1. DESIGN STANDARD:

1.1 Insulation systems must be in strict accordance with the latest version of the International Energy Code and/or ASHRAE Standard 90.1.

1.2 Insulation for cold piping and equipment must have a water vapor permeability not to exceed 0.117 perm inch and must not deteriorate in the presence of water.

1.3 Insulation for hot piping systems must be rated for temperature equal to 110% of the design rated temperature of the system.

1.4 Insulation in tunnels must have aluminum jacket

2. PRODUCT STANDARD:

2.1 Acceptable products for cold piping and equipment: Koolphen K, Trymer, Pittsburg Corning (PC) Foam Glass. Fabricate with vapor barrier jacket applied.

2.2 Acceptable products for heating water systems (180°F max design temperature) Glass fiber insulation with All Service Jacket manufactured by Manville Knauf, Owens Corning and approved equals Koolphen K, Trymer and PC Foam glass and approved equal fabricated with ASJ.

2.3 Acceptable products for steam piping and equipment: Calcium Silicate, PC Foam glass with ASJ Jacket.

2.4 Acceptable products for ductwork and air handling systems: Glass fiber blanket insulation with vapor barrier jacket and adhesive manufactured by Manville, Knauf, Owens Corning and approved equals.

2.5 Acceptable products for grease exhaust duct: Calcium Silicate insulation and fire rated drywall barrier; Fire Master ceramic duct wrap (thickness and details as outlined in products U.L. listing for fire rated enclosure).

3. PERFORMANCE STANDARD:

3.1 Insulation systems must be applied to piping only after piping systems have been tested and approved by the Rice University’s Project Manager. (Both pressure testing and cleaning/flushing tests).

3.2 Piping systems must be clean, dry and free of dirt, oils and debris before insulation is applied.

3.3 Insulation that is damaged by construction activities must be replaced. Patching is not acceptable.
3.4 Insulation systems that are not rigid by nature will require a “hard section” at each hanger. Sheet metal saddles should be applied at each hanger.

3.5 Joining of insulation sections and securing the insulation to the piping must be approved by the Rice University’s Project Manager. In general, self sealing lap joints and taped butt joints are not desirable. Mechanically jointed laps with sealant applied at laps and butts or floated fiber mesh joints are preferred.

3.6 The contract should include painting of all piping systems. Color coding of piping to the Rice University’s Standard must be included.

3.7 Pipe marking and flow arrows should be applied after color coating is complete and approved by the Rice University’s Project Manager.
1. DESIGN STANDARD:

1.1 All domestic cold water and fire protection piping exposed to exterior conditions must be heat traced and wrapped with aluminum jacket. Other non-critical areas Rice University prefers insulation with out heat trace.

1.2 All horizontal storm drain piping including drain body above finished ceilings must be insulated. Pipes in walls adjacent to sound sensitive areas must be insulated.

1.3 All domestic hot water and tempered water including circulation pumps, condensate, drain lines, drinking fountains and drain lines must be insulated.

1.4 Provide insulation on Valves, Fittings and Other Components.

2. PRODUCT STANDARDS:

2.1 Rice prefers Koolphen insulation with canvas wrap over paper wrap. No Armaflex.

2.2 All insulation for fittings must be prefabricated.

2.3 All insulation must be minimum 1" thick.

3. PERFORMANCE STANDARDS:

3.1 Insulation thickness must meet or exceed Energy Code requirements.

3.2 Unless noted otherwise, insulation thicknesses indicated are for interior locations where the temperature and relative humidity are maintained at 80 degrees F and 60% RH. The insulation system shall be sufficient to eliminate the possibility of condensation at the design fluid temperature of the piping system and 90 degrees F and 85% RH when the piping is located in the following conditions:

1. Within equipment or storage rooms that are ventilated with unconditioned outside air.

2. In exterior equipment yards, on roofs or any other exterior location.

3. Within crawl spaces, exterior soffit areas, ventilated attics and other concealed locations subject to ambient conditions.

Note: Locations where temperature and humidity may exceed these conditions, the engineer will evaluate on a case by case basis and will provide Rice University’s Project Manager with recommendations.
3.3 At each support point, install a hard section of insulation, minimum 8" length on lower 180E of piping or 360E of piping if clamps are used on top of pipe. Hard section should be same thickness as adjacent insulation.

Provide formed galvanized sheet metal saddles at support points that are the same length as the hard section to completely cover hard sections.
1. DESIGN STANDARD:

1.1 Piping systems must be designed for approximately 50 years life in the main distribution to buildings and in main branches to buildings. Pipe sizing, materials, valving and support must be specified with longevity and future additions in mind.

1.1.1 Size piping for maximum pressure loss per 100 feet of 3-5 feet based on 30 year old pipe using Cameron or equivalent sizing charts. Maximum velocity in pipe mains should be 8 feet per second.

1.1.2 Include isolation valves at each connection to buildings from the campus system and at zoned segments of the building system. Isolation valves should be rebuildable in the field since the ability to isolate buildings and systems without central campus shutdown is necessary.

1.1.3 Butt-welded joints for piping systems are preferred. Do not use resiliently coupled piping systems without approval of the Rice University’s Project Manager.

1.1.4 Black steel piping should be covered with insulated pipe covering or should be painted where insulation is not required or exposed to exterior. Exception: Sprinkler pipe does not require painting.

1.1.5 Refrigerant piping must be Type "L" copper ACR tubing.

1.2 Support systems for piping should be designed for stability and long life.

1.2.1 Pipe hangers should be steel clevis (unless piping is copper) for individually hung pipes and structural steel trapeze type for multiple pipes. Except when a multi-trade support system is part of the project planning, supports should be exclusive to each specific trade. (Do not support equipment, control wiring, light fixtures and the like from pipe, duct and conduit systems.

1.2.2 Support risers and floor mounted equipment with structural steel bases. Use pipe rollers for horizontal runs when expansion or contraction of the pipe run is expected.

1.2.3 Design of piping systems should include allowance for expansion. Expansion compensation that depends on manufactured devices and require periodic maintenance should be avoided (especially in main pipe runs). Pipe loops and anchors are preferred for expansion compensation.

1.2.4 Pipe supports and anchors should be specified with coatings to protect them against the effects of moisture and corrosion. Moisture is to be expected, especially in tunnels and basement locations.
1.2.5 Fire stops should be made using U.L. listed assemblies for the time rating of the wall or floor.

1.2.6 Penetrations through exterior walls should be sleeved with galvanized steel pipe and fitted with water resistant sealing assemblies.

1.2.7 Risers through floors above grade should be curbed in mechanical rooms to prevent water migration.

1.3 Piping downstream of building pumps may be designed using somewhat less conservative criteria.

1.3.1 Piping should be sized based on 30 year old pipe using Cameron Design Manual or equivalent.

1.3.2 Balancing at pumps and at each coil should be considered. Design should use balancing valves with memory stops and employ pressure/temperature test plugs at each coil and in major zone branches.

