

WRIGHT STATE UNIVERSITY  
OWNERS STANDARDS OF DESIGN  
AND  
CONSTRUCTION STANDARDS

Revised  
September, 2003

Refer to Section 1.1.1 of the Agreement for Professional Design Services for additional design responsibilities

### Design Review Process

All consultants providing professional design services to Wright State University shall participate in the established design review process as a part of their contractual obligations to the University. This participation shall be considered a part of basic services paid for under basic compensation and shall not be construed to lengthen the time to complete the design or to require additional fees. The University will complete its reviews in a timely manner as set forth in the Project Schedule prepared by the consultant and accepted by the University.

### Design Phases

Unless otherwise agreed upon, the consultant will provide an opportunity for the University's review (including duration of review) at the completion of each of the following design phases:

Schematic Design – 10 working days

Design Development – 10 working days

Construction Documents – 10 working days, to commence not later than 20 working days before the project is to be advertised for bidding

Each of these phases and review periods shall be identified in the Project Schedule.

### Construction Budget and Estimates of Probable Construction Cost

The University will provide the consultant with the Program of Requirements and the Construction Budget (Fixed Limit of Construction Cost) prior to the execution of the agreement for professional design services. The Fixed Limit of Construction Cost may be adjusted only in accordance with the terms of the Agreement.

In addition to drawings and specifications, the consultant shall prepare Estimates of Probable Construction Cost for submission to the University at each of the design review phases. These estimates shall be compared to the Fixed Limit of Construction Cost by the consultant and the University shall be notified in writing of any adjustments in the project that may be necessary, to either limit the scope of the project or increase the Fixed Limit of Construction Cost. It shall be the responsibility of the consultant to complete the project design within the original Construction Budget unless directed by the University in writing to do otherwise.

### Written Review Comments

The design review process is intended to be a formal one in that the University will solicit written comments from various reviewers, edit them as to appropriateness within the program parameters, and submit them to the consultant for incorporation into the

design documents. The consultant shall respond in writing to each of the comments. If the consultant takes exception to any comment, the reasons shall be stated in writing for further discussion and resolution. The University and the consultant shall agree before proceeding to the next phase of the design. The consultant will incorporate comments into the documents and provide the written responses to those comments within 10 working days after submission to the University for each design phase.

### Standard Document Format

The University maintains its records in standard print and electronic format generally in conformance with the AIA CAD Layer Guidelines and CSI Master Format Specifications.

The consultant shall provide a test file and meet with the University CAD Specialist to assure that electronic drawing files will conform to University standards. At any time, when requested, the consultant shall submit an electronic copy of any requested project drawing file(s), and at the completion of the construction document phase he shall submit a complete set of all drawing files. A final complete set of electronic as-built drawing files shall be submitted on CDs at the completion of construction and shall be identified as such. All electronic files will be furnished as a part of basic services paid for by basic compensation.

All electronic drawing files shall be furnished in AutoCAD Release 2005 or earlier release. Data Interchange Files (DXF) will not be accepted as an alternate. If another software program is used by the consultant to generate project drawings, the consultant will be responsible for furnishing a translation/conversion to AutoCAD that will maintain the accuracy and inclusion of all drawing data and will plot identical to the Project print records. Text styles and style names allowed shall be from the standard AutoCAD font set contained in the base AutoCAD program; third party proprietary fonts shall not be permitted. All electronic drawings of physical objects shown in plan, elevation, section and detail shall be depicted as actual size; nominal sizes shall not be used which would create scaling problems or drawing distortions. Diagrams, schedules, symbols and drawing conventions shall be drawn so that they are clearly readable at their plotted sizes.

The consultant and each of his subconsultants shall submit separate electronic drawing files corresponding to, complete and identical to each sheet in the plotted project set. Irrespective of the processes used to create drawings, such as cross-reference files, paper space and other organizational tools, the contents of each sheet in the project plan set shall be written to a separate .DWG file. Each file shall be labeled the same as it is in the plotted set. All layers in each drawing file shall be visible. Extraneous information, unused layers and blocks shall be purged. Drawing files that do not meet the University's standards shall be returned to the consultant for correction at no additional cost to the University.

Electronic copies of all sections of the specifications shall be submitted in Microsoft Word.

