

The University of Toledo

**Construction Design Standards
Manual**

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Revisions will be posted on the Internet.

**The University of Toledo
Construction Design Standards Manual**

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PART I - OVERVIEW

A. Purpose of Manual

The University of Toledo Design and Construction department has prepared this manual to assist the Associates who provide professional services for all new construction, remodeling, rehabilitation and maintenance projects at The University of Toledo. Part III of this manual is the design standards which are to be utilized on all projects. This section includes the minimum building requirements which the University has recognized as necessary on all projects. If deviations are necessary to satisfy the conditions of certain projects, the Associate must request and receive approval for such deviation in writing from the Director of Design and Construction.

Throughout this Manual wherever the term Associate is used, the term will be applicable to an architect, engineer or other specialized consultant similarly retained by the University to provide professional services.

B. Administration of Construction Projects

Design and Construction is responsible to the University for managing the design and construction activities for all capital projects, regardless of the source of funding. The selection of consultants and providing leadership to all stages of design and construction through building commissioning are the primary responsibilities. In addition, Design and Construction will provide assistance with the development of programs and initial cost estimates.

A Project Manager will be designated by Design and Construction for each project. All communications from the Associate to the University shall be directed to the Project Manager. The Project Manager will provide guidance to the Associate and leadership to the project and the Building Committee to provide the University a project that is within the established budget, schedule, and quality, and meets the users' requirements.

The following organizational units will provide input in completing the requirements of the projects, and will be involved in the review of the schematic, design, and construction documents:

- Plant Operations will be involved in decision making relative to building operational systems quality, performance, and cost-effective maintenance issues.
- Grounds and Fleet Services is responsible for the care and coordination of all landscaping and site work, including utilities location, walkway locations, irrigation systems, and any other site work on the campus.
- Safety and Risk Management provides advice and consultation in matters relating to the health and safety of faculty, staff, and students. These services include matters relating to asbestos control and other environmental hazards. This office will assign a Safety Representative to most projects.

- Telecommunications and Educational and Information Technology operates and maintains all telecommunication facilities on the campus and is responsible for the development and maintenance of standards for equipment and wiring, and the review of the proposed installation of the inter-building and intra-building telecommunications and data distribution facilities.
- The Office of Accessibility provides advice and consultation in matters relating to accessibility throughout the campus.
- The Campus Environs and Beautification Committee provides advice and consultation in matters relating to landscape, the exterior appearance of buildings and the campus environs in general.

C. Professional Services

The Professional Services Scope and Conditions (found in Appendix C) define and detail the services required during these phases of all locally administered projects:

- Program Validation;
- Schematic Design;
- Design Development;
- Construction Documents;
- Bidding; and
- Construction.

The Professional Services Scope and Conditions will be included and become part of the Professional Services Agreement. It is expected that the Associate become knowledgeable of these requirements and comply with all duties and responsibilities detailed therein.

PART II - BID DOCUMENTS

A. Bid Documents Overview

The Bid Documents consist of:

- 1) Table of Contents**
- 2) Notice to Bidders**
- 3) Bid Form**
- 4) Special Conditions**
- 5) Wage Rates**
- 6) Standard Conditions**
 - Instructions to Bidders
 - Form of Bid Guaranty and Contract Bond
 - Responsible Bidder Information
 - Contract
 - Definitions
 - General Conditions
 - Change Order Procedure and Pricing Guidelines
- 6) Technical Specification**
- 7) Drawings**

The Design and Construction Project Manager is responsible for completing the portion of the Bid Documents which are modified for each project, Items 1-4. The Standard Conditions are the remainder of the Bid Documents and are to be utilized as written. Any revision to the Standard Conditions is to be made through the Special Conditions and must be approved by Design and Construction.

A full copy of the Bid Documents for locally administered projects may be obtained from Design & Construction.

B. Bid Documents Instructions

1. Special Conditions

Special Conditions are intended to modify and supersede information provided in the Instruction to Bidders, General Conditions and the remainder of the Standard Conditions. The format of the Special Conditions shall be such that the intended clause to be modified is clear, and no mistakes can be made. Each section that is being modified should have a heading, such as AGC 2.7 TEMPORARY FACILITIES AND UTILITIES” then, the paragraph to be modified, deleted, or added should read, “Revise 2.7.1.1 to read...” OR “Delete 2.7.1.7 in its entirety” OR “Add 2.7.1.8...” This is the only place in the bid documents that can be used to revise any portion of the Standard Conditions. Associates shall not use the General Requirements section of the Technical Specification for this purpose.

2. Specifications

Construction Specifications shall utilize standard CSI coding. **The General Requirement Section shall not include items that are already covered in the General Conditions.**

The Associate is cautioned to study the General Conditions before beginning the preparation of specifications, and to refer to them constantly through the writing of specifications. Particular attention should be paid to standardized or computerized specifications written by outside firms who are employed to write technical sections, to ascertain that nothing contained in those specifications disagrees with provisions in the General Conditions or these supplements. Complete coordination of all Bid Documents is the responsibility of the Associate.

Computerized or Standard Specifications

The Associate is cautioned that computerized or standard specifications must be edited to suit the requirements of the project being specified. The excuse that this mandatory editing of the Associate's standard specification will result in excessive costs or delays in producing the construction documents will not be accepted. Specifications must be tailored to the project.

Prohibited Language

The following words and phrases are expressly prohibited in the specifications or on the drawings:

- The note "by others." This phrase must not be used. Name the specific contractor or agent responsible.
- The phrase "This contractor shall..." to begin instructions to a contractor. These words are redundant, since instructions are directed to a single prime contractor and it should be obvious to which contractor the instructions are directed.
- The words "alternate" or "substitute" to indicate an "option." The words alternate and substitute have specific definitions in the front-end contract documents. The word "option" should be used to indicate items for which the contractor may make a choice without affecting the contract.
- The word "mechanical" when referring to the Plumbing Contract, Fire Protection Contract, or the HVAC Contract, or when referring to any of the contractors for these divisions of work. The applicable trade must be used when making these references.
- The word "owner." Use the name of the specific entity referenced. This may be "the University," or "the University Project Manager," or the University Design & Construction department," or other. Be specific as to who the reference is made.

3. Construction Drawings

Construction Drawings shall incorporate a title block with the following information listed in boldface type:

THE UNIVERSITY OF TOLEDO
PROJECT NAME
UT PROJECT NUMBER

The official title and number of the project will be stated in the Agreement. If a building name is not incorporated in the project title, the Associate must incorporate the building name in the drawing title block.

The construction drawings also shall utilize column numbers to provide accurate coordinates when doing renovations in existing buildings. The column numbers shall coincide with the original building design. All room numbers shall be assigned by the University of Toledo Office of Facilities Information Systems (FIS). The Associate shall provide the FIS with a set of the program drawings prior to the schematic design phase for this purpose. The Associate shall consult with FIS whenever room numbers are added or revised during the project.

The Associate shall provide all drawings, including record drawings and bulletin sketches in .tif format, Adobe (.pdf) format and Autodesk AutoCad (.dwg) format in the software version specified by FIS. All External References and inserted files/objects shall be bound to the individual drawings. All specialized fonts, shapes or other attributes shall be included. Plot logs or pen settings shall also be provided. The electronic file for each drawing should be complete and distinct, allowing individual drawings to be easily opened or plotted with all necessary layers turned “on,” all other layers turned “off,” and all external references, inserted files/objects (such as fonts and symbols) bound to the individual drawing.

CAD layers should be intelligently labeled. A document that lists each of the layer names along with a description of each layer should be provided for each individual AutoCAD drawing. All text should be placed in separate layers. That is, a layer should not contain both text and drawings. As many text layers as needed may be used. A layer should only contain objects drawn in one line color and one line type. In other words, line color and line type should not be set for the individual objects but, rather by the layer.

At a *minimum*, the following layers should be used when appropriate:

Column Lines	Text
Walls	Doors
Windows	Electrical
Plumbing	Mechanical
Data/Communication	Permanent/Fixed Furniture
Fire & Safety	Room Numbers and related Area Identifiers
Area, showing net sq. ft. of each distinct area (room, corridor, etc.)	

In addition, an index of documents, which describes each drawing, its contents, and layer labels, must be included with the record drawings.

Specifications, Addenda and Bulletins shall be provided in Microsoft Word format.

In addition to the electronic formats, the Associate shall provide two bound hard copies of all record drawings, in a standard architectural size, usually 24”x 36” or 30”x 42”.

Also see Article 10 of the General Conditions for Contract Completion requirements.

At project closeout, in addition to two hard copies, the Associate is to provide copy of all project files in electronic form in Adobe (.pdf) format. (This includes meeting minutes, correspondence, transmittal, invoices, shop drawing logs, specifications, operating and maintenance manuals, warranties, etc.) Provide both a hard copy and electronic copy of index of materials included.

At project closeout, in addition to two hard copies of the Record (As-Built) Drawings, the Associate is to provide electronic copy of these drawings in .tif format, Adobe (.pdf) format and Autodesk AutoCad (.dwg) format. Comply with all layer and format requirements outlined above. Clearly label drawings as "Record (As-Built) Drawings," and indicate project closeout date.

PART III - DESIGN STANDARDS

A. Design Standards Overview

Buildings shall be designed as quality institutional buildings or renovations, and heavy-duty components shall be selected and specified to provide maximum life-cycle usefulness. The requirement that the project be designed within available funds is not a license to design short life cycle, speculative-type construction or to specify inferior or inappropriate material. **The Associate is responsible for providing and recommending cost-effective designs that achieve the quality institutional building requirement. In addition, the Associate shall provide all necessary value engineering to ensure funds allocated are utilized in the requirements established herein.**

The Associate shall perform professional services, including services customarily furnished in accordance with generally accepted architectural or engineering services to provide the Owner a Project within the Construction Budget. The Associate shall provide such services and comply with the applicable Sections of the Ohio Revised Code and any applicable state rules and regulations, any applicable federal and local statutes, ordinances, rules, regulations, and building codes. The University has recognized minimum building requirements and has summarized these requirements in the Design Standards.

The University is dedicated to the principle of conserving energy. University personnel will scrutinize proposed design for means of reducing not only initial cost of energy consuming equipment, but also long-range operational costs. The Associate must work in harmony with its consultants to design new buildings and to remodel existing buildings to make the most efficient use of building materials and energy sources available.

Certain design standards will be guidelines for the Associate to develop specifications. Other standards are specifications that shall be incorporated by the Associate.

The Associate is responsible for ensuring these standards are met, not only during the design process, but also during construction. The Associate is also responsible for verifying that the Standards being used are current.

B. Design Standards

The Design Standards are organized in Construction Specifications Institute (CSI) format, Divisions 1 through 16. Standards dealing with specific spaces have been placed in **Appendix A**.