1.3.3 Piping systems should be identified with pipe markers identifying the system type and flow direction.

2. PRODUCT STANDARD:

2.1 Piping system for chilled and heating water should be ANSI/ASTM A 53 schedule 40 through 10" size; 0.375 minimum wall thickness for 12" and larger size.

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<thead>
<tr>
<th>Pressure Rating</th>
<th>Temperature Range</th>
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<tbody>
<tr>
<td>CHWS</td>
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2.2 Piping systems for steam should be ANSI/ASTM A53 Grade B, Schedule 40 for all sizes. Condensate use Schedule 80.

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<thead>
<tr>
<th>Pressure Rating</th>
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<tr>
<td>Steam</td>
<td>150</td>
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<tr>
<td>Condensate Return</td>
<td>300</td>
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2.3 Refrigerant pipe fittings must be wrought copper streamlined sweat fitting. Solder must be Sil-Fos, except on valves use solder recommended by valve manufacturer.
3. PERFORMANCE STANDARD:

3.1 All condensate piping must be gravity fed to condensate pump. No up hill piping allowed.
1. **DESIGN STANDARD:**
   
   1.1 No butterfly valves in domestic water service.
   
   1.2 All valves for domestic service must be as follows:
      
      1.1.1 2" and smaller - Ball valves.
      
      1.1.2 Larger than 2" – Specify rising stem gate valves.
      
   1.3 Victaulic style piping system allowed in mechanical rooms only with exception to sprinkler pipe.
   
2. **PRODUCT STANDARD:**
   
   2.1 All products including piping must be U.S. Manufacturer. The use of foreign products are subject to Rice University Approval.
   
   2.2 All piping is to be seamless.
   
3. **PERFORMANCE STANDARD:**
   
   3.1 The Rice University’s representative must be notified of all inspections by Code Officials.
   
   3.2 Install pipe markers on each system. Include arrows showing normal direction of flow.
   
   3.3 Provide equipment tags for valves, heat exchangers, pumps, etc.
   
   3.4 Construct all piping systems in accordance with applicable Codes, including ANSI, ASTM, and ASME Codes.
   
   3.5 Pipe sleeves will be required at penetrations as necessary through walls and slabs for fire proofing, water proofing and acoustical purposes.
   
   3.6 Provide adequate access to all equipment, valves, instruments, and controls.
   
   3.7 Provide supports of adequate strength for all piping.
   
   3.8 Victaulic style pipe use roll grooved in lieu of cut groove.
   
   3.9 Test all piping systems to assure that they are absolutely leak free. Rice University’s Project Manager will be notified of all tests.
1. DESIGN STANDARDS:

1.1 Provide floor drains/floor sinks in all public toilets (not required in residential units) air handling rooms, central plants and locker room facilities.

1.2 Coordinate with the Rice University’s Project Manager for requirements of floor drains in single water closet/lavatory toilet rooms.

1.3 Roof drains and overflow roof drains are to be designed per City of Houston Code.

1.4 All trap primers for floor drains and floor sinks shall be accessible.

2. PRODUCT STANDARD:

2.1 Drain manufacturer - Rice University to provide a list of acceptable manufacturers.
   i.e.-Smith, Josam, Wade and Zurn.

2.2 In Toilet Rooms, provide trap primer that connects to the water closet supply.

3. PERFORMANCE STANDARD:

3.1 Installation shall be in strict accordance with published manufacturers recommendations.

3.2 Provide and install trap primers where indicated on drawings and where required by code and authorities having jurisdiction.

3.3 Provide and install backflow preventers where required by Code and authorities having jurisdiction.

3.4 Provide vacuum breakers where required by Code.

3.5 Provide cleanouts at all bends, angles, at ends of all waste and sewer piping and in accessible locations.
1. DESIGN STANDARD:

1.1 Provide shut off valves in all branch lives and all major fixture groups. All valves locations must be easily accessible.

1.2 Specify ball valves up to 2”. Rising stem gate valves 2” or greater.

1.3 When house pump is required, pump all floors.

1.4 Consider VSD where applicable to eliminate bladder tank.

2. PRODUCT STANDARD:

2.1 The Rice University prefers all domestic hot and cold water to be copper up to 3”. 4” and above must be galvanized steel. Specify type L rigid copper pipe for interior applications and type K for exterior and underground applications.

2.2 Provide dielectric unions on all dissimilar metals.

2.3 Victaulic Style couplings and fittings may be used in Mechanical Rooms only.

3. PERFORMANCE STANDARD:

3.1 Coordinate with the Rice University Project Manager the cleaning, flushing and chlorinating/disinfecting of all domestic water piping.

3.2 Provide a complete domestic water piping system as required by Code.

3.3 Tag all valves and provide list to Project Manager/Engineer.

3.4 Coordinate pressure testing with the Rice University Project Manager.
1. DESIGN STANDARD:

1.1 Provide cleanouts every ninety feet and at change of directions.

1.2 Cleanouts must be accessible.

2. PRODUCT STANDARD:

2.1 Use cast iron pipe and fittings throughout the building. Bell & Spigot with neoprene gaskets must be used below slab on grade and outside the building. No-hub pipe and fittings may be used above grade. PVC piping is not acceptable.

3. PERFORMANCE STANDARD:

3.1 Provide complete sanitary soil, waste, and vent piping system as required by Codes and as per recommendations of manufacturer.

3.2 Test in accordance with applicable Code.
1. DESIGN STANDARD:
   
   1.1 Provide a complete storm piping system as required by Code.

2. PRODUCT STANDARD:

   2.1 Use cast iron pipe and fittings throughout the building. Bell & Spigot with neoprene gaskets must be used below slab on grade and outside the building. No-hub pipe and fittings may be used above grade.

   2.2 PVC pipe and fittings with solvent cement joints where approved by Rice University.

   2.3 No carbon steel pipe allowed.

3. PERFORMANCE STANDARD:

   3.1 Install piping per manufacturer’s recommendations.

   3.2 Test in accordance with applicable Code. Coordinate all tests with Rice University’s Project Manager.

   3.3 Insulate pipe in areas recommended and approved by Rice University.
1. DESIGN STANDARD:

1.1 Provide a complete fuel oil piping. Comply with the equipment manufacturers requirements and recommendations.

2. PRODUCT STANDARD:

2.1 Use schedule 40 black steel pipe with screwed fittings only.

2.2 Specify dielectric unions at connections between dissimilar metals.

3. PERFORMANCE STANDARD:

3.1 Install per recommendations of manufacturer.

3.2 Test in accordance with applicable Code. Coordinate all tests with Rice University’s Project Manager.

3.3 Test fuel oil lines for tightness prior to connection to equipment.

3.4 Specify flexible connections on driven equipment.
1. DESIGN STANDARD:

1.1 Provide a complete gas piping system as required by Code.

2. PRODUCT STANDARD:

2.1 Use Schedule 40 black steel pipe with screwed fittings. Piping below grade must be wrapped. Copper is not acceptable.