## Document Completeness

The consultant shall prepare drawings and specifications at each phase of the design to correspond with the following criteria for completeness, and the inclusion of the various design disciplines. These shall be submitted together with the Estimate of Probable Construction Cost for each phase described above. Failure to provide complete documents for review will not relieve the consultant of his obligation to meet the Project Schedule and will result in an unfavorable performance evaluation. Payment of the last twenty percent (20%) of the Basic Fee...shall be made only after all documents and Drawings required for the respective Phase have been submitted...as applicable, in form and substance reasonably satisfactory to...the Owner. Refer to Section 5.4.1 of the Agreement.

## Document Review and Coordination

The consultant and subconsultants shall conduct an extensive review of all drawings and specifications to assure they have been coordinated with each other and that the proper notes, references and cross references are present. The consultant will submit a written affidavit attesting to this review and coordination at the time of completion of final bid documents.

## SCHEMATIC DESIGN PHASE

### All Disciplines

For renovation projects, the consultant and each of the subconsultants shall be required to field verify all existing conditions including but not limited to the location and condition of structural, architectural, mechanical and electrical items. To the extent necessary, all drawings at each phase of the design shall accurately represent existing conditions.

### Civil Documents

Submit a scale schematic site plan based on existing University topographic and utility mapping showing the relation of the proposed project to existing site features such as roadways, walks, parking, major trees and plantings and any underground and overhead utilities that will be affected by the project. Submit an outline specification of Division 2 work.

### Architectural Documents

Submit scale drawings showing compliance with basic program requirements, room sizes, uses and spatial functions and identifying support spaces such as stairs, corridors, rest rooms, mechanical, electrical, telecommunication, custodial and storage spaces. Drawings shall demonstrate general compliance with the OBC with respect to building use/mixed use and occupancy, construction type, fire protection requirements, means of egress and accessibility. Indicate by building section or other means, the

structural system proposed or modifications required and the general relation of floor, ceiling, structural and mechanical systems. Submit an outline specification listing those sections to be used for the project.

#### Mechanical, Plumbing and Fire Protection Documents

Submit drawings that indicate the location of all mechanical spaces, water service entrances, sanitary and storm water exits and the location of all large equipment within the building(s), on grade and roof mounted. Indicate the types of systems to be used in the project including, but not limited to, air handling systems, mechanical cooling systems, heating systems and specialized mechanical systems specific to the project. Submit cut sheets of representative pieces of equipment. Submit load calculations and design criteria for all systems. Submit cut sheets for plumbing fixtures and any specialized plumbing systems and/or equipment to be incorporated into the project.

Submit cut sheets for fire protection equipment, pumps, extinguishers, sprinkler heads, etc. Indicate zones and occupancy hazard requirements for each wet and dry and special system locations.

#### Electrical, Telecommunication and Special Systems Documents

Submit drawings that indicate the location of all electrical, telecommunication and special system spaces and the location of major equipment including transformers, switchgear, distribution panels, etc. Submit a brief narrative describing the various systems and their operations, the type of lighting proposed for each area and the power requirements for spaces and special equipment. Submit an outline of Division 16 specification sections. Submit proposed standard drawing symbols for review and approval by the University.

### DESIGN DEVELOPMENT PHASE

#### Civil Documents

Submit scale site plan(s) based on an actual survey of the project area to confirm existing lines and grades and verification of existing features and utilities that will be affected by the project. Indicate which utilities will be disturbed, interrupted or relocated and a proposed schedule for site construction activities that would affect University activities and operations. Submit preliminary details of paving, landscaping and other site work proposed in the project. Show the proposed limits of construction and the location of any temporary fencing, barricades or construction facilities such as stockpiles, dumpsters and trailers.

#### Architectural Documents

Submit final scale plans, elevations, building and wall sections to fix and describe the size and character of the project as to architectural, structural, mechanical and electrical

systems, including materials of construction proposed, the placement of all doors, windows, partitions, equipment and special construction unique to the project. This shall include the location and extent of built in casework, fixed furnishings, and all other items provided in the Fixed Limit of Construction Cost that is related to the intended use of all spaces. Drawings shall be provided in sufficient detail, that while not complete for bidding, a reasonably qualified reviewer can ascertain the design intent for materials, finishes and the type of construction for foundations, structural framing, walls, floors, ceilings and roofs. The drawings shall be complete enough for submission for a preliminary code review by the Bureau of Construction Compliance if the University elects to do so.