Division 1. GENERAL REQUIREMENTS

Summary of Work Section

- The Associate shall include a Summary of Work section in Division 1 of the Technical Specifications.
 - A general description of all elements of the project, including exterior work and any other related work, is required. This description, though brief, should be complete enough for each contract so that prospective bidders can understand the full scope. The use for which the project is being built shall be explained. Some parts of this description can be copied from the Program of Requirements.
 - List the separate contracts under which the work will be accomplished and outline the scope of work included in each contract.
 - Work on the Other Projects: If other work, outside the scope of contracts for this project, will be performed simultaneously with the work on this project, explain how Contractors must cooperate with outside Contractors and with the University to avoid interference with each other's work.
 - Scheduling the Work: Fully describe all job conditions that will affect phasing and scheduling of the work. Particular attention shall be given to the scheduling of remodeling in buildings that will remain in operation during remodeling. Examples of some items to consider are:
 - Providing and Maintaining Means of Ingress and Egress.
 - Maintaining Security for the University.
 - Shared Use of Docking Facilities.
 - Storing of Construction Materials and Delivery Schedules.
 - Scheduling For Moves by University Departments.
 - List and description of all Alternates being bid

Project Meetings

- **PRECONSTRUCTION MEETING:** The University will schedule and furnish the agenda for a pre-construction meeting after award of contract; attendance will be required for the Associate and successful bidders. Among items to be discussed are provisions specified in this division of the specifications.
- **PROGRESS MEETING:** Include the following in the specifications; edit and revise to suit job conditions. The General Contractor shall schedule a weekly job progress meeting with other prime contractors and major subcontractors and shall notify the Associate of the time and place of the meeting. Subsequent meetings shall be held on the same day and hour of the week for the duration of the construction period; except, upon instructions of the Associate, the scheduled meetings may be increased or decreased as required by the progress of the work. The Associate shall take minutes at each meeting. Typed copies of the minutes shall be distributed to all concerned parties. Minutes may be distributed via the Internet.

Barriers

- **INGRESS AND EGRESS FOR BUILDINGS:** During joint occupancy of buildings, entrances and exits for public use must be provided to meet code requirements. A minimum of one ingress, and egress, and path of travel that is accessible to individuals with disabilities must be maintained to all user occupied portions of the building.
- **SIDEWALK BARRICADES:** Provide a detail for sidewalk barricades as required to discourage pedestrian traffic. The barricades are to be at least 42 inches high and of suitable width to completely obstruct passage beyond on the closed sidewalk. The barricade shall consist of: a rigid frame with a 2X6 wooden toe board affixed approximately one inch above the sidewalk across the entire width, cross bracing to hold the barricade in place, and orange safety fencing affixed to the frame. Specify/detail a sign stating “SIDEWALK CLOSED” affixed to the structure. Signage must meet all applicable ADA requirements.
- **CONSTRUCTION FENCE:** A 6 ft. high fence with gates shall be erected around the project site and storage yards. Fence and location shall be subject to the approval of the University Project Manager. Show fence location on drawings.
 - Usually a chain link wire fence on steel posts is sufficient; however, where appearance is a consideration, a privacy type fence might be required, provided the budget permits such construction.
 - Temporary plastic fence material may be used for projects with durations of less than one month provided they are maintained.
 - Barbed wire used on any part of the fence is prohibited.
 - 'No Trespassing' signs, which meet OSHA requirements, shall be specified.

Security

- **BUILDING SECURITY:** During construction, one exterior door of any enclosed structure shall be provided with a lockset with a UT core. The General Contractor shall obtain core from and return same to the University Project Manager.
- **FENCE GATES:** Except during working hours, gates shall be kept locked by the General Contractor at all times. One gate shall be double locked with a UT padlock and the contractor's padlock in a manner that will allow access by unlocking either padlock.

Access, Parking and Traffic

- **CONSTRUCTION AREA MAINTENANCE AND ACCESS:** If existing streets and roads on campus must be used, a detailed plan of the routes to be used must be worked out in cooperation with University personnel. The final approved plan shall be shown on the project drawings, and specifications must stipulate that no other streets and roads be used.
- **CLEAN-UP ENFORCEMENT:** Specifications shall contain provisions that Contractors must remove mud and spillage from public and university streets without delay. Failure to clean streets promptly could result in streets being cleaned by the University or other public agency at the Contractor's expense.
- **REPAIRS OF DAMAGES TO FACILITIES:** Specifications shall also contain provisions that

damage to roads or other facilities on University property, resulting from hauling, storage of materials, or other activities in connection with the work, shall be repaired or replaced, at no expense to the University, by the Contractor causing the damage. Repairs or replacement shall be made to the satisfaction of the University Project Manager.

- **WEED CONTROL:** Specify that the General Contractor must cut the weeds inside the construction fence as often as necessary to maintain a neat appearance at the project site.

Maintenance of Traffic

- **PLANNING FOR TEMPORARY CONTROL:** The University Police Department must be notified at least two weeks in advance of any anticipated work affecting traffic flow. To assure maintenance of flow and to safeguard all parties involved in planning temporary routing, a field inspection should be made jointly by the Associate, the University, and Contractor personnel prior to performing any work that would interrupt normal traffic patterns. Rerouting of traffic shall be planned as to route and direction, in cooperation with the University Police Department and as approved by the University Project Manager.
- **CONTRACTOR'S RESPONSIBILITIES:** The contractor, whose work requires interruption of traffic, shall be required to post signs in all affected areas, in sufficient numbers and with appropriate messages, to warn motorists entering the construction zone and to alleviate conflicts and confusion among motorists or pedestrians at intersections, crossings, turns, and other obstructions to normal traffic flow. Temporary signs shall be as shown in the Ohio Manual of Uniform Traffic Control Devices for Streets and Highways, Ohio Department of Transportation. Temporary lanes shall be well marked, and obstructions, barriers, lane changes, or detours shall be indicated by appropriate signage at each point of potential confusion, as well as at each change in direction of a temporary route. University Police Department shall be notified in advance of the anticipated time of return to normal traffic patterns. Upon completion of construction affecting streets or traffic flow, but before temporary control devices and lane markings are removed, the area shall be restored to receive traffic in the normal pattern. The Police Department shall be notified of the actual time of completion of restoration.

Noise and Dust Control

- In occupied buildings the Associate shall indicate areas for which noise and dust control must be provided and shall specify methods of control. If details of installations are involved, specify these in the applicable sections of the technical specifications. The General Contractor shall install barriers indicated by the Associate and shall provide other dust control barriers as required by construction operations.

Closeout Requirements

- **CLEANING:** The Associate should review Article 11 (11.4 Final Cleaning) of the General Conditions to determine whether or not this subject is adequately covered; some amplification may be required for the specific project.
- **OPERATION AND MAINTENANCE DATA:** Detailed requirements should be stipulated in the appropriate sections of the specifications. For items of General Construction, specify that

information for care and maintenance be furnished for any item requiring more than ordinary custodial care. For mechanized equipment and electrical equipment, specify that operations manuals be provided, and for special equipment stipulate that, in addition to operating manuals, the original equipment manufacturer provide demonstrations and operating instructions by factory trained employees to designated University personnel.

- OPERATION AND MAINTENANCE MANUALS: The Associate shall review the contractor's submittals of manuals for completeness, correctness, and sufficiency of data. After approving the content and format, the Associate shall obtain two copies for submittal to the University Project Manager. The Associate shall obtain signed receipts for the manuals to be included with the Associates final pay request.
 - FORMAT FOR MANUALS: Manuals shall consist of manufacturer's typed or printed operation instructions and maintenance data, catalog cuts, and other data listed below, bound in 8-1/2" x 11" hard-backed, three ring binders. Vinyl pocket inserts may be used for folded sheets. The spine of the binder shall list The University of Toledo, Project Name, Project Number, and Prime Contract Name. In cases where more than one binder is necessary, volume number shall be indicated on the spine of each binder: e.g. "Volume 1 of 3," etc. Sections shall be separated with labeled, tabbed dividers. Material shall be assembled as follows:
 - FIRST PAGE: The University of Toledo, Project Name, Project Number, Date, Prime Contract Name, Prime Contractor Name; Address; Phone number.
 - SECOND PAGE: List of subcontracts with Contractor Name, Address, Phone number.
 - THIRD PAGE: Index organized by prime contractor and subcontractors work.
 - FIRST SECTION: Copies of all permits, inspection certificates and all other official approvals required under the contract.
 - SECOND SECTION: Shop drawings, catalog cuts, manufacturer's brochures, operating instructions and all other related information organized per the index and separated with labeled tabbed dividers.
 - THIRD SECTION: Index of guarantee/warranty information for all equipment and labor. Index shall include equipment item, manufacturer, contact person/firm, address and phone number for guarantee/warranty work, start and end dates of guarantee/warranty. Supplemental information such as guarantee letters, affidavits or certificates should be included after the index.

Division 2. SITE WORK

Drainage

- All grades shall slope away from buildings at 3" per foot (minimum).
- All sewers and drains shall be installed to provide self-cleaning velocities.

Asphalt Pavement

- Bituminous Paving will be as per ODOT Construction and Materials Specifications. Cross section will be as engineered. Mix design will be as engineered as directed by the University. Maximum amount of recycled material will be 15% for base course and 10% for wearing course.
- Where asphalt pavement is cut, cracked, or in any other way damaged by construction or related activities, it will be the Contractor's responsibility to replace and the following shall be required:
 - Asphalt shall be saw-cut and removed in a straight line, perpendicular to the direction of roadway or walk.
 - New pavement shall conform to ODOT Items 402 and 404. Thickness will be determined by the University upon examination of existing material after cut.
 - All new asphalt in parking areas shall be sealed with two (2) applications of coal tar pitch emulsion, meeting all requirements of federal specification R-P-355D. The first application shall be loaded with sand at a rate of 6 lbs. of sand per gallon of sealer. Sealer shall not be diluted with water beyond the manufacturer's recommendations. Rate of application shall meet the manufacturer's recommendations.
 - Asphalt will be placed in two (2) compacted lifts.
 - All new asphalt joints will be sealed with a non-tracking, rubberized asphaltic crack filler. AC 20 will not be allowed. An oil bath, doubled jacketed, agitated melting kettle shall be used for preparation of this product, "HiSpec" by W.R. Meadows or equal.

Irrigation Systems

- Lawn irrigation systems shall be used only in special circumstances, and only with written direction from Design and Construction.
- The Manager of Grounds and Fleet Services shall be consulted prior to system design.

Sidewalks

- Walk width to be a minimum of 8'.
- Walk thickness to be a minimum of 5.5" for walks not normally receiving vehicular traffic.
- Walk thickness to be a minimum of 8" for walks normally receiving vehicular traffic.
- Sidewalk/curb interface shall be monolithic.