2.2 Specify gas cocks in an easily accessible location, in each branch line, and at each individual piece of gas consuming equipment.

3. PERFORMANCE STANDARD:

3.1 Install per recommendations of manufacturer.

3.2 Test in accordance with applicable Code. Coordinate all tests with Rice University’s Project Manager.
1. DESIGN STANDARD:
   1.1 Install per medical gas piping requirements and standards including cleaning of the piping systems.

2. PRODUCT STANDARD:
   2.1 Lab gas specify schedule 40 black steel pipe only with screwed fittings only.
   2.2 Vacuum and air copper with dielectric unions at connections between dissimilar metals.

3. PERFORMANCE STANDARD:
   3.1 Install per recommendations of manufacturer.
   3.2 Test in accordance with applicable Code. Coordinate all tests with Rice University’s Project Manager.
   3.3 Specify flexible connections on driven equipment.
1. DESIGN STANDARD:
   1.1 Provide all acid waste and vent piping serving fixtures and equipment receiving acid wastes.

2. PRODUCT STANDARD:
   2.1 All new projects specify glass pipe and fittings above floor and Enfield pipe and fittings below grade.
   2.2 All retrofit projects specify Enfield plastic acid pipe and fittings.

3. PERFORMANCE STANDARD:
   3.1 Specify entire installation to be in conformance with the latest published literature, printed by manufacturer of piping. Details of installation, materials and tools required.
   3.2 Test in accordance with applicable Code. Coordinate all tests with Rice University’s Project Manager.
1. DESIGN STANDARD:

1.1 All fire sprinkler systems must be designed to meet all requirements of the City of Houston Code and NFPA Chapter 13. Use most stringent where conflict occurs.

1.2 All Rice University Buildings must be provided with an automatic sprinkler system, unless directed otherwise. Remodels should be upgraded with sprinkler systems.

1.3 Each sprinkler system must be monitored by floor and provided with separate valve.

1.4 All sprinkler valves/sprinkler control stations must be accessible and located no higher than 7'-0" above finished floor. Do not locate above ceilings.

1.5 Provide sprinkler system drain piping to building drains, or sumps, or, as approved by the University’s project manager, provide direct discharge to the building exterior.

1.6 Not used.

1.7 Locate Inspector test valves in mechanical and storage areas.

2. PRODUCT STANDARD:

2.1 Rice University prefers Fire Department Siamese connections to be wall mounted.

2.2 Rice University prefers wall indicator OS&Y gate valves for the sprinkler system. If not possible, locate post indicator OS&Y gate valve as close to the building as possible.

2.3 No restrictions on material. Design per code. (Schedule 40 black steel, schedule 10, Victaulic and CPVC to be evaluated on project by project basis.)

3. PERFORMANCE STANDARD:

3.1 Contractor to submit complete fire protection drawing and submittals indicating sprinkler head locations pipe routing and all devices to the University for coordination prior to installation.

3.2 All sprinkler system tamper and flow alarms to be tied into the building Fire Alarm System.

3.3 Install piping between fire water surge tank and fire pump suction with straight pipe run.

3.4 Support CPVC properly to allow removal of sprinkler heads.
PLUMBING EQUIPMENT:

1. DESIGN STANDARD:

   1.1 When domestic house pumps are required, the pumping system must pump the entire building. A full size bypass line with a shut off valve must be provided.

   1.2 Acid dilution basins must be designed with sampling well.

   1.3 Grease traps must be provided for all commercial kitchen applications.

   1.4 Sump pumps and sewer ejector pumps must be provided to meet flow elevation requirements.

   1.5 Provide domestic hot water circulation systems where directed by Rice University’s Project Manager.

2. PRODUCT STANDARD:

   2.1 For domestic pumping systems the Rice University prefers variable speed drives and prefers not to have a bladder tank. 2 stage at minimum.

   2.2 All large domestic water heaters are to be steam to water shell and tube type heat exchangers.(Provided under mechanical sections.)

   2.3 Master House/Residential Homes use gas fired hot water heaters.

   2.4 Sewer and Storm Injectors.

   2.5 Grease traps/interceptors.

   2.6 Acid Neutralization basins with sampling well similar to Enfield.

3. PERFORMANCE STANDARD:

   3.1 Sump pumps and Sewer Ejector pumps: Rice University to provide a list of acceptable manufacturers.

   3.2 Design grease traps per Code Requirements.

   3.3 Hot water circulation system to be sized 5-10 gpm minimum at water heater.

   3.4 Hot water heater sizing per code requirements.
PLUMBING FIXTURES:

1. PRODUCT STANDARD:

1.1 Rice University prefers American Standard fixtures with Chicago Faucet trim.

1.2 Rice University to provide a list of acceptable manufacturers.

1.3 Automatic flush valves: Rice University to provide a list of acceptable manufacturers.
1. DESIGN STANDARD:

1.1 The design professional must review system types to be employed with the Rice University’s Project Manager. This will be done during the Schematic Design and Design Development Phases of each project.

1.2 In general the following system types may be employed in typical applications.

1.2.1 Classrooms - Single zone fan coil units (one zone per classroom); single duct VAV; double duct VAV terminals; bypass multizone air units.

1.2.2 Dormitories - Single zone fan coil units (one per residential unit). Systems that return air from multiple residences should be avoided.

1.2.3 Science Labs - Single zone air unit per lab with separate pressurization control air unit. Central outside air make up unit with VAV pressurization/temperature control for each lab.

1.2.4 Libraries - Single duct VAV terminals in thermostatic zones; Double duct VAV terminals; Bypass multizone with separate outside air pressurization unit(s).

1.2.5 Offices - Same as libraries. Thermostatic zones should be arranged by exposure and common heat gain/loss. (Approximately three offices per thermostat/zone).

1.2.6 Residential Dwellings - Single zone DX air units with suitable zone control for the application. Master houses provide separate zones for 1st floor and 2nd floor.

1.2.7 Equipment Areas (Electrical, telephone, elevator equipment, IT rooms) - Use separate fan coil or air unit serving each space or supply ventilation systems. These spaces will normally be required to operate 24-7.

1.2.8 Computer Rooms: Packaged Computer Room Air Units (PCRU’s) Units may include electric infrared reheat, electric humidifiers, high efficiency filters, stand alone or site wide controls, ZN redundant cooling coils (chilled water primary with direct expansion back-up), N + 1 air system redundancy. Verify temperature humidity and redundancy criteria with the Rice University’s Project Manager.

1.2.9 Cross zoning is not acceptable under any circumstances. Careful consideration should be given to zoning offices with high heat load rooms. Conference rooms must be provided their own zone and thermostat control.