Submit a draft preliminary specification including all sections to be incorporated in the Construction Documents.

The consultant together with his subconsultants shall adjust the Estimate of Probable Construction Cost to reflect any changes in the design; program, schedule or other factors affecting cost resulting from the development of this phase of the design. Refer to the Construction Budget and the consultant's obligations described above.

#### Mechanical, Plumbing and Fire Protection Documents

Submit drawings that show the location of all mechanical, plumbing and fire protection equipment and fixtures. Mechanical drawings shall have ductwork systems laid out in their entirety, at a minimum, in one-line format. All major piping systems for all disciplines/trades shall be laid out in plan. Submit an outline specification for all sections of Division 15, which covers systems and equipment for the project.

#### Electrical, Telecommunication and Special Systems Documents

Submit plans that show the location of all lighting fixtures, electrical equipment and panels and the general location of all devices, specialties and project specific items. Identify the location and space requirements for all major equipment and its relation to the system(s) that it supports. Submit cut sheets for all equipment, fixtures and devices proposed for the project. Submit the refined specifications for all Division 16 sections.

### CONSTRUCTION DOCUMENTS PHASE

#### Civil Documents

Submit complete drawings showing all site work, utilities, grading, landscaping and details to enable bidders to quantify all elements of the project. Indicate phasing of the work if included in the project schedule. Include all benchmarks, items to be removed, relocated and constructed by the site contractor. Clearly distinguish the work of the University, if any, and the work of other contractors. Submit completed Division 2 specifications.

### Architectural Documents

Submit complete drawings and specifications setting forth in detail all of the requirements of the project for bidding, construction and code compliance which shall incorporate all University review comments and shall coordinate the work of all subconsultants to be fully integrated into the project. Conflicts and/or inconsistencies discovered during the bidding period shall be addressed and clarified by addenda. The Construction Documents shall include clearly defined additive and/or deductive alternatives as may be considered appropriate by the University and the consultant and subconsultants. For state administered capital projects, the state front-end as published by the Department of Administrative Services shall be used. For locally administered projects the local front-end as published by the Department of Planning-Engineering and Construction shall be used. The consultant shall prepare Division 0 and Division 1 specification sections that are consistent with the state or local General Conditions and Special Conditions.

### Mechanical, Plumbing and Fire Protection Documents

Submit complete drawings and specifications, schedules, diagrams and details necessary for project bidding, construction and code compliance. Submit any additional documentation necessary to demonstrate that the systems will perform to the design criteria established in prior phases of the project.

### Electrical, Telecommunication and Special Systems Documents

Submit complete drawings and specifications, diagrams, schematics and schedules and details necessary for project bidding, construction and code compliance. All drawing notes shall be on the sheets to which they pertain. Panel schedules, motor control center schedules, and distribution board schedules shall be complete and coordinated with other disciplines/trades. Submit foot-candle calculations for normal and emergency operating conditions. Submit feeder voltage drop calculations for panels, large motors and other major equipment. Submit building load calculations. Submit short circuit calculations for building, including the settings for any relays.

Submit final cut sheets for all lighting fixtures, electrical and special equipment. All cut sheets and calculations shall be submitted in a notebook with tabs indicating each section.

### Documents for Examination by the Bureau of Construction Compliance and State Architect

Submit four copies of the drawings and three copies of the specifications, which are signed and stamped by the person(s) primarily responsible for their preparation to the Bureau of Construction Compliance. Building permit fees paid by the consultant are a reimbursable expense with no mark-up allowed.

For State of Ohio administered capital projects, submit a copy of the drawings and specifications to the Office of the State Architect.

### Front End Requirements

The front end of all specifications for Wright State University projects shall be arranged in the following manner, using the most up-to-date version of the documents, which will be provided by the University. Specific questions concerning any of the items should be directed to the Project Manager.