- ADA curb ramps shall be at least 6' wide at narrowest point.
- Walk placement, when parallel to a street, shall abut the street curb and be monolithic.
- Reinforcing, when needed, shall include only fiber strands (no steel).

Waste Removal

- Solid waste shall be removed from campus buildings via open top front-load containers (dumpsters) or front-load containers attached to compactors (compactors). The method of waste removal shall be determined by several factors, such as:
 - building purpose.
 - number of occupants.
 - any food service operations.
- Open Top Front-load Container Method: The following scenarios are listed in priority order of request, with the first being the most attractive.
 - In buildings with raised truck docks, the dumpster shall be positioned directly against the dock or in close proximity, affording the opportunity to fabricate a dock extension, enabling employees direct and easy access to dump refuse. The truck dock shall be large enough to accommodate two (2) additional 4' x 4' x 4' cage-type containers used to stage corrugated cardboard and bags of cans and glass. The exterior door closest to the dumpster shall provide for a clearance of 36" for trash removal with a tilt truck.
 - In buildings without raised truck docks, dumpsters shall be positioned in close proximity (30 ft. or less) to service entrance/exits. The dumpster shall be positioned on an 8' x 8', 8" reinforced concrete base. An 8' x 8' x 12' open-front (3-sided enclosure) shall be included. (The material utilized for construction shall be determined by architectural aesthetics.)
- Front-load Container Attached to Compactor Method: The following scenarios are listed in priority order of request, with the first being the most attractive.
 - In buildings with raised truck docks and adjacent service areas (rooms), compactors are to be positioned so as to allow inside loading of refuse (a through-the-wall system would be utilized, allowing employees to discard refuse via an inside chute attached to an outside compactor). The dock or service area shall be large enough to accommodate two (2) additional 4' x 4' x 4' cage-type containers used to stage corrugated cardboard and bags of cans and glass. The compactor shall be positioned on an 8" reinforced concrete base (dimensions shall be determined according to compactor specifications). Electrical service will require 3-phase, NEMA 3R fused disconnect. Voltage and amperage to be determined according to compactor specifications.

- In buildings with raised truck docks and no adjacent service areas, compactors are to be positioned directly against the dock or in close proximity, affording the opportunity to fabricate a dock extension, allowing employees direct and easy access to dump refuse. The dock shall be large enough to accommodate two (2) additional 4' x 4' x 4' cage-type containers used to stage corrugated cardboard and bagged cans and glass. The compactor shall be positioned on an 8" reinforced concrete base (dimensions shall be determined according to contractor specifications). Electrical service will require 3-phase, NEMA 3R fused disconnect. Voltage and amperage to be determined according to compactor specifications.
- In buildings without raised truck docks, compactors are to be positioned in close proximity (30' or less) to service entrance/exits. The compactor shall be positioned on an 8" reinforced base (dimensions shall be determined according to compactor specifications). Electrical service will require 3-phase, NEMA 3R fused disconnects. Voltage and amperage to be determined according to contractor specifications. An enclosure shall be included that is large enough to accommodate two (2) additional 4' x 4' x 4' cage-type containers used to stage corrugated cardboard and bags of cans and glass (dimensions shall be determined according to compactor specifications).

Underground Utilities

- The consultant shall lay out all cable, conduit, duct banks, piping and, in general, all underground work in a manner to avoid all existing trees, shrubs, etc., wherever possible. Avoid root structures of all plantings. Final layout must be approved by the University.
- The Contractor shall notify Design and Construction 48 hours prior to backfilling any utility trench so that the University may record the exact location of the site utility for its Master Utility Plan.

Landscaping

- The contractor shall provide all labor, materials and equipment necessary for the planting of all trees, shrubs, groundcovers and lawn areas as shown on the drawings. Additionally, the contractor shall repair/replace all landscaping damaged through construction activities and related activities for the proposed project. This will not be limited to the project boundaries if damage occurs outside the referenced boundaries in support of the proposed project. This shall include, but not be limited to, damage caused by vehicles (construction, delivery service, personal, etc.) workers, trenching, installation and negligence.
- The contractor shall take the necessary precautions including watering, fertilizing, weeding, reseeded/ re-laying of sod, where and when necessary to establish a completely filled-in, weed-free lawn within the project construction limits. It is recognized that a minimum period of at least 60 days will be required to achieve a uniform, completely filled-in lawn. Where specified planting dates have not been achieved, additional maintenance time may be necessary. The make-up of the lawn shall consist only of the specified grass seed varieties. Weed-type grasses (quack grass, tall-fescue, etc.) will not be allowed. If present, they must be chemically removed and their vacated spot filled in with the specified lawn mix prior to acceptance. This circumstance could add additional maintenance time to the project. Until final acceptance of the project by the Landscape Architect, any washouts resulting from sudden and/or unusual amounts of rain that result in loss of soil, seed, sod, etc. must be restored by the contractor at the

contractor's expense within 30 days of the date of the loss. Any settlement of soil in trench areas within one year after project acceptance will be corrected by the contractor at the contractor's expense. This shall include any necessary reseeding/sodding and subsequent maintenance until acceptance by the Landscape Architect and/or owner.

- **Lawn Areas**

- **Construction:** Construction of lawn areas will conform to Ohio State University Extension Service Bulletin **Lawn Establishment, Bulletin 546**.
<http://ohioline.osu.edu/b546/index.html>
- **Compaction:** In lawn or planting areas, where soil has been compacted for any reason: Compaction will be relieved to a minimum depth of 1.5'. Where ingress to a project requires the crossing of existing established turf; a 1.5' depth of wood chips will be laid down and maintained as a road so as to minimize compaction of the turf area. An alternative to this will be to use an approved road mat material.
- **Seed:** Unless otherwise directed the university will furnish seed to the contractor. In projects involving over 1 acre to seed, the contractor will include in the bid a per square foot cost allowance as directed by the university for purchase of seed. The university will advise the contractor of the specific blend of seed to purchase and source (s) for the seed.
- **Sod:** The University will advise specifier of the specific blend of sod to specify for inclusion in the project.

- **Trees and Shrubs**

- **Plants** (trees, shrubs, groundcovers) shall be guaranteed to be in a healthy, vigorous condition one year from final acceptance. Unsatisfactory plants shall be removed and replaced with plants equal to originally-specified plants at no additional cost to the owner. Additional plant maintenance needs after initial planting and watering will be provided by the University.
- **Protection of Existing Plant Material.** When construction occurs in the vicinity of existing plant material – precautions will be taken to protect existing plant material that follows recommendations of the American Nurserymen's Association.
- **Plant Material:** All plant materials shall be specimen quality, nursery grown, sound, healthily, and fully developed – free from insect and disease damage. Use freshly dug plant materials. Any necessary pruning shall be done at the time of planting.
- **Plant material size** and form shall be as specified in the latest edition of "*American Standard for Nursery Stock*". Where a minimum and maximum size is specified, an average of these sizes is required throughout the planting. Measure all plants when branches are in the normal position. Height and spread dimensions specified are for the main body of the plant, not from branch tip to tip.
- **Planting:** Planting will conform to Ohio State University Bulletin. HYG-1014- on line @ <http://ohioline.osu.edu/hyg-fact/1000/1014.html>

- All burlap, twine and any wire basket will be completely removed from the plant ball and disposed of off site.
- The fungal inoculant Mycorrhizal will be incorporated into the planting soil surrounding the roots per manufactures instructions.

- **Lawn Irrigation Systems**

- **GENERAL:** When an irrigation system is approved to be included in the project, bid specifications will follow Draft specifications as by **The Irrigations Association.** www.irrigation.org/PDF/IABMPsept2003draft.pdf.
- **Products:**
 - **Valves & Heads:** All materials will be commercial grade and match existing products used by the university unless directed otherwise.
 - **Controllers:** Unless otherwise directed the university will furnish the controller to the contractor. In projects involving solar powered controllers, or multiple controllers, the contractor will include a specified allowance for a controller.
- **Start-up and Shutdown of System**
 - Drainage of system in the first fall, following acceptance of the installation shall be the total responsibility of the Contractor.
 - The Contractor shall start up the system in the spring following the fall drainage.
- **As-Built Drawing:** After completion of the installation, the Contractor shall furnish an electronic "as-built" drawing showing all sprinkler heads, valves, drains, pipelines, quick couplers and locations to scale in a format that will interface with the universities electronic utilities inventory drawings. Instruction sheets and parts lists covering all operating equipment will be bound into a folder and furnished to the Owner in duplicate.

Division 3. CONCRETE

Cast-in-Place Concrete

- Exterior concrete steps: No nosings. Non-slip broom finish.
- Interior concrete steps: No nosings. Use rubber treads.
- Concrete will be Class III as per the latest version of ODOT Construction and Materials Specifications. Sub-base will be as engineered. Concrete will be air entrained to 6%.
- All sidewalk concrete to be ODOT Class C, 7 bag, and contain chopped fiberglass (1.5#/C.Y.). A High Range Water Reducer/Super Plasticizer shall be utilized. Concrete shall have a maximum slump of 3" before the HRWR/SP is added, and a slump of 6" – 8" after, at point of distribution (out of the shoot).
- All sidewalk forms shall be a minimum of 5 ½" deep to insure a minimum of 5" depth of concrete.
- A fugitive dye curing compound, compatible with a penetrating sealer, shall be used for all exterior concrete. A penetrating sealer shall be applied, per manufacturer's instructions, a minimum of thirty days after the application of the curing compound.

Division 4. MASONRY

Lannon Stone

- All new buildings, and additions to buildings, north of the Ottawa River on the Bancroft Campus are required to utilize Lannon Stone on a minimum of 50 percent of the exterior surface. Buildings south of the river may be permitted to utilize Lannon stone or a manufactured stone such as Arriscraft as a feature element. Manufactured stone may be substituted for Lannon Stone if a substantial cost saving is achieved due to this substitution and written approval from the Director of Design and Construction.

Division 5. METALS

Railings

- All exterior railings shall be Schedule 40 welded, galvanized steel pipe, painted.
- Aluminum railings are prohibited.

Division 7. THERMAL MOISTURE PROTECTION

Roofing

- **Abstract:** The University of Toledo standard roof system is a built-up-roof (BUR) consisting of an SEBS base sheet and three plies of type 6 glass felts installed in modified asphalt. A modified asphalt flood coat with limestone (3/8") ballast completes the field of the roof. Flashings consist of 2 plies of type 6 glass felts in modified asphalt followed by a mineral surface cap-sheet. Exposed metals are to be Kynar coated aluminum (minimum 050) or galvanized steel (minimum 24 gage). All flashings are to be protected with counter-flashing. Manufacturer details are to be considered minimum standards. The University appointed Roof Consultant is to be utilized to review specifications and to insure quality during the submittal and roofing process. A moisture survey will be conducted at the end of the project for quality assurance. Specifications are performance based. The following manufacturers (others are available) have systems that meet or exceed the standards set forth herein; SR Products, W.P. Hickman, Tremco, Garland, Ecology, Barrett. A twenty year, non-prorated no dollar limit warranty must be provided by the manufacturer of the roof materials upon completion of the job. The installing contractor is to be responsible for the first two years of the warranty.