1.3 Reheat systems are to be avoided. Do not use electric reheat except as approved by the Rice University’s Project Manager for Humidity Control. Reheat in other than critical laboratories must be approved by the Rice University’s Project Manager and allowed by
If reheat is to be employed for humidity control, the air system must be capable of 50% reduction in air flow prior to application of heat. Humidity sensors should control cooling output as an extension of the cooling cycle. Do not open cooling coil valves fully on first humidity control demand. Cooling coil discharge temperature will be limited to 55°F in dehumidification cycle.

Do not use multizone units with hot deck and cold deck controls. Bypass multizone units may be employed if the cold deck damper is fully closed before zone heat is applied.

Separate ventilation control using 100% outside air units are preferred in many system types.

If bypass multizone, double duct, individual fan coil units or other systems that do not promote dehumidification of the supply air stream are employed, the outside air must be conditioned by a separate cooling/heating air unit.

Heat recovery or other means of dehumidification efficiency must be employed on 100% outside air units. Ref: IECC.

Hot water heating is preferred. However, steam coils may be employed on outside air units for pre-heat when approved by the Rice University’s Project Manager.

Fan powered or side pocket fan VAV terminals are not desired. If approved for use by the Rice University’s Project Manager, the secondary (plenum) air must be filtered or ducted to the space.

Double duct VAV must employ hot deck reset. Constant volume mixing boxes must be employed only in specialized areas where pressure to the space is critical and must be approved by the Rice University’s Project Manager.

Double fan units operated as separate VAV units for hot and cold deck supply air are preferred. If a single fan is to control pressure in both hot and cold deck, suitable logic must be employed to prevent over pressurization of the separate duct systems. (Cool-down/Warm-up/and seasonal operation).

Cold deck and hot deck reset should be employed based on ambient temperature for double duct systems.

Outside air handling units must have automated inlet dampers which are hardwired to the freeze thermostat and motor starter. Unit will have freeze stat, preheat temperature
sensor, cooling coil discharge temperature sensor and reheat coil discharge temperature sensor. All points to be alarmable. Dampers will provide feedback proof of open to start fan. Temperatures will be re-settable based on outside air conditions.

2 PRODUCT STANDARD

2.1 Air handling units and terminal unit design should promote good indoor air quality.

2.2 Internally insulated air units and terminal units should be constructed as double wall systems with fully cleanable internal surfaces. Terminals and fan coil units may be internally lined with “fiber free” rubber insulation.

2.3 Where multiple coils are used in air units, ensure that 24” minimum access section is employed between coils. Each side of coils will be accessible through hinged doors.

2.4 Coil drain pans will be sloped to coil drains for cooling coils.

2.5 Heating coils, humidifiers and the like should include drain pans in base of unit.

2.6 U.V. lights and other forms of source control of mildew should be typically provided.

2.7 The following standards for air unit design should be employed:

2.7.1 Cooling coil casings and tube sheet supports should be stainless steel.

2.7.2 Depth of coil and fin spacing must be selected such that coils are cleanable. (8 row max/10 fpi).

2.7.3 Tube velocity and circuiting should be selected to promote turbulent flow at 25% design flow.

2.7.4 Casing should be supported by structural steel rails.

2.7.5 Drain pans will be welded Stainless Steel. Provide overflow switch in pan.

2.8 Floor of units wider than sixty inches should be reinforced for “walk-in” accessibility. Access space between coils should be increased based on unit width. “True walk-in” units should have lights and receptacles. All access must be through hinged doors. True walk-in units will be constructed of 10 gauge metal.

2.9 Air units designed for exterior or ventilated mechanical room applications must have “no through metal” design to prevent condensation on unit exterior.

2.10 Unit structure must be un-effected when the coil or modular section is removed.

2.11 Filters must be suitable for the application. 30% efficiency based on ASHRAE standard 52 is minimum. (Except for residential units).
2.12 Fan coil unit construction standards should be as follows:

2.12.1 Except for residential units, fan static pressure must allow for 0.3 inches W.G. loading of filter.

2.12.2 Filter access should be hinged. Filter rack must accept filters with adequate retention to minimize bypass air.

2.12.3 Removable access panels should have fasteners retained with the panel.

2.12.4 Cooling and heating must be separate coils slabs. One common coil with chilled and hot water circuits are not acceptable.

2.12.5 Dual wall units preferred. “Fiber free” internal insulation with Armaflex rubber insulation may be acceptable.

2.12.6 Casing should be galvanized or painted furniture steel.

2.12.7 Designer should work with Rice University’s Project Manager to determine whether unit should be belt drive.

3. PERFORMANCE STANDARDS:

3.1 Outside air units will have dampers upstream of coiling coils. On remodels, add dampers where space allows.

3.2 Adequate service access to be provided and approved by University’s Project Manager. Specify retainable fasteners.

3.3 Specify safety guards for externally mounted motors.
1. DESIGN STANDARD:

1.1 All duct systems must be designed in strict accordance with the latest editions of SMACNA, NFPA 90-A, IECC and applicable codes.

1.2 Low pressure duct systems are preferred. Systems in excess of 3 inches W.G. design pressure will be leak tested.

1.3 Elbowed change of plane transitions should be made to minimize pressure loss. Transitions should limit total angle of change to 30°. Elbows should be radius type or mitered with turning vanes. Do not apply turning vanes in double elbow applications or where successive elbowed plane changes occur in the duct system.

1.4 Duct board systems are not acceptable and any use of internal liner must be approved by Rice University’s Project Manager.

1.5 Welded joint, stainless steel duct systems should be used for the following:

1.5.1 Laboratory exhaust systems.

1.5.2 Shower room exhaust systems.

1.5.3 Unprotected exterior mounted ductwork.

1.5.4 Drainable sections at duct mounted humidifiers and the like.

1.6 Welded joint, black or galvanized steel and stainless steel duct systems should be used for kitchen hood exhaust systems.

1.7 Manufactured spiral re-enforced galvanized steel duct systems should be considered for higher pressure supply and return systems. Snap lock duct is unacceptable in any application.

2. PRODUCT STANDARD:

2.1 Material for ductwork systems should be United States Domestic manufactured, galvanized prime grade, lock-forming quality, copper bearing steel sheets. Environmental exhaust systems should be similar except as noted otherwise.

2.2 Gauge and reinforcing must be as defined in the SMACNA manual for the respective pressure class. In acoustically sensitive spaces gauges in excess of SMACNA may be required.

2.3 Duct sealing must be SMACNA Class A. All longitudinal and transverse joints will be sealed. Water based sealants is preferred except in exterior duct applications solvent based sealants should be used in exterior applications.
2.4 Ductmate or equal sheet metal jointing systems may be proposed in lieu of duct sealant.

2.5 Acoustically sensitive applications that require the use of internally lined duct must be approved by the Rice University’s Project Manager.

2.6 “Fiber Free” acoustical lining using sheet rubber material should be considered as replacement for glass fiber lining.