1. Cover Page listing project information, name, number etc.
2. Notice to Bidders
3. Instructions to Bidders
4. Definitions
5. Bid Form
6. Responsibility of Bidder Form
7. Form of Contract
8. Contract Bond
9. General Conditions
10. Special Conditions
11. Change Order Procedure and Pricing Guidelines
12. Index
13. Wage Rates
14. WSU Safety and Health Program
15. Hot Work Program
16. Digging/Boring Permit

### Special Requirements by Division

#### **DIVISION 2 - SITEWORK**

##### Walks

All sidewalks shall be designed in accordance with accepted engineering practice for the service conditions and loads to which they will be exposed. At a minimum, sidewalks in permanent locations and expected to be used only by pedestrians, snow removal equipment and occasional police or ambulance vehicles shall be designed of Portland cement concrete as follows: minimum compressive strength 4000 psi, air entrained, minimum thickness 5 inches, minimum reinforcement 6 x 6 10/10 welded wire fabric, and a minimum base of 5 inches of compacted granular materials.

In addition, sidewalks located along accessible routes shall slope not more than 5% and in all other respects shall meet the requirements of ADAAG.

### Stormdrain grates

All Stormwater area drain and catch basin casting grates shall be bicycle safe similar to Neenah Type C for round drains and Type S for rectangular drains. This standard applies to both paved and landscaped areas

### Controls and Fees

1. The contractor shall be responsible for satisfying any and all erosion control and storm water management requirements for any land disturbing activities, including but not limited to on-site or off-site borrow, on-site or off-site stockpiling or disposal of waste materials.
2. The contractor shall be responsible for waste disposal for all material not to be salvaged. Contractor shall be responsible for all fees when materials are disposed in a location not provided by the university.

### Clearing and Grading

1. Remove all tree stumps, trees, limbs, and rubbish from construction area. Controlled burning shall not be permitted.
2. Removal topsoil from the affected site prior to construction activities to reduce the potential for soil compaction and contamination. Topsoil shall be stockpiled in areas approved by the university for later use during final grading and site restoration.

### Backfill and Compaction

1. Utility trenches and other excavations shall be designed to limit settlement. Areas to receive pavement or other surface structures shall include engineered fill properly placed and compacted. Landscaped areas shall be dressed with approved topsoil.

### Seeding Mixture and Sod

1. Campus standard seed mixture:  
40% SR 8300 Tall Fescue  
40% SR 8200 Tall Fescue  
20% Titan Fescue
2. Preferred sod is Green Velvet "Sports Mix" by Green Velvet Farms, Bellbrook, Ohio. Preparation and installation shall be in accordance with ODOT item 660 material specification.

### **DIVISION 3 - CONCRETE**

1. Interior and/or exterior structural concrete surfaces should not be scheduled to receive a sandblasted finish unless specifically approved by the university.
2. Building interior structural concrete painted surfaces should not be scheduled to receive a rubbed finish. If a smooth plaster-like finish is desired, specify a thin coat of veneer plaster over the concrete substrate.
3. Exposed interior concrete floors should be sealed. A hardener is required where the floor surface is subject to heavy, impact, and/or rolling loads.

### **DIVISION 4 - MASONRY**

Specifications for exterior masonry shall at a minimum include the following provisions for the mitigation of efflorescence:

Bricks and concrete masonry units shall pass ASTM C 67.

Portland cement, masonry cement shall be low in alkali.

Mortar admixtures, especially calcium chloride, shall be prohibited.

During construction, all work shall be kept dry by covering with a strong waterproof membrane at the end of each workday or shutdown period.

Include an adequate Allowance for acid washing 12 months after completion of the work.

### **DIVISION 5 - METALS**

No specific requirements.

### **DIVISION 6 – WOOD AND PLASTICS**

No specific requirements

### **DIVISION 7 – THERMAL AND MOISTURE PROTECTION**

#### Building Insulation

1. Designs shall minimize exposure to fiberglass in areas needing to be accessed for inspections, maintenance, etc. Where exposed encapsulate fiberglass using foil, backing, plastic or gypsum board covering.

#### Roofing

1. Consult the WSU Roofing Survey document prior to starting any design work. Copy is on file in the PEC Office, 386 University Hall.