- **Specifications:** Because each building is different, custom specifications must be created. Due to the many variables involved, listing each is beyond the scope of this standard. As part of the submittal process, the manufacturer providing the warranty must accept the specifications as written and include an affidavit statement to that effect. Good roofing practices (National Roofing Contractors Assn.) and safety (OSHA and others) must be adhered to. Building Codes must be complied with. University of Toledo procedures and conduct for contractors while on campus must also be adhered to and may supersede the specification. Utilizing any or all parts of this standard does not in any way negate the architects' liability.

- **Product Standards:**
 - Sheet Goods

Base Sheet

<u>Test</u>	<u>Typical Value</u>	<u>Test Method</u>
Tensile Strength	100 lbf/in MD 85 lbf/in XMD	ASTM D 146
Elongation	45% MD 50% XMD	ASTM D 146
Tensile Tear Strength	115 lbf. MD 85 lbf XMD	ASTM D 4073
Asbestos Content	0%	EPA/600/R-93/116
Fire Resistance	Pass, Class A	ASTM E 108/UL 790
Thickness	60 mils	ASTM D 1777
Pliability	Pass	ASTM D 146
Asphalt	16 lbs/100 ft ²	ASTM D 146
Surfacing	10 lbs/100 ft ²	ASTM D 146
Roll Dimensions	39-1/2" x 67'	ASTM D 146

Base Sheet – Cont'd

Test	Typical Value	Test Method
Average Roll Weight	71 lbs.	ASTM D 146
Compatibility of Felt Coating With Asphalt Roofing Bitumen	Oliensis Test, No Exudate	ASTM D 1370
Average Minimum Adhesion Strength to Felt Coating After Conditioning:		
1) 24 Hrs. @ 73°F	12.9 lbf/in	
2) 7 Days @ 73°F	12.5 lbf/in	
3) 30 Days @ 73°F	10.7 lbf/in	
4) 6 Months @ 73°F	13.0 lbf/in	
5) 1 Year @ 73°F	9.3 lbf/in	

Ply Sheets

Test	Typical Value	Test Method
Breaking Strength	60 lbf/in., MD & CMD	ASTM D 146
Pliability	Pass	ASTM D 146
Ash	70-88%	ASTM D 146
Bituminous Saturant	3.0 lb/100 ft ² , min.	ASTM D 146
Mass of Desaturated Glass Felt	1.9 – 2.2 lb/100 ft ²	ASTM D 146
Moisture	1% max.	ASTM D 95
Asbestos Content	0%	EPA 600/M4-82-020
Fire Resistance	Class A	ASTM E 108
Adherent Comminuted Surfacing	2.5/lb 100 ft ² , max.	ASTM D 146
Dry Mass of Asphalt Impregnated Glass	6 lb/100 ft ² , min.	ASTM D 146

- Coatings and Adhesives

Base Sheet and Flashing Adhesive

Test	Typical Value	Test Method
Softening Point	185-205 °F	ASTM D 36
Flash Point	550 °F or greater	ASTM D 92
Penetration	15-20 units, 25 °C	ASTM D 5
Ductility	3.5 cm, 25 °C	ASTM D 113
Tensile Strength	90 psi	ASTM D 412
Elongation	150%	ASTM D 412
Density	1.0 or greater	ASTM D 70
Fire Resistance	Pass, Class A	ASTM E 108/UL 790
Asbestos Content	0%	EPA/600/R-93/116
Cold Temperature Bend	40 °F	ASTM D 3111
Softening Point Temperature Fallback	10 °F or less (5 hours at 500 °F, 450 g. material in closed one quart container)	HRC 632

Interply Adhesive

Test	Typical Value	Test Method
Softening Point	185-205 °F	ASTM D 36
Flash Point	550 °F or greater	ASTM D 92
Penetration	20 units	ASTM D 5
Penetration Index	6.0	Calculated Value
Tensile Strength	60 psi	ASTM D 412
Elongation	1000%	ASTM D 412
Density	1.0 or greater	ASTM D 70
Asbestos Content	0%	EPA/600/R-93/116
Cold Temperature Bend	30 °F	ASTM D 3111
Softening Point Temperature Fallback	No fallback (5 hours at 500 °F, 450 g. material in open one quart container)	HRC
T-Peel Adhesion Strength Coating to Felt After Conditioning:		
1) 24 Hrs. @ 73°F	6.2 lb/in.	ASTM D 1876
2) 7 Days @ 73°F	6.9 lb/in.	
Fire Resistance	Pass, Class A	ASTM E 108/UL 790

Flood Coat/Protective Coating

Test	Typical Value	Test Method
Softening Point	185-205 °F	ASTM D 36
Flash Point	550 °F or greater	ASTM D 92
Penetration	20 units	ASTM D 5
Penetration Index	6.0	Calculated Value
Tensile Strength	60 psi	ASTM D 412
Elongation	1000%	ASTM D 412
Density	1.0 or greater	ASTM D 70
Asbestos Content	0%	EPA/600/R-93/116
Cold Temperature Bend	30 °F	ASTM D 3111
Softening Point Temperature Fallback	No fallback (5 hours at 500 °F, 450 g. material in open one quart container)	HRC
T-Peel Adhesion Strength Coating to Felt After Conditioning:		
1) 24 Hrs. @ 73°F	6.2 lb/in.	ASTM D 1876
2) 7 Days @ 73°F	6.9 lb/in.	
Fire Resistance	Pass, Class A	ASTM E 108/UL 790

Flashing Base Ply Felt

Test	Typical Value	Test Method
Breaking Strength	60 lbf/in., MD & CMD	ASTM D 146
Pliability	Pass	ASTM D 146
Ash	70-88%	ASTM D 146

Flashing Base Ply Felt – Cont'd

Test	Typical Value	Test Method
Bituminous Saturant	3.0 lb/100 ft ² , min.	ASTM D 146
Mass of Desaturated Glass Felt	1.9 – 2.2 lb/100 ft ²	ASTM D 146
Moisture	1% max.	ASTM D 95
Asbestos Content	0%	EPA 600/M4-82-020
Fire Resistance	Class A	ASTM E 108
Adherent Comminuted Surfacing	2.5/lb 100 ft ² , max.	ASTM D 146
Dry Mass of Asphalt Impregnated Glass	6 lb/100 ft ² , min.	ASTM D 146

Flashing Top Ply

Test	Typical Value	Test Method
Thickness, mils (mm)	160 (4.0)	ASTM D 5147/D 6164
Maximum Load, 73.4 ± 3.6°F (23 ± 2°C), lbf/in (kN/m)	132 (23.1) MD 90 (15.8)	ASTM D 5147/D 6164
Elongation at Max. Load, 73.4 ± 3.6°F (23 ± 2°C), %	63 MD 68 XMD	ASTM D 5147/D 6164
Maximum Load, 0 ± 3.6°F (-18 ± 2°C), lbf/in (kN/m)	166 (29.1) MD 119 (20.8) XMD	ASTM D 5147/D 6164
Elongation at Max. Load, 0 ± 3.6°F (-18 ± 2°C), %	35 MD 34 XMD	ASTM D 5147/D 6164
Tear Strength at 73.4 ± 3.6°F (23 ± 2°C), lbf (N)	164 (730) MD 121 (538) XMD	ASTM D 5147/D 6164
Low Temperature Flexibility, °F (°C)	-15 (-26)	ASTM D 5147/D 6164
Dimensional Stability, %	0.3	ASTM D 5147/D 6164
Compound Stability, °F (°C)	250 (121)	ASTM D 5147/D 6164
Net Mass per Unit Area Lbs/100 ft ² (g/m ²)	106 (5,175)	ASTM D 228
Asbestos Content	0%	EPA/600/R-93/116
Fire Resistance	Pass, Class A	UL 790/ASTM E 108
Length (Average)	32.8 ft. (10 M)	Tape Measure

- Roofing Aggregate: ASTM D 1863-83, Limestone, Clean, washed roof gravel, or approved equal. Do not use: Joplin chats, scoria, volcanic rock, crushed oyster and clam shells, crushed brick tile, or cinders. Samples of gravel are to be submitted to manufacturer's representative and owner's representative for approval prior to application.
- Warranty: A warranty must be provided and shall be a full system warranty that includes metal, insulation, etc.

Division 8. DOORS AND HARDWARE

General Information

- Exterior doors shall be made of metal and approved by The University to blend with architecture of the building.
- All multiple exterior doors shall have fixed mullion separations. At least one pair of doors shall have a key removable mullion at each opening.
- At least one door at main accessible entrances shall be equipped with ADA power door operator/s. Consult with Facilities and Construction Lock Shop for possible options.
- Demolition doors and lock hardware removals shall be coordinated with The University Lock Shop through Facilities and Construction and/or the designated Project Manager. All doors and lock hardware are the property of The University of Toledo, Facilities and Construction and are to be delivered and/or returned by the contractor to the University Lock Shop or other University storage area.
- High traffic doors and doors with ADA power operators shall be fitted with heavy duty continuous hinges. (Consult with Facilities and Construction Lock Shop)
- All corridor, suite, mechanical, electrical, custodial, tele/data and storage (if off main corridor) room doors must be equipped with door closers.

Metal Doors and Frames

- All doors and frame hardware must be installed in a true, plumb, level and square manner. All door frames are to be installed within 1/16" of true, plumb and level with tolerance of door/frame gaps not to exceed 1/8 of one inch. Door frames installed in excess of 1/16" out of plumb level are subject to be removed and reinstalled at no cost to the University (per ANSI/DHI A115IG).
- Steel Doors
 - Exterior doors shall be not less than 16 gauge metal. All doors shall be reinforced at the door closer, panic exit device or lockset.
 - Interior doors shall be not less than 18 gauge metal. All doors shall be reinforced at the point of door closer attachment, panic exit device or lockset.
 - Access doors shall be provided at plumbing chases and ceiling areas.
- Steel Frames
 - Steel frames must be one-piece welded frame not less than 14 gauge for exterior with hot dipped zinc coating and 16 gauge for interior. Knock-down frames are not allowed, unless conditions justify and approved by the University. All frames shall be reinforced at hinge, strike and closer locations.

Aluminum Doors and Frames

- Doors

- Narrow stile doors are prohibited.
- Dimension Specifications:
 - Doors must be 1/8" thick metal
 - Head rail 6-1/2" x 1-3/4"
 - Stile 5-1/2" x 1-3/4"
 - Bottom rail 12-1/2" x 1-3/4"
 - Hardware reinforcement 1/4" thick metal
 -
- Frames
 - Dimension specifications:
 - Metal thickness 1/8"
 - Head size 4 1/2" X 1 3/4"
 - Jamb size 4 1/2" x 1 3/4"
 - Hardware reinforcement 1/4" thick metal material

Wood Doors

- All wood doors shall be at least 1-3/4". Fire doors must be UL labeled per required rating.