2.7 Flexible duct systems may be applied at terminal units and at air devices.
   2.7.1 Semi-rigid spiral locking flexible duct is preferred for connection to terminals.
   2.7.2 Semi-rigid spiral locking flexible duct is preferred for connection to terminals.
   2.7.3 All duct systems must be U.L. 181 listed for air duct systems.
   2.7.4 All flexible duct must be insulated and include an outer jacket for containment of the insulated covering.
   2.7.5 Jackets should be stenciled by the manufacturer to indicate the insulation R value.

2.8 Stainless steel duct systems should be 316 unless otherwise approved by the Rice University’s Project Manager.

3 PERFORMANCE STANDARD:

3.1 Duct support should be made using structural steel and threaded rod. Perforated strap suspension systems are not acceptable.

3.2 Flexible duct systems should be secured at both ends with removable fasteners.
   3.2.1 Semi-rigid flexible duct should be connected with sheet metal screws and stainless steel banding on the outer jacket.
   3.2.2 Spiral wound flexible duct should be attached using stainless steel banding both at the duct collar and at the outer jacket.
   3.2.3 The length of flexible duct should be no more than required to make the connection and should not exceed six feet on any one connection.

3.3 Duct systems must be proven leak free before insulation materials are applied.
   3.3.1 A duct system in excess of 3 inches W.G. must be pressure tested. All welded systems must be pressure tested. The pressure test should be made in accordance with SMACNA.
and should achieve 1% maximum leakage criteria.

3.3.2 All duct systems must be visually and audibly inspected before insulation is applied. All apparent leaks must be repaired before insulation is applied.

3.3.3 Rice University’s Project Manager must sign off on all duct inspection and testing.
1. DESIGN STANDARD:

1.1 Rice University maintains an extensive Facility Control and Management System (FCMS). New and renovated systems must meet the following criteria:

1.1.1 Each system controller must be stand-alone with processing capacity for all assigned control functions including time of day schedules.

1.1.2 The individual controllers must communicate on the Ethernet LAN to the Central Site Operator interface located in the Central Plant Building. Provide all data points as required for the project. Subject to review by Rice University’s Project Manager.

1.1.3 All new and existing replacement systems must be Direct Digital Control. All open systems must use Lon Mark open protocol devices.

1.1.4 All systems must communicate to and be configurable from one of the software systems maintained by Rice.

1.1.4.1 Tridium

1.1.4.2 Siemens System 600.

1.1.5 All control points must be trendable, resetable (either operator initiated or event initiated), configurable and scalable.

1.1.6 All software must be developed using dynamic graphics. Mapping and configuration of new points into the Human Machine Interface (HMI) must be a requirement of each construction project.

1.2 A specification which defines the fundamental requirements of the FMCS will be supplied by the Rice University’s Project Manager. The design professional must customize the specification for the project.

1.2.1 Provide for an acceptance procedure for competitive products.

1.2.2 Define sequences of operation for each piece of equipment.

1.2.3 Complete a Point Input/Output Summary. The Summary must be reviewed by the Rice University’s Project Manager at the Schematic Design, Design Development and Construction Document Phase of design process.

2. PRODUCT STANDARD:

2.1 The specification provided by the Rice University’s Project Manager will give the design
2.1 Field communication should be convenient for operating personnel. All temperature sensor and field controllers must have ports for interrogation of system performance.

2.1.2 Field devices including controllers should be housed in sturdy metal enclosures. Housing of sensors should be removable with tools provided by the manufacturer (tamper proof). Field cabinets should have hinged access and be lockable.

2.1.3 Location of devices should be consistent with the criteria outlined for service of equipment (Ref 15050).

2.2 Actuators should be suitable for the controlled devices. Except as otherwise approved by the Rice University’s Project Manager, actuators must be electric motor driven.

2.2.1 Steam valves must have normally closed, spring return actuators.

2.2.2 Chilled and heating water valves should fail in the last commanded position. (If spring return is desirable for isolation of systems to preserve and direct emergency system capacity, the design profession should make that recommendation.)

2.2.3 Outside air dampers must have normally closed, spring return actuators. Outside air dampers must have positive feedback on closure.

2.2.4 Automatic volume control dampers may fail in the last commanded position. Dampers must be commanded closed when the air system is shut-down by the fire alarm system.

2.2.5 Modulating control valves must be designed such that actuator travel is proportional to the change in flow. Globe, plug and characterized (ball) valves are acceptable. All control valves will have unions at the inlet and outlet sides of the valve.

2.2.5.1 Steam coil, heat exchangers, re-boilers and coil slabs in excess of 200 gallons per minute should utilize two control valves (1/3-2/3 capacity control criteria). High turn-down valves with similar result may be considered.

2.2.5.2 Two position valves must close-off against the shut-off head of the system pump.

2.2.5.3 Chilled and heating water valves/actuators should be designed for modulating control at 35 psig differential pressure without noise or damage to valve.
2.2.5.4 System bypass valves (where used) should modulate against the design head of the system without noise or valve seat damage.

2.2.5.5 Three-way mixing valves used for heating water temperature reset, should open to the heating device when the pumping system is shut-down to prevent overheating at the heating equipment.

2.2.5.6 All control valves must be rebuildable in the field. “Throw-away” valves are not acceptable.

2.3 Energy flow measurement at each building should include:

2.3.1 Chilled water flow(gpm), supply and return temperature and calculated BTUH.

2.3.2 Steam mass flow and calculated BTUH.

2.3.3 Electrical building use reported in KW and KWH.

2.3.4 Instruments specified will be approved by Rice University’s Project Manager.

3. PERFORMANCE STANDARD:

3.1 Flow control of chilled water systems must be maintained by straight through valves at coils and variable frequency drives on building pumps. VFD control should be based on system differential pressure. Reset of pressure control based on maximum commanded valve position of cooling coils should be employed.

3.2 A proof of flow device in each heating water system must be “hard wire” interlocked to prevent flow of steam when proof of flow is not established.

3.3 The following data must be transmitted to the FCMS:

3.3.1 Chilled water supply and return temperature, flow pressure. Calculated use (tons).

3.3.2 Steam mass flow rate (1 lbs/hr) Steam pressure.

3.3.3 Alarms for high chilled water temperature, no flow for heating water, steam high pressure, status failure for chilled and heating pumps, high level (failure) of condensate receivers.

3.4 Freeze protection of outside air unit preheat coils must be applied. Acceptable methods are pumped hot water coils or steam coils. Size of preheat coil should be minimized
(40°F maximum LAT). Apply separate heating coil if necessary to deliver higher LAT for heating service.

3.4.1 Freeze stat must be serpentine to cover face of coils. Stat must be manual reset type and must shut down unit, close damper and maintain LAT at coil face when any 1'-0” section of continuous element senses temperature below the low limit (35°F adjustable).

3.4.2 Minimum required access for continuous or averaging elements is 36” between coils.

3.5 Outside air temperature reset must be employed. Each “new” building or significant “addition” should include an outside air sensor for this purpose. Reliance on global OA sensors is not advised. Outside air reset schedule must be adjustable. Automatic reset of set point based on building demand should be considered.