2. Specify service walkways (minimum 2'0" wide) appropriately located to service all roof top equipment from the roof access.
3. Downspouts shall tie directly to underground storm drainage system.
4. Specify roof hatches that are insulated and lockable.

## **DIVISION 8 – DOORS AND WINDOWS**

### Exterior Doors

1. At least one primary entry door should be power operated. Both doors in a vestibule configuration should be power operated. Power operated egress doors shall allow power operation during times when building is locked.

### Interior Doors

1. All doors in new construction shall have lever handles that comply with ADAAG requirements. When renovation work requires changing door hardware or which hardware change is requested for functional change, all replacement hardware shall include ADAAG compliant lever handles.

### Locksets

1. The University Keyshop personnel shall accomplish the final keying and installation of cores. Construction cores may be installed by the Contractor during construction, but must be removed prior to beneficial occupancy. The University standard system is Schlage "Primus".
2. **Closers**; Equal to Super Smoothy LCN-4040 Regular or Super Smoothy LCN-4041 Handicapped.

## **DIVISION 9 – FINISHES**

No specific requirements.

## **DIVISION 10 – SPECIALTIES**

1. **Sanitary Napkin Disposal**; Stainless steel type 304, 22 gage, satin finish, surface mounted, cover to have full length piano hinge and bottom unlocks with key, equal to Bobrick B-270.
2. **Feminine Napkin Vendor Machine**; Stainless steel, type 304, satin finish, welded construction, field replaceable door, 18 gage minimum, full length piano hinge, coin mechanism set for \$.25 operation, equal to Bobrick #B-2800.

## Fire Extinguishers and Cabinets

1. Fire extinguisher cabinets shall be incorporated into all projects as required by code and sized for the required extinguisher.
2. Contract specifications shall identify the extinguisher type and size and note that the extinguishers shall be provided and installed by the university.

## **DIVISION 11 – EQUIPMENT**

No specific requirements.

## **DIVISION 12 – FURNISHINGS**

### General

1. Building furnishings including, but not limited to desks, chairs, tables, lockers, window treatments, lecterns, etc. shall be identified by the A/E but not included in the building contract.
2. Where appropriate, furnishings shall be shown on the contract drawings with a note indicating “NIC”.
3. The A/E shall provide to the university minimal specifications and a budget cost estimate for furnishings specified to be owner furnished.

## **DIVISION 13 – SPECIAL CONSTRUCTION**

No specific requirements.

## **DIVISION 14 – CONVEYING SYSTEMS**

1. Perform work in accordance with the following:  
ANSI/ASME A17.1 – Safety code for Elevators and Escalators.
2. Submittals shall include shop drawings, schematic wiring diagram, product data and maintenance manuals. Maintenance manuals are required and shall minimally include operating and maintenance instructions, parts listing, recommended parts inventory listing, purchase source listing for major and critical components, and emergency instructions. Provide three sets of maintenance manuals for the Owner’s use after approval of all shop drawings.
3. Elevator shall be provided with a 12 month warranty which begins on the date of Substantial Completion.

4. Full maintenance shall be provided by skilled, competent employees of the elevator Installer for a period of 12 months following Date of Substantial Completion at no additional cost to the Owner. Full maintenance services to be included under this contract and at no additional cost to the Owner shall minimally include (1) monthly preventive maintenance performed during normal working hours, (2) repair or replacement of worn or defective parts or components, (3) lubricating, cleaning, and adjusting as required for proper elevator operation in conformance with specified requirements and (4) 24-hours-per-day, 7-days-per-week emergency callback service. Exclude only repair or replacement due to misuse, abuse, accidents, or neglect caused by persons other than Installer's personnel.
5. **Submittals:** Contract documents shall require a letter from the elevator manufacturer (on manufacturer's letterhead) verifying that the manufacturer acknowledges and will comply with all requirements of the specifications relative to repair and maintenance tools. Specifically, the letter shall include language that acknowledges the acceptance of the following:
  - a. Any and all maintenance diagnostic tools, electrical schematic wiring diagrams and any access codes and passwords required to perform any maintenance function over the life of the equipment such as diagnostics, adjustments or parameter reprogramming shall be provided to the Owner on the Date of Substantial Completion. Tools may be handheld or built into the control system and shall function for the life of the equipment