Special Doors

- Access doors to equipment spaces shall be hollow steel metal doors in 4 sided steel frames and equipped with a lock able to be keyed the university lock system.

Hardware

- Prohibited Material Installations
 - Thresholds raised over 1/2" above floor level
 - Floor mounted doorstops unless wall mounted is not possible (Must be preapproved by Facilities and Construction Lock Shop)
 - Floor and concealed door closers
 - Door closers with fire system release
 - All surface mounted and concealed vertical rod exit devices unless approval is received from the Facilities and Construction Lock Shop
 - Passive infrared motion sensors used as request to exit on outside entrance doors equipped with card reader access
 - Magnetic door locks used for access control

ADA Power Doors

- Power-activated doors shall be of the swinging type with hard-wired push button activation. Wireless remote is allowed for retrofit and areas where it is impossible to run wiring and must be preapproved by Facilities and Construction Lock Shop. Card access attached to ADA power doors must work in conjunction with one another. (Consult with Facilities and Construction Lock Shop due to different applications.)
- Power Door Operators and Accessories
 - LCN 4640 power door operator
 - LCN 9540 power door operator

- LCN 7910-956 4-1/2'' wall plate actuator (Consult with Facilities and Construction Lock Shop for possible actuator options for retrofit and special applications.)
- Weatherproof actuators must be used on exterior applications. (Consult with Facilities and Construction Lock Shop for possible actuator options for retrofit and special applications.)

Card Access Readers

- Network Readers
 - Blackboard SA3000 card access readers
- At least one exterior door for all new buildings, additions and major renovations shall be fitted with card access reader. SA3000 readers are purchased through the University Campus Community Support Services Department. (Consult with Facilities and Construction Lock Shop for specifications and installation information.)
- Wiring
 - Belden 8723 or equivalent (card slot to controller)
 - 2 conductors stranded 14 gauge up to 100 ft. (Belden 9411 or equivalent) or 12 gauge up to 200 ft. (Belden 9412 or equivalent; power supply to electric latch retraction). No single conductor building wire.
 - 2 conductors stranded Belden 9320 or equivalent (door position switch)
 - 4 conductors stranded Belden 8723 or equivalent (request to exit, latch monitor)
 - All network card access doors shall be equipped electric latch retraction with request to exit switch and latch monitoring built into the door hardware with position switches on the door.
 - For new construction and major renovations wiring in door frames shall be in conduit from power transfer and door position switch to accessible junction box to the location of card access equipment. Card slot shall be mounted to a metal single gang box with conduit to junction box. Conduit diameter shall be a minimum 3/4'' from junction box to card access equipment.
- Card access reader equipment must be located in tele/data room as close as possible to the door location.
- Consult with Facilities and Construction Lock Shop for specifications and installation information.
- Offline Readers
 - Locknetics CM5196xBPxMGIxSFSxATK US26D (Limited interior doors only)

General Door Hardware

- Butts
 - Hager (1279 series, BB1279 series, BB1168 series, BB1199 series)
 - McKinley (T2714 series, TB2714 series, TB2314 series, T4B3386 series, T4B3786 series)
 - Stanley (F179 series, FBB179 series, FBB199 series, FBB168 series)
- Standard ball bearing hinges are to be installed on all doors up to 36'' equipped with door closers and over 36'' without door closers. Heavy duty ball bearing hinges are to be installed on doors larger than 36'' equipped with door closers. Standard hinges on all doors 36'' and under without door

closers. Stainless steel must be installed on all exterior doors. All out swinging interior and exterior doors must have non-removable pin hinges.

- Continuous Hinges
 - Hager 780HD series
 - Select SLHD series

- Door Closers
 - LCN 4041 series heavy duty aluminum finish
 - LCN 1461 series medium duty aluminum finish
 - Door closers shall be mounted on room side as not to be visible from corridor, lobby or other public places. Where it's impossible or impractical to mount door stops at multiple exterior door openings a spring cushion closer arm may be used. Consult with Facilities and Construction Lock Shop for other special closer options.

- Exit Devices
 - Von Duprin 99 rim type series (Exterior/ Fire doors) US26D finish
 - Von Duprin 33A rim type series (Retrofit for narrow stile doors only) US26D finish
 - Von Duprin 99 trims (990 series, 992 series and 994 series with #17 levers) US26D finish
 - Von Duprin 33A trims (386 series, 388 series, and 360 series with # 17 levers) US26D finish
 - All exit devices on exterior doors shall be installed in the night latch (NL) function were key retracts latch.
 - Vertical Rod exit devices are prohibited unless special circumstances require it and approved by Facilities and Construction Lock Shop. Consult with Facilities and Construction Lock Shop other special exit device options.

- Mullions
 - Von Duprin KR4954, KR9954 (fire doors)

- Rim Cylinders
 - Best 1E72 7 pin I/C US26D
 - Falcon C953 7pin I/C US26D
 - Arrow 16RCR-27 7 pin US26D
 - Schlage 80-129 7 pin US26D

- Mortise Cylinders
 - Best 1E74 7 pin I/C
 - Falcon C987 7pin I/C US26D
 - Arrow 16CR-27 7 pin I/C US26D
 - Schlage 80-102 7 pin I/C US26D

- Cylindrical Lever Locks
 - Falcon T511Q Extra Heavy Duty US26D (interior office doors)
 - Falcon T521Q Extra Heavy Duty US26D (office suite doors)
 - Falcon T581Q Extra Heavy Duty US26D (storage, custodial, electrical, mechanical, tele/data, card access doors etc.)
 - Falcon T561Q Extra Heavy Duty US26D (classrooms, seminar, public restroom etc)
 - Falcon T101Q Extra Heavy Duty US26D (closets, non-locking areas)
 - Falcon T301Q Extra Heavy Duty US26D (unisex restrooms, single stall restrooms)

- Mortise Locks - Retrofit and special circumstances only
 - Falcon M series QN trim US26D
 - Schlage L series N17 trim US26D
- Deadbolts – Restrooms
 - Arrow D44 7 pin I/C US26D
 - Best 83T7S 7 pin I/C US26D
 - Schlage B663BD 7 pin I/C US26D
- General Doors:
 - Arrow D40 7 pin I/C US26D
 - Best 83T7K 7 pin I/C US26D
 - Schlage B660BD 7 pin I/C US26D
- Dorm Rooms:
 - Best 83T7K 7-pin I/C STK US26D CS (concealed screws)
- Cores-I/C Small Format
 - Falcon CB847 7pin Best style capping US26D
 - Best 1C7 7 pin US26D
 - Arrow P7100CR 7pin US26D
 - Consult with Facilities and Construction Lock Shop for correct keyway to be used
- Flush Bolts
 - Rockwood 555
 - Ives FB 458
- Wall Stops
 - Ives WS407CCV US26D concave type
 - Rockwood 409 US26D
 - Don-Jo 1407 US26D
- Kick Plates
 - Stainless Steel
- Note regarding existing Corbin/Russwin unit locks: Whenever an existing unit lock is to be replaced, and the existing door is to remain, a Falcon RU series lever unit shall be used.

Electric Door Hardware

- Power Supplies
 - Von Duprin PS873
- Power Transfers
 - Von Duprin EPT-10
- Electric Strikes
 - Von Duprin 6211 24VDC US32D (interior doors only)

- All hardware under this section is to be installed per manufacturer's specifications. Failure to follow specifications will result in door hardware malfunction and corrected at the expense of the General Contractor.

Design Considerations

- University locksmiths shall be consulted early in the project regarding scope, future installation schedule, special considerations, etc. The University Project Manager will determine the optimum timing for this consultation.
- Renovations shall take into consideration to what extent adjacent areas, which are not being renovated, should be included in the project to upgrade older hardware.
- In all cases, regardless of project size or method of installation, the University locksmiths, and prior to advertising the project for bidding, must approve the hardware specifications and schedule.
- In some cases, hardware specifications shall include a provision for supplying additional hardware to the University locksmiths at the end of the project. The exact amount and type of hardware shall be made at the time of the final specification review, prior to bidding.

Keying System Specifications (for Major Renovations, Additions and New Buildings)

- Locking devices shall be equipped with small format (Best type) 7 pin removable cores. General Contractor or Hardware Supplier shall furnish and install temporary construction cores for security purposes while the building is under construction. The General Contractor or hardware supplier shall provide cores, pins, springs, key blanks (3 per core) and lock forks to the University Lock Shop with the project number, building and room or door number information attached. The University Lock Shop will develop master system, cut/stamp keys, combinate and install permanent cores and return temporary core to supplier. The University Lock Shop shall be compensated one-fourth hour per installed core at the current hourly rate.
- University locksmiths will be compensated for their labor as follows:
- For state funded projects, a local funding source will be identified to be included in the project budget.
- For locally funded projects, University locksmiths' services shall be included in the project budget, and shall be paid for via the project account.

Division 9. FINISHES

Carpet

- All carpet shall comply with the following material specifications:
 - Construction: Tufted or woven, level or multi-level loop
 - Pile weight: 26 ounces per square yard (minimum)
 - Gauge/Stitches per inch: Balanced to achieve specified pile density
 - Soil resistance: Protective anti-soil treatment, heat-applied by the mill
 - Yarn System: 100% nylon, 66 BCF
 - Indoor air quality: Maximum 0.6 mg/m two hour total volatile organic compound (VOC) emission, ASTM D5116-90
 - Appearance retention: Drum ASTM D 5417 for 22,000 cycle minutes, resulting in a minimum rating of 3.0 using ISO/TC38/SC12/TR9405 without under-cushion
- All carpet shall meet the radiant panel class 1 fire rating.
- Used carpet and installation waste must be reclaimed or recycled. Each carpet quotation shall include a reclamation plan to address the reclamation of all types of carpet removed from the University. Under no circumstances shall landfilling of any used carpet or carpet installation waste be allowed.
- Computer areas are areas with more than 12 computer stations. Examples are computer labs for teaching and student use. Carpet in computer areas shall comply with the following material specifications:
 - Method of Dye: Yarn dyed
 - Density: 5,000 (minimum)
 - Finished Pile Thickness: 0.125"
 - Backing System: Carpet impregnated, conductive latex back
 - Static Control: 1.5 kv prior to cleaning
 - Tuftbind: 12 lb. (minimum)
- Severe traffic areas are areas with a constant flow of visitors and staff, rolling equipment, and exposure to food and moisture. Examples are locker rooms, food service/vending, commons/lounges with vending opportunities, and major entrance corridors. Carpet in severe traffic areas shall comply with the following material specifications:
 - Method of Dye: Cationic solution dyed
 - Density: >6,000
 - Finished Pile Thickness: 0.100
 - Backing System: Condensed vinyl
 - Static Control: <3.5 kv
 - Tuftbind: 20 lb. minimum