3.6 Single zone units must employ adjustable dead bands to avoid simultaneous heating and cooling.

3.7 VAV systems must reduce flow to minimum before heating is applied.

3.8 Double duct systems must be VAV whenever possible. Logic for volume control must be carefully applied.

3.9 Air system should be schedulable by individual thermostatic zone. Normal over-ride is from the FCMS by the operator.

3.9.1 In some cases, the space user may require direct interface with the FCMS for system over-ride. Method of interface must be approved by the Rice University’s Project Manager.

3.9.2 Morning warm-up/cool-down without outside air should be employed.

3.9.3 Unoccupied set-up and set-back should be employed on most air systems.
1.0 MEASUREMENT STANDARDS

1.1 Definition Of A "Building."(1)

A "building" is defined as a roofed structure for permanent or temporary shelter of persons, animals, plants, materials, or equipment. The building inventory may encompass many different types of structures, including marine and space structures (whether staffed or not); research vessels; and trailers that are not on wheels and are used for offices, residences or storage. (See technical definitions, Section 1.3).

1.1.1 Buildings to be included.

The inventory will include all buildings on the campus bounded by Main St., Sunset Blvd., Rice Blvd., Greenbriar and University Blvd.

As guidelines, separate, minor structures should be included in the inventory if all of the following criteria are met:

1. They are attached to a foundation.
2. They are roofed.
3. They are serviced by a utility, exclusive of lighting.
4. They are a source of significant maintenance and repair activities.

Following these guidelines, an example of a minor structure to be included in a building inventory is a traffic control or information booth, roofed, attached to a concrete pad, with lights and at least one other utility service, and on a regular maintenance schedule. An example of a separate structure not meeting the above criteria is a bus shelter, which is roofed and attached to the concrete sidewalk, but which has only lights as a utility service.

1.1.2 Buildings to be excluded.

The following types of buildings should not be included in the inventory: uncovered swimming pools, athletic tracks, bleachers and playing fields.
1.2 Building Measurement Terms

Assignable Area = Sum of the area designated by the ten Major Room Use Categories (See table on pages 14 and 15)

Nonassignable Area = Sum of the area designated by the three Nonassignable Room Use Categories: Building Service + Circulation + Mechanical (See table on page 19)

Net Usable Area = Assignable Area + Nonassignable Area

Void Area = "Open to Below" Area

Gross Area = Sum of all floor areas - Void Area

Structural Area = Gross Area - Net Usable Area

1.3 Definitions Of Building Areas

1.3.1 Assignable Area

A. Definition: The sum of all areas on all floors of a building assigned to, or available for assignment to, an occupant or specific use.

B. Basis for Measurement: Assignable area is computed by physically measuring or scaling measurements from the inside faces of surfaces that form the boundaries of the designated areas. Exclude areas having less than a six-foot, six-inch clear ceiling height unless the criteria of a separate structure are met.

Measured in terms of assignable square feet (ASF),

Assignable Area = Sum of Area Designated by the Ten Assignable Major Room Use Categories.

C. Description: Included should be space subdivisions of the ten major room use categories for assignable space - classrooms, labs, offices, study facilities, special use, general use, support, health care, residential and unclassified - that are used to accomplish Rice's mission.

D. Limitations: Areas defined as building service, circulation, mechanical, structural and void areas should not be included.
1.3.2 Nonassignable Area

A. **Definition:** The sum of all areas on all floors of a building not available for assignment to an occupant or for specific use, but necessary for the general operation of a building.

B. **Basis for Measurement:** Nonassignable Area is computed by physically measuring or scaling measurements from the inside faces of surfaces that form the boundaries of the designated areas. Excludes areas having less than six-foot, six-inch clear ceiling height unless the criteria of a separate structure are met.

Measured in terms of area,

\[
\text{Nonassignable Area} = \text{Sum of the Area Designated by the Three Nonassignable Room Use Categories: Building Service + Circulation + Mechanical.}
\]

C. **Description:** Included should be space subdivisions of the three nonassignable room use categories - building service, circulation and mechanical - that are used to support the building's general operation.

D. **Limitations:** Areas defined as assignable should not be included.

1.3.2.1 Building Service Area

A. **Definition:** The sum of all areas on all floors of a building used for custodial supplies, sink rooms, janitorial closets and for public rest rooms. Building Service Area does not include assignable areas (e.g., areas classified as Central Storage and Central Supplies are not part of Building Service Area).

B. **Basis for Measurement:** Building service area is computed by physically measuring or scaling measurement from the inside faces of surfaces that form boundaries of the designated areas. Exclude areas having less than a six-foot, six-inch clear ceiling height unless the criteria of a separate structure are met.

C. **Description:** Included should be janitor closets or similarly small cleanup spaces, maintenance material storage areas, trashrooms exclusively devoted to the storage of nonhazardous waste created by the building occupants as a whole, and public toilets.
D. **Limitations:** Areas defined as central physical plant shop areas, or special purpose storage or maintenance rooms, such as linen closets and housekeeping rooms in residence halls, should not be included. Does not include private rest rooms.

### 1.3.2.2 Circulation Area

**A. Definition:** The sum of all areas on all floors of a building required for physical access to some subdivision of space, whether physically bounded by partitions or not.

**B. Basis for Measurement:** Circulation area is computed by physically measuring or scaling measurements from the inside faces of surfaces that form the boundaries of the designated areas. Exclude areas having less than a six-foot, six-inch clear ceiling height unless the criteria of a separate structure are met.

**C. Description:** Included should be, but is not limited to, public corridors, fire towers, elevator lobbies, tunnels, bridges, and each floor's footprint of elevator shafts, escalators and stairways. Receiving areas, such as loading docks, should be treated as circulation space. Any part of a loading dock that is not covered is to be excluded from both circulation area and the gross building area. Also included are corridors, whether walled or not, provided they are within the outside facelines of the buildings to the extent of the roof drip line.

**D. Limitations:** When determining corridor areas, only spaces required for public access should be included. Restricted access private circulation aisles used only for circulation within an organizational unit's suite of rooms, auditoria, or other working areas should not be included.

### 1.3.2.3 Mechanical Area

**A. Definition:** The sum of all areas on all floors of a building designed to house mechanical equipment, utility services, and shaft areas.

**B. Basis of Measurement:** Mechanical area is computed by physically measuring or scaling measurements from the inside faces of surfaces that form the boundaries of the designated areas. Exclude areas having less than six-foot, six-inch clear ceiling height unless the criteria of a separate structure are met.
C. **Description:** Included should be mechanical areas such as central utility plants, boiler rooms, mechanical and electrical equipment rooms, fuel rooms, meter and communications closets, and each floor's footprint of air ducts, pipe shafts, mechanical service shafts, service chutes and stacks.