- Heavy traffic areas are areas with significant numbers of visitors on a daily basis and a limited exposure to food and moisture spills. Examples are lobbies, reception stations, corridors, and commons/lounges without vending opportunities. Carpet in heavy traffic areas shall comply with the following material specifications:
 - Method of Dye: Cationic solution dyed
 - Density: 6,000 minimum
 - Finished Pile Thickness: 0.130
 - Backing System: Unitary
 - Static Control: >3.5 kv
 - Tuftbind: 20 lb. minimum

- Moderate traffic areas are areas with 11-20 permanent staff, liberal visitor access, and limited exposure to food and moisture spills. Carpet in moderate traffic areas shall comply with the following material specifications:
 - Method of Dye: Cationic solution dyed
 - Density: 5,500 minimum
 - Finished Pile Thickness: 0.125
 - Backing System: Unitary
 - Static Control: <3.5 kv
 - Tuftbind: 20 lb. minimum

- Low traffic areas are areas with limited visitor access, less than 11 permanent staff, and limited exposure to food and moisture spills. Examples are individual or multi-office areas, library study areas, and residence hall rooms. Carpet in low traffic areas shall comply with the following material specifications:
 - Method of Dye: Yarn dyed
 - Density: 5,000 minimum
 - Finished Pile Thickness: 0.125
 - Backing System: Woven polypropylene
 - Static Control: <3.5 kv
 - Tuftbind: 12 lb. minimum

Painting

- Only premium grades of paint are acceptable. The following examples are used to set a benchmark for quality. Acceptable manufacturers are Glidden, Pittsburgh, Benjamin Moore, 21st Century and Sherman-Williams.

- Materials
 - Masonry block filler. "Ultra-Hide" latex block filler no. 5317.
 - Concrete and masonry primers. Interior, flat, latex base paint. "Ultra-Hide" latex block filler no. 5317.
 - Gypsum drywall primer. White, interior, latex base primer.
 - Ferrous metal primer. Synthetic, quick-drying, rust-inhibiting primers. Tank and structural primer no. 5207.
 - Galvanized metal primer. "Glidden" Glide-Guard all-purpose metal primer no. 5229.
 - Undercoat materials. "Ultra-Hide" alkyd enamel undercoater no. UH400. Ferrous metal and

galvanized metal tank and structural primer no. 5207.

- Exterior finish. Concrete and masonry block. "Glidden" Spread-Glide-on no. 3525.
- Exterior finish. Metal. Gloss alkyd enamel no. 4500.
- Exterior finish. Ultra-exterior flat latex house and trim no. 6500.
- Interior finish. "Glidden" no. 4100 spread ultra latex, eggshell.
- Interior finish. Metal. "Glidden" no. 5000 Ultra-Hide, eggshell enamel.
- Oil-type interior wood stain. Slow penetrating oil-type wood stain. "Glidden" no. 1600 Woodmaster.
- Cut shellac. Quick-drying, rosin-free, clear, general-purpose, shellac varnish.
- Paste wood filler. Solvent-based, air-drying, paste-type wood filler. "Glidden" paste wood filler.
- Polyurethane varnish. Clear, Polyurethane varnish for use on interior sanded or natural finished woodwork.

Wall Coverings

- Wall coverings may only be specified as permitted by Design and Construction.
- Use 54" wide rolls. Non-patterned.

Division 10. SPECIALTIES

Restroom Accessories

- Electric Hand Dryers shall be installed in every restroom. Number of dryers will be dependent upon restroom size. They shall be stainless steel, automatic infrared sensor, fixed direction, tamper-proof screws on the cover, 120 volt, 2,300 watt, surface mount.
- Paper towel dispensers will be supplied by the University and installed by the contractor. These dispensers are not used for every project. Confirm with project manager.
- Toilet paper dispensers, sanitary vendors, waste receptacles, and soap dispensers shall be provided by the University and installed by the Contractor.
- During renovations, existing accessories shall be removed by the contractor and returned to the University provided they are in good condition.

Fire Protection Specialties

- Fire extinguishers in all public areas will have separate cabinets. Cabinets shall be no smaller than 24" in length, 9 1/2" in width, 6" in depth, stainless steel painted or unpainted, with no locks or glass.
- The use of hose cabinets to store fire extinguishers is not acceptable except in warehouse and large storage areas.
- Install fire extinguishers in all laboratories, mechanical, electrical and elevator equipment rooms. No cabinets are required in these areas.
- Extinguishers shall be Amerex, Crooker or Firechief five lb. dry chemical, Classification 3A: 40-BC. Extinguishers shall have D.O.T. sticker and a health hazard sticker. All kitchens shall be equipped with a K-type fire extinguisher.
- Extinguishers shall include a bar code with its serial number label for use with the present Facilities Management System.
- All fire extinguishers will be tagged indicating that the annual maintenance was completed just prior to taking possession of the building. The tag shall include the inspector's license number.
- Signs shall be used to identify extinguisher location. The signs shall be plastic 3-way signs in order to be visible from all sides in hallways.

Division 11. EQUIPMENT

General

- Fixed Equipment is acquired through one or more of the construction contracts and is funded within the project construction budget.
 - Unless otherwise directed by the Owner, the following equipment shall be classified as fixed equipment and shall be included in the Bid Documents prepared by the Associate:
 - Library shelving.
 - Food service equipment.
 - Unit kitchens and cabinets.
 - Laboratory work benches cabinets and associated equipment. This includes: fume hoods, controlled temperature rooms, and growth chambers.
 - Fixed Furniture Seating, Chalk Boards, Tack Boards, etc.
- The University, utilizing a fund allocation within the total project budget, acquires movable Equipment. This funding is independent of the project construction budget. This equipment shall not be included in the Bid Documents.

Movable Equipment Purchasing Procedures

Whenever a project budget includes an amount for equipment (regardless of the source of funds), the following procedures for acquiring the equipment shall apply:

- The project user groups shall determine the equipment needs for the project. The equipment needs and specifications shall then be given to the Purchasing Department for bidding or selection from state contract vendors.
- Purchasing will receive pricing thru the competitive bid process, or from approved vendors for the equipment and provide this to the users.
- The users will then decide upon the equipment and pricing that they wish to purchase using the available funds within the project budget.
- The user shall then provide the equipment list, pricing, and a Fast Order Requisition to the Design & Construction Fiscal Specialist.
 - Proposals/Quotations for equipment must be provided on the company letterhead of the vendor.
 - It must be stated on the quotation that prices are valid for a minimum of 90 days.
 - The vendors Tax identification number must be provided.
- The Fiscal Specialist shall initiate the requisition charged to the appropriate Plant Fund. ***The Design & Construction Fiscal Specialist shall be the only person permitted to initiate Plant Fund requisitions.***
- The Design & Construction Director shall then approve the requisition through FRS and authorize the issuance of a Purchase Order.

- Purchasing will then issue the Purchase Order.
- As invoices are received from the vendor, the Fiscal Specialist will confirm through the users that the equipment has been received prior to approving payment.

Kitchen Hood Fire Suppression

- Fire suppression systems for kitchen hoods shall be limited to the following manufacturers:
 - Ansul
 - Amerex
 - Pyrochem
- Other manufacturers must be approved in writing by Design and Construction.

Division 13. SPECIAL CONSTRUCTION

Fire Alarm System

- Products
 - Simplex fire alarm systems are to be bid; there are no equals at this time. Internal schematics are to be provided as part of the system. A non-disclosure agreement will be signed if necessary. These schematics are not to be confused with wiring diagrams that are also necessary as part of the system. Schematics are the engineering diagrams of the circuits internal to all control panels and devices. Circuit descriptions of these schematics are part of the package. The panel will have locks requiring the use of a Simplex “B” key to open. Control panels are to be mounted in a nonpublic room in the facility. The fire alarm panel must be installed in an area where temperatures do not drop under 60 degrees Fahrenheit and above 80 degrees Fahrenheit. An area three feet in front of the panel and one foot to either side is to be provided for proper service environment.
- Acceptable Manufacturers
 - Manufacture: Subject to compliance with requirements, provide a fire alarm system of the following:
 - Simplex Grinnell
- System Operation
 - Furnish and install an electrically operated, supervised, closed circuit, zoned, non-coded fire alarm system. The equipment shall include master control panel, break stations, combination horns and lights, annunciator, smoke detectors, water flow switches, fire pump monitoring, door holders and gate valve supervisory switches, when shown on drawings.
 - The equipment shall be a standard product of a single manufacturer. The catalog numbers specified are those of Simplex Grinnell.
 - System Operation: The activation of any fire alarm station or automatic detector circuit shall automatically perform the following functions:
 - Light the fire alarm control panel mounted red light emitting diode and audible alert and display a 40-character description of the device causing the alarm.
 - Sound a temporal coded alarm signal on all signal devices in the building.
 - Shut down HVAC fans via photoelectric duct smoke detectors of Control ZAM’s as indicated on the drawing.
 - Gate valve temper switch shall indicate as a trouble condition only upon fire alarm control panel.
 - Power failure, open circuit or other abnormal conditions in the circuit of a building fire alarm system shall cause the trouble signal to sound and the amber zone trouble light to flow on the fire alarm control panel indicating which circuit is in a disarranged condition. The silencing push-button may be selected to silence the audible trouble signal, but the trouble lamp shall not be extinguished until the abnormal condition is rectified.
 - All panels shall be connected to the campus wide Simplex Network.
 - The City tie module shall be tripped causing the Campus police dispatch to be notified.
 - All audible alarm signals shall sound.
 - All fire doors shall close on alarm condition from the Fire Alarm Panel.

- If alarm signals are silenced for any reason, they shall automatically resound if another zone is tripped.
- In the even of a commercial power interruption, the system shall automatically transfer to an emergency standby battery source.
- Annunciator
 - The remote annunciator is to be mounted in an entrance area approved by the fire department and the Department of Safety and Risk Management. All reset, silence and acknowledge switches are to be mounted inside the annunciator panel. The annunciator panel is to be keyed with the Simplex “B” key. The reset and acknowledge switches will use a standard “AH” key to activate. An area necessary for proper service is to be considered into location.
- Fire Alarm Control Panel
 - Fire alarm control panel shall be a Simplex Network capable fire alarm panel. Control panel construction shall be modular with solid-state microprocessor based electronics. It shall display only those primary controls and displays essential to operation during a fire alarm condition. Keyboards or keypads shall not be required to operate the system during the fire alarm conditions. Scrolling through menu options or lists shall be accomplished in a self-directing manner in which alphanumeric prompting messages shall direct the user. Control panel shall use “B” key lock on door.
 - The system shall be an addressable system, multiplexed on a per device basis. Non-addressable systems are acceptable in smaller or single story buildings. Zones will be on a per floor basis with manual and automatic devices contained in separate zones. Detection in air handling equipment will be zoned separately on a per air handler basis. Water flow detection is also to have its own zone on a per floor basis.
 - One dry contact alarm relay is to be provided for telephone dialer tie in to the University Police Department.
 - The control panel shall have a 2 line x 40-character liquid crystal display that shall be backlit for enhanced readability. The display shall support both upper and lower case letters.
 - The system shall be capable of logging and storing 300 events in an alarm log and 300 events in a trouble log. Each recorded event shall include the time and date of that event’s occurrence.
 - The system shall have walk test capabilities.

Fire Suppression System

- Water supply to fire suppression systems shall have a double-check back-flow assembly or an Ames back-flow preventer, isolated by two (2) OS & Y valves. Proof of operation of the double check assemblies shall be provided after installation.
- Do not install fire hoses. Fire Department connections shall be installed only with Toledo Thread.
- Fire pumps shall be wired to the fire alarm panel for monitoring operation or power loss.
- Vertical fire pumps are not permitted.

- Fire Pump Bearings: Wherever practical, equipment shall be furnished with sealed ball or roller bearings. Specify that the Contractor shall not lubricate sealed bearings. Equipment shall be FM approved.
- Fire Pump Bearing Packing Drip Pans: Shall be tied together and plumbed to the floor drain to keep water drips from corroding the bottom of the fire pump base. Casing relief valves shall be piped separately from all other drain pipes. Piping shall be PVC.
- Fire Pump Relief Valve and Drain: The fire pump shall have a Kunkle type relief valve with a Y-type strainer before the relief valve. The fire pump shall also have a trap. The relief valve shall be piped to a suitable drain and have a site glass installed.
- Fire Pump Test Connections: The test connection cluster, with 22" valves, shall be located on the building exterior adjacent to the fire department Siamese connection for the purpose of performing proper testing of the fire pump for initial acceptance and annual testing. Test headers shall have metal caps with chains. Test valves shall have piped in drainage. Equipment shall be FM approved.
- All post-indicating valves located in areas subject to damage by vehicular traffic shall be protected by bollards.
- All valves shall have tamper switches that shall be wired to the fire panel.
- Inspector Test Valves: Test valves shall be as remote as possible for each zone, have piped-in drainage to allow for testing without the use of hoses or special adapters, be located in stairwells or some common, easily accessible location and contain a sight glass for visual inspection of the flow. All inspector test valves shall have a sign indicating where and what it is.
- All wet systems shall have water flow switches for each zone and be equipped with inspector's test valves installed after each flow switch.
- All actual devices for low suction pressure, fire pump interruption, tamper switches, and flow switches shall be wired into the main fire alarm panel as distinct zone annunciation.
- Each floor shall have isolating valves with appropriate drainage.
- All pumps, valves, and similar devices shall be painted red. All piping shall be painted red or permanently banded red.
- Fire pump testing shall be performed with diffusers hooked to the hoses. No full pressure direct stream of water permitted.
- Each system shall be wired to the fire alarm panel with its own zone indicating trouble or alarm conditions.
- **Fire pumps and related equipment shall be designed and specified to comply with NFPA 14.5-7 (a) without exception.**

Division 15. MECHANICAL

Associate shall adhere to the following guidelines, along with specific information in Appendix E, for all major projects. For smaller renovations, the guidelines will be reviewed on a project-by-project basis with the Associate. Written acceptance for all variances must be received prior to design.

Plant Operation Requirements

- Plant Operations shall review all intended systems for acceptance prior to Design Development. Authorization for the selected system must be received from the Plant Director or the Director's designee through the Project Manager.
- Associate shall submit load calculation with zoning in Design Development phase for review.
- Associate shall submit piping and air static pressure calculations with the 90% review.
- Associates will cooperate and lead the mechanical contractor in providing University personnel with training on all equipment with an electrical connection, motor drive, operating controls and/or with moving or operating parts and devices. The instruction will vary in duration based on complexity. Coordinate duration with Plant Operations designee through the Project Manager prior to the construction document phase.

Plans and Specifications Requirements

- Associate shall include in the front of the specifications a contractor scope of work description.
- Equipment names and tagging shall follow the Master Specification format.
- Equipment cut-sheets shall be submitted in the design development phase.
- Color Coding of Pipe shall be specified as follows:

Specify that, the installer of the piping identify the type of service lines with applied colored stenciled letters and indicate direction of flow with colored stenciled arrows. Lettering and arrows shall be finished in gloss enamel and shall be applied at connections to pumps, chillers, and other equipment; at entrances to spaces; adjacent to valves; near access doors to pipe spaces; and at 30-foot maximum intervals on long pipe runs. The stenciling shall be positioned to be easily read from a normal standing position.

Compressed Air	White	CA
Natural Gas	Yellow	Gas
Hydrogen	Red	HYD
Nitrogen	Black	NIT
Oxygen	Green	OXY
Vacuum	Gray	VAC
Domestic Cold Water	Light Blue	DCW
Domestic Hot Water	Dark Blue	DHWS
Domestic Hot Water Return	Dark Blue	DHWR
De-ionized Water	Gray	DZDW
Oil, Fuel, or Hydraulic	Orange	Oil
High Pressure Steam 125PSI	Aluminum	HPS

Med. Pressure Steam 50PSI	Aluminum	MPS
Low Pressure Steam 15PSI	Aluminum	LPS
Boiler Feed Water	Green	BLR F
Chilled Water Supply	Black	CWS
Chilled Water Return	Black	CWR
Condensate Water	Aluminum	COND
Condenser Water	Purple	CDSR
Hot Water Heating Supply	Lime Green	HWHS
Hot Water Heating Return	Lime Green	HWHR

- Drawings shall be in the following order with associated prefix to the drawing number:
 - Plumbing (P) - Demolition; Schedules, Legend, and General Notes; Aboveground Piping; Belowground Piping; Enlarged Areas; Sections; Isometric Diagrams; Details
 - HVAC (H) - Demolition; Schedules, Legend, and General Notes; Ductwork; Piping; Enlarged Areas; Sections; Flow Diagrams; Details; Controls with Sequence of Operations
- Drawing layer naming shall follow AIA standards.
- Associate shall coordinate all construction documents with other trades paying particular attention to building aesthetics, structural interferences, and electrical requirements.
- Cutting and Patching shall be clearly indicated on plans that each contractor is responsible for their own work
- Procedures for Utility connections shall be noted on the plans and are as follows: The Contractor shall schedule the work two weeks in advance and execute to provide reasonably continuous service throughout the construction period. Connections shall be made only at times approved by the University which may be outside normal contractor working hours in order to reduce class disruptions. If University assistance is required for the connection/disconnect, the contractor may be charged for the maintenance labor. The Associate will review the Contractor's plan with the University Project Manager who will coordinate with the appropriate University personnel.
- Associate shall schedule a pre-balance meeting through the University project manager to review Balancing Contractor's proposed test procedure means, methods, and for what systems.
- Warranty on equipment, material, installation of same and the operation of such will be a minimum of one (1) year labor and material from date of Beneficial Occupancy. Hermetic refrigeration compressors and variable frequency controllers shall have a minimum material warranty of five (5) years. Underground insulated steel cased utility piping will have a minimum material warranty of five (5) years. Plant Operations may requests extended warranties on all other major equipment. Coordinate all major equipment warranties prior in the construction document phase.
- Operation and Maintenance Manuals shall be organized by 15000 specification tabs. Submit 2 Associate approved copies with warranties, instruction sheets, catalogue data, and final shop drawings secured in three ring binders. Shall be submitted to the University project manager.
- Record drawings of the Associates plans and of the Controls Contractors installation shall be submitted as prints, updated AutoCAD (latest version), and TIF files.
- Also see Division 1 – General Requirements for additional closeout requirements.

Energy Conservation Requirements

- Design of the HVAC systems must include consideration to building utilization by planning for the conservation of energy during varying occupancies (i.e. winter and summer breaks) where the building will be shut down. Research laboratories and other spaces which require 24 hours/day operation must have supplemental systems and/or energy recovery systems – heat wheels are unacceptable.
- As required, Associate shall submit to the University a life-cycle cost analysis of the proposed system.
- As required, Associate shall submit an energy budget to the University calculated on a BTU per square foot per year basis using Energy Conservation Report form (see Appendix E).

System Design Requirements

- The project's heating and cooling block load data will be established during the schematic phase of design.
 - Acceptable programs for heating and cooling loads are Trane Tracer 700 (under the following condition) and Elite. *If using the Trane program, Associate must select the 1985 ASHRAE cooling load method not the default 1972 method.*
 - Design heating loads will be calculated at -5F outside temperature with a 75F indoor temperature.
 - Design cooling loads will be calculated at 92F outdoors with a 78F WB; Indoor design conditions will be 75F with 50% RH.
 - Heating systems will be designed with equipment redundancy. The redundant equipment will be sized for 80% of the design load.
 - Primary heating water equipment selection will be based on 190F supply water w/ 30F temperature drop. Secondary (terminal) heating equipment will be selected on 180F supply water w/ 20F temperature drop.
 - Primary cooling equipment selection will be based on 44F supply water with a temperature rise of 12F as provided by the central chilled water plant.
 - Night setback temperatures shall be summer, 85F and winter, 55F with a maximum 65% RH.
 - Fan coil units and radiation will be required in perimeter areas to facilitate shut-down of major equipment.
 - All air conditioning systems shall be designed with economizer cycles.
- Classroom/Administrative Spaces
 - Variable Volume Air Handling with VAV boxes for offices, series type fan-powered VAV boxes for conference/classrooms, baseboard fin-tube heat for perimeter offices with large windows, reheat on all boxes, typically 6 ACH
- Research/Teaching Laboratories

- Variable Volume Air Handling with VAV boxes for labs, reheat on all boxes, VAV exhaust, up-blast rooftop exhaust fans with modulating by-pass and VFD's, hoods to operate at closed or 18" w/o bypass from pressure independent VAV exhaust box, rooms to modulate 3 ACH at night and 10 ACH during day
- Computer/Specialized Equipment Spaces
 - Supplemental DX units for room load and VAV air handling ventilation requirements
- Return air systems shall utilize return air plenums with strategically located transfer air ducts. These ducts can be constructed out of Ductboard and shall have elbows for sound transfer reduction.
- Medium pressure supply air systems shall utilize oval to round ducts depending on space limitations.
- Low pressure supply air systems shall utilize rectangular or round ducts. Duct liner is not acceptable on supply air ducts.