D. **Limitations:** Areas designated as private toilets are not included.

### 1.3.3 Net Usable Area

**A. Definition:** The sum of all areas on all floors of a building either assigned to, or available for assignment to, an occupant or specific use, or necessary for the general operation of a building.

**B. Basis for Measurement:** Net usable area is computed by summing the assignable area and the nonassignable area.

Measured in terms of net usable square feet (NUSF),

\[
Net \text{ Usable Area} = \text{Assignable Area} + \text{Nonassignable Area}
\]

**C. Description:** Included should be space subdivisions of the ten assignable major room use categories and the three nonassignable space categories.

**D. Limitations:** Areas defined as structural should not be included. Areas which have 2+ story spaces should only be counted once. Void spaces should be excluded.

### 1.3.4 Void Area

**A. Definition:** That portion of an upper floor which is eliminated by a room that rises above the lower single-floor ceiling height. This upper floor area is designated as "Open To Below."

**B. Basis for Measurement:** Void area is computed by physically measuring or scaling measurements from the inside faces of surfaces that form the boundaries of the designated areas.
1.3.5 Gross Area

A. **Definition:** The sum of all areas on all floors of a building included within the outside faces of its exterior walls, to the extent of the roof drip line, including floor penetration areas, less any Void Area.

B. **Basis for Measurement:** Gross area is computed by physically measuring or scaling measurements from the outside faces of exterior walls. Exclude areas having less than a six-foot, six-inch clear ceiling height unless the criteria of a separate structure are met.

Measured in terms of gross square feet (GSF),

\[
\text{Gross Area} = \text{Net Usable Area} + \text{Structural Area} - \text{Void Area}
\]

C. **Description:** In addition to all the internal floored spaces obviously covered above, gross area should include the following: excavated basement areas; mezzanines, penthouses, and attics; garages; enclosed porches, inner or outer balconies whether walled or not, if they are utilized for operational functions; and corridors whether walled or not, provided they are within the outside face lines of the building, to the extent of the roof drip line. The footprints of stairways, elevator shafts, and ducts (examples of building infrastructure) are to be counted as gross area on each floor through which they pass.

D. **Limitations:** Exclude open areas such as parking lots, playing fields, courts, and light wells.

1.3.6 Structural Area

A. **Definition:** The sum of all areas on all floors of a building that cannot be occupied or put to use because of structural building features.

B. **Basis for Measurement:** It is determined by calculating the difference between the measured gross area and the measured net usable area.

C. **Description:** Examples of building features normally classified as structural areas include exterior walls, fire walls, permanent partitions, unusable areas in attics or basements, or comparable portions of a building with ceiling height restrictions, as well as unexcavated basement areas.
APPENDIX C

APPLICATION AND CERTIFICATION FOR PAYMENT

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<th>PROJECT:</th>
<th>APPLICATION NO:</th>
<th>Distribution to:</th>
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<td>VIA ARCHITECT:</td>
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<td>CONTRACTOR</td>
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CONTRACTOR'S APPLICATION FOR PAYMENT

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

1. ORIGINAL CONTRACT SUM $___________
2. Net change by Change Orders $___________
3. CONTRACT SUM TO DATE (Line 1 ± 2) $___________
4. TOTAL COMPLETED & STORED TO DATE (Column G on G703) $___________
5. RETAINAGE:
   % of Completed Work $ -
   % of Stored Material $ -
   Total Retainage (Lines 5a + 5b c) $___________
6. TOTAL EARNED LESS RETAINAGE $___________
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT (Line 6 from prior Certificate) $___________
8. CURRENT PAYMENT DUE $___________
9. BAL. TO FINISH, INCLUDING RETAINAGE $___________

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ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising the application, the Architect certifies to the Owner that to the best of Architect's knowledge, information and belief the Work has progressed as indicated in the last column of the Application for Payment shown herein. The Architect certifies that the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED $___________

(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and on the Continuation Sheet that are changed to conform with the amount certified.)

ARCHITECT:

By: ___________________________ Date: ___________________________

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.
The Rice University Campus consists of an Urban Forest of over 4,000 trees in a 300-acre area. Stewardship of this priceless investment falls under the Grounds Division of Facilities and Engineering Department. The following guidelines are necessary for the preservation of the majestic beauty of this campus.

DEFINITION:

**Root zone area/Dripline** – The area of soil, extending from the tree trunk to the branch dripline, which contains the majority of a tree’s feeder-root system. This is considered the most important area of a tree’s root zone and shall be protected from disturbance. When possible, 10’ beyond the dripline should also be protected.

DAMAGING CONDITIONS TO AVOID:

A. Compaction of root zone areas by foot and vehicular traffic and material storage. Soil compaction is one of the leading contributors to tree decline and death associated with construction.
B. Poisoning by pouring or spilling chemicals including gasoline, oil, paint, concrete, and other injurious materials on or near root zone areas.
C. Damage by improper pruning techniques.
D. Damage from lack of moisture during periods without adequate natural rainfall, or from changing the natural drainage patterns.
E. Change in soil pH caused by addition of lime in root zones by direct application, runoff, or concrete waste.
F. Damage caused by severing roots ¾” in diameter and larger.
G. Change in grade. Grade change should be limited in root zone areas to a maximum of three inches (3”) cut or fill.
H. Burning of foliage and twigs resulting from expulsion of exhaust.
I. Trunk and limb damage resulting from contact with equipment or vehicles.

PROTECTION PROCEDURES:

1. Limit construction access by placing temporary tree protection fencing around trees to be preserved. Fencing should be placed as far out from the tree’s trunk as possible, preferably a minimum distance to include the branch dripline. In areas where construction access is required, the natural grade shall be protected from compaction by placing a 4”-6” thick blanket of mulch or plywood over natural grade. A combination of mulch and plywood or timber matting may be necessary when frequent travel or extremely heavy traffic is required within root zone areas.
2. Any work, excavation or grading required within the protected root zone areas should be limited to three inches (3”) cut or fill, with no roots over ¾” in diameter being cut. Work in root zone areas should be done by hand. This includes excavation, grading, landscaping, and irrigation installation.
3. Route underground utility lines around root zone areas or bore at a minimum depth of four feet (4’) to eliminate open cuts through root zones. When it is not possible to reroute or to bore under the root systems, hand dig to preserve roots measuring ¾” in diameter and larger.
4. When excavating with a backhoe in tree root zone areas is unavoidable, first cut roots along the edge of the required excavation limits using a conventional trenching machine. (Depth of trench should be limited to the depth of the required excavation for installation of the utility or 3’, whichever is less.) This helps reduce the number of roots damaged by the ripping and tearing caused by excavators. After trenching, make a clean, smooth cut on roots ¾” in diameter and larger using a sharpened saw or pruning shears. Provide trench excavation protection at excavations to minimize trench width. Use only vertical trench walls. Do not bench-cut or step-cut edge where such techniques will further encroach on root zones.
5. Place drives, walks, etc., on or above grade to eliminate altering the root system. Feeder roots of most trees are within 12”-18” of the soil surface.
6. Prior to pouring concrete, create a non-leaching barrier by placing a 6mil thickness layer of plastic sheeting over grade. Turn plastic upward on edges to contain concrete. Remove exposed, visible plastic at end of project.

7. Cover exposed roots within 48 hours of exposure during hot, dry periods to protect the roots from drying out.

8. Service trees to improve growing conditions:
   a. Trim trees according to ANSI A300 – 1995 Tree, Shrub and Other Woody Plant Maintenance – Standard Practices. Trees should be pruned in a manner to maintain their natural shape and form. Do not remove interior sucker growth. All sucker growth should remain for several years after the damage is received and the tree has become re-established.
   b. Deep root fertilizer. Recommend fertilizers – Arbor Green (30-10-7) by Lesco, Inc., or XL Injecto Feed (32-7-7) by the Doggett Corporation. Mix and apply per label instructions in a tank with mechanical agitation. Inject fertilizer on a 3’ square grid extending ten feet (10’) beyond the dripline at an injection pressure of 150 p.s.i. Regular rate – Mix at 40 pounds of fertilizer per 100 gallons of water.
   c. Depth of injection – ten inches (10”) below grade. Injection rate per specifications on product label.
   d. Trees affected by construction should be fertilized annually until the trees have become re-established.

9. During periods of minimal rainfall, supply additional moisture to damaged trees to help eliminate additional stress associated with drought.

10. Due to the threat of Oak Wilt disease, DO NOT prune any oak trees from February through May and October through December. Beetles and fungal mats are active during this period and could transmit the disease. Paint all wounds on living tissue immediately after wounding occurs. Use black paint labeled for arboricultural use.

NOTES:

1. Contractors shall seek consultation with the Grounds Division before any disruption to the campus landscape occurs. A Work Order, shall be generated by the Project Manager or Supervisor in charge of the job. This will help the Grounds Division track down protection procedures and provide a history on the care of the trees.

2. The information provided herein is intended to be used as guidelines for tree preservation. Depending on the project, additional preservation procedures, techniques, and tree services may be required for adequate protection and optimum results.

Only through the combined effort and cooperation of all involved parties can we insure a beautiful campus for future generations.
## FINISH SCHEDULE

### INTERIOR

<table>
<thead>
<tr>
<th>Category</th>
<th>Section</th>
<th>Description</th>
<th>Contractor</th>
<th>Item</th>
<th>Manufacturer</th>
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## Project Name - Line 1
## Project Name - Line 2

Date of Occupancy

## FINISH SCHEDULE

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APPENDIX F

PROJECT WARRANTY FOR GENERAL CONSTRUCTION

WHEREAS, _________________________________(Contractor), Telephone (   ) ______ has performed general construction work on the following project: _________________________________

______________________________
Address _________________________________,
For _________________________________(Owner),
Address _________________________________, and, WHEREAS, Contractor has agreed to warrant said work to be new, unless otherwise specified in the Contract Documents, and that all Work is of good quality, free from faults and defects, and in accordance with the Contract Documents.

NOW THEREFORE, Contractor hereby warrants said work in accordance with terms hereof, complying with terms of Contract with Owner dated _____________________, 19__, that:

We agree to repair or replace to the satisfaction of the Architect all work that may prove defective in workmanship or materials within the warranty period, ordinary wear and tear and unusual abuse or neglect excepted, together with all other work which may be damaged or displaced in so doing.

All repairs or replacements shall have a warranty period equal to the original warranty period as herein stated, dated from the final acceptance of repairs or replacement.

WARRANTY PERIOD One year, STARTING ________________, TERMINATING ________________.

IN WITNESS THEREOF, this instrument has been duly executed this _________ day of _____________________, 19__, for Contractor by

__________________________________________ ________________
(signature) (typed name)

as its _________________.

(position)
APPENDIX G

SPECIAL WARRANTY FOR

WHEREAS, _________________________ (Contractor),
Address ____________________________,
Telephone ( ) __________ has performed ________________________________
work on the following project: ________________________________,
Address ________________________________,
For _________________________ (Owner),
Address ________________________________, and,
WHEREAS, Contractor has agreed to warrant said work to be new, unless otherwise specified in
the Contract Documents, and that all Work is of good quality, free from faults and defects, and in
accordance with the Contract Documents.

NOW THEREFORE, Contractor hereby warrants said work in accordance with terms hereof,
complying with terms of Contract with Owner dated __________________, 19__, that:

We agree to repair or replace to the satisfaction of the Architect all work that may prove
defective in workmanship or materials within the warranty period, ordinary wear and tear and
unusual abuse or neglect excepted, together with all other work which may be damaged or
displaced in so doing.

All repairs or replacements shall have a warranty period equal to the original warranty period as
herein stated, dated from the final acceptance of repairs or replacement.

WARRANTY PERIOD ____ years, STARTING ________________, TERMINATING
______________ .

IN WITNESS THEREOF, this instrument has been duly executed this ________________
day of _____________, 19__, for Contractor by

__________________________________  ______________________________
(signature)                         (typed name)
as its __________________________
(position)
And has been countersigned in accordance with terms and conditions, for Installer by

__________________________________  ______________________________
(signature)                         (typed name)
as its __________________________
(position)

Name of Firm ________________________________
Address ________________________________
**Appendix H**

**FACILITIES ENGINEERING AND PLANNING**

**EQUIPMENT STATUS FORM**

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<tr>
<td><strong>Equipment Condition:</strong></td>
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**Equipment ID#:**

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<table>
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<tr>
<th>Model #: ________________________________</th>
<th>PM Performed by Craft: ____________</th>
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<tr>
<th>Manufacturer: ____________________________</th>
<th>PM Frequency: (every)______________</th>
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<tr>
<th>Capacity: ________________________________</th>
<th>In Service (Startup) Date: ___________</th>
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<table>
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<tr>
<th>Vendor: ________________________________</th>
<th>Replacement Cost: $_______________</th>
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<tr>
<th>Belt/Filter Size(s): ____________________</th>
<th>Covered by a warranty: Yes ( ) No ( )</th>
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<tr>
<th>Warranty Expiration Date: __________________</th>
<th>Warranty Vendor: ________________</th>
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<tr>
<th>Warranty Covers: ____________________________________________</th>
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<tbody>
<tr>
<td>Comments: ____________________________________________________________________</td>
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| Safety Notes: ____________________________________________________________________ | |

**Component Information**

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<tr>
<th>Description: ______________________________</th>
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<th>Serial #: ________________________________</th>
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<th>Frame: ________________________________</th>
<th>HP: ________________________________</th>
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<th>RPM/ROT: ________________________________</th>
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<th>Impeller/Shaft: __________________________</th>
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<th>Spec. Info: ______________________________</th>
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| Spec. Info: ______________________________ | |