Range Limits for Sound Control

<u>Type of Room</u>	<u>Decibels</u>	<u>NC Criteria</u>
Auditoriums/Lecture Halls	30-40	25-30
General Circulation	40-50	35-45
Classroom/Study Areas	30-40	25-35
Dining Areas	35-45	30-40
Laboratories	40-50	35-45
Libraries	35-45	30-40
Offices	35-50	30-45
Recreation	40-55	35-50
Study Areas	35-45	30-40
Sound Studios	30-40	25-30
Computer Machine Rooms	45-65	40-60
Dormitory Sleeping Rooms	35-45	30-40
Kitchens and Laundries	45-55	40-50
Museums, Court Rooms	35-45	30-40
Exterior Equipment	<60dba, 7 am to 10 pm; <50dba, 10 pm to 7 am	

Equipment Descriptions

- Air Handler Units (AHU) shall have internal supply relief dampers in the air handlers for when the VFD's fail. For larger AHU's, supply with two fans each capable of

70% of the capacity. Steam coils are not acceptable. For filtration, supply with 2” 30% pleated media and 12” 60% box filters.

- Variable Speed Controller (VFD) will be housed in a minimum NEMA 1 cabinet with necessary provisions for ventilation and cooling. The VFD will be a pulse width modulated inverter system; manual bypass; minimum five automatic restarts following fault conditions before lockout.
- Open drive motors, one horsepower and over, will be of the high efficiency type with a minimum power factor of 80%.
- Water pumping packages are preferred rather than individual pumps, valves, fittings and controls. The system will require only suction and discharge pipe connections and one electrical power connection. The packaged system will consist of a system base, pumps and motors, controls, air separator, valves, pipes and fittings as required for a complete and operating system.
- Central steam condensate return station will be a packaged duplex system consisting of two (2) vertical turbine pumps, cast iron receiver and control panel. Pump to be multi-stage type cable of pumping 200F condensate. Each unit will have a mechanical seal capable of being removed by removing shaft coupling without further pump disassembly.
- Steam to water heat exchanger is to be a shell and tube type, “U” bend removable bundle, with water in the tubes and steam in the shell. The converter will be capable of operating at 125 psig (min) working pressure and will be so stamped.
- Semi-instantaneous steam to domestic hot water heaters without storage tanks is preferred with hot water recirculation within 20’ the most remote sink.
- Electric water coolers shall be equal to Oasis Model #PF8ACSL, split-level.

Systems Descriptions

- Mechanical systems will be of a central station configuration. Although reasonable in a small number of instances, the use of rooftop units is considered unacceptable.
- Systems configured with variable quantities of air and water will support the University’s commitment to energy conservation. Constant volume systems are discouraged.
- Mechanical systems heating and cooling utility services will utilize the campus’s high pressure (125PSI) steam loop and the chilled water (12F delta) loop as it is available.
- Heating (hot) water is the standard medium for heating and ventilating systems. Other energy source applications (steam; solar; electricity; etc) are considered acceptable upon review by the University.
- Cooling (chilled) water is the standard medium for central air-conditioning systems. Direct expansion evaporators / condensers are acceptable upon review of by the University.
- The use of electricity for secondary / terminal heating systems can be used when the equipment being served is justified by cost, capacity, or specific need.
- Ventilation systems in general will be configured as part of the heating and air-conditioning systems. The ventilation system will be cable of exhausting up to 100% of the mechanical

systems supply air.

- Floor mounted equipment will be mounted on a finished concrete housekeeping pad with a minimum height of 3-½ inch.

Building Automation System (BAS) System Description

- The intent of the specification included in Appendix E is to provide a Building Automation System (BAS) either by utilizing Siemens (Apogee) System, or Computrols (CBAS) System, therefore, incorporating direct digital control (DDC) for energy management, equipment monitoring and controls. This will be accomplished by open bidding the installation on new and large renovation projects. On small renovations, either the Associate, or the University will establish a BAS contractor allowance.
- Associate provides: contractor allowance, system architecture and design; a “Points List Summary Table” including names and address; panel layouts; point to point wiring diagrams; sequence of operation.
- BAS contractor shall provide all control equipment, engineering and programming of system configuration, power and auxiliary panels with their components. This work will be submitted in a “Schedule of Values” format provided by the university to include, ENG (engineering), PM (project management), Programming, Graphics, Panel Construction, CTS (check, test, start), FT (functional testing). All shall be provided using “State Term Pricing” on materials and labor.
- The University may choose to engineer and/or program particular projects of renovation and system additions.
- Connection of a building DDC panel to the University’s existing EMS (energy management system) host computer will be via trunk connection to the existing campus Ethernet.
- All low voltage electrical control wiring within mechanical rooms will be run in EMT conduit per specification, Division 16. All low voltage control wiring above accessible ceilings will be run in “J-hooks” or “Bridle Rings”.
- All temperature control systems installed shall be electronic, direct digital controls. Pneumatic controls shall only be permitted to control 2 1/2” or greater control valves. Each facility will be provided with the means to access the existing campus control system software via laptop.
- All VAV boxes with reheat will have the control valve and DDC controller mounted on the same side. A discharge air sensor will always be used in conjunction with a VAV box w/reheat.
- 2 (two) year parts and labor warranty shall be provided on every new installation.

Special Plant Requirements

- Ethylene Glycol is not acceptable - only Propylene Glycol where absolutely necessary and with plant authorization.
- Thermal Disk traps are not acceptable - only bucket traps on high pressure and F/T traps on low temperature steam.
- Swing check valves are not acceptable - only ball checks.
- Insulation lined supply air ducts are not acceptable.
- Victaulic fittings and piping are not acceptable for hot water applications.

- Pneumatic actuators are preferred for valves 1½” and larger.
- Slop Sinks shall have hot and cold water check valves.
- Chilled water and condensate meters shall be installed with main building system renovations. Meters shall be capable of connecting to the University’s existing Square D system.
- Zern automatic flush valves are not approved for any application.

Chemical Treatment Guidelines

- Test Equipment, Parts, and Materials
 - The chemical supplier shall supply the steam plant staff with the following operating and testing information. written test procedures, written chemical feed instructions, log sheets for recording test results, water usage, chemical consumption, chemical test reagents for regular in- plant analyses, and any other pertinent operating data requested by the University.
 - The supplier shall provide a complete test kit at the steam plant consisting of but not limited to five 10 ml. burettes, all necessary glassware, color comparator, and reagents to performs the following analysis:

1. Calcium hardness	2. P & M Alkalinity
3. Chloride	4. Sulfite
5. Phosphate	6. Nitrite
7. Organic phosphate test kits	8. Total dissolved solids
9. PH	10. Total hardness

- Guarantee
 - The supplier will guarantee that all systems are maintained free or scale build-up and microbial fouling or these systems will be cleaned at no cost to the University. The supplier will provide all materials and labor to clean these systems or the 'University will contract it out and bill the supplier.
 - The supplier guarantees the corrosion rate is maintained at less than 2ml per year. This will be monitored by the use of corrosion coupons supplied and analyzed by the supplier at no additional charge to the University.

- Substitution of Chemicals
 - If the supplier wishes to substitute a chemical not specified in the Chemical Section, they shall so state in their proposal as an exception and the University will evaluate and approve any substitution(s).

Division 16. ELECTRICAL

Electrical Systems

- Raceways
 - All conduit shall be 3/4" (minimum size) rigid galvanized steel or I.M.C., with the following exceptions:
 - Interior conduit concealed or exposed (10' A.F.F.) may be E.M.T. with compression fittings.
 - Flexible metal may be used for interior light fixtures above suspended ceilings and connections to vibrating equipment, maximum length 6 feet.
 - Conduit under slabs or exterior below grade may be schedule 80 PVC or schedule 40 encased in 6" of concrete.
- Conductors
 - All conductors shall be XHHW copper, 600-volt rated (minimum size #12 for power and #14 for lighting and control) except where special conditions (high temperatures, gasoline or oil, etc.) require other insulations to be used.
 - Three-phase color coding, Phase A, B, and C order - 480/277 volt shall be brown, orange, yellow, and 208/120 volt shall be black, red, blue.
- Grounding
 - All conduits shall contain a grounding conductor.
- Electrical Boxes
 - All boxes shall be pressed galvanized steel or cast. Rigid conduit connections shall be secured in place by double locknuts and bushings.
- Lighting
 - Illumination levels: All areas to be designed in accordance with the Lighting Level requirements at the end of this section.
 - Exterior: Exterior lighting shall be 277 volt. All walkway lighting shall be Metal Halide 175 watt (mounted on 10' x 5" poles) or 250 watt (mounted on 14' x 5" poles). All poles to be KIM WTC Series or approved equal. Fixtures shall be cut-off type with type V light pattern or type III if wall mounted and a baked poly-gray finish. All other lighting shall be High Pressure Sodium. Roadway fixtures shall be Cobra Head type. All poles shall be one-piece spun aluminum.
 - Interior: Interior lighting shall be fluorescent and 277 volt except for compacts. All lamps shall be T8s (SP-41) and have electronic ballasts or compact (SPX-27). Office, classroom, and computer room environments lay in fixtures shall be 2 or 3 tube with parabolic lens. Restroom, hallway, and general purpose area lay in fixtures shall be 2 or 3 tube with acrylic lens. The use of incandescent require prior approval.
- Exit/Egress: Exit lights shall be LED with diffused lens and connected into 120 volt, code approved source with emergency generator backup. If a generator is not available, the lights shall have a self-contained power pack, charger, and transfer relays.

- **Lighting Controls**
 - All suitable areas, such as offices, classrooms, etc. shall use occupancy sensors (IR/Ultrasonic combination) unless the electrical output in the area is below 250 watts.
 - Any large interior area exposed to constant outside light shall use photocells.
 - Large office areas not suitable for occupancy sensors shall be controlled by low-voltage relays and tied into the Energy Management System.
 - Manual spring return timers shall be used in all mechanical and electrical rooms (4 hour) and other non-occupied, enclosed areas (1 hour).
 - Dimming systems are not to be specified.
 - Exterior areas shall be controlled by individual and/or master photocells.

- **Wiring Devices**
 - All receptacles, wall switches, etc. shall be specification grade. All 208- to 480-volt power devices shall be heavy duty industrial rating. All devices shall be gray except those connected to emergency power; emergency power shall be red. All face plates shall be stainless steel.

- **Overcurrent Protective Devices**
 - Fuses shall be used for all systems except 120- to 277-volt general purpose receptacle and lighting panels, and protection for HVAC compressors. All fuses shall be dual element, time delay.

- **Motors**
 - Motors shall be high-efficiency energy saver and have 1.15 SF.
 - Motor starters for smaller than 2 HP shall be manual with overloads and pilot light. Motor starters for 2 HP and above shall be fusible combination magnetic, with full size NEMA starters with three melting alloy overload delays.

Voice/Data/Video

- Voice/Data/Video systems shall be included in every new building and renovation project. The system description and construction requirements are contained in Appendix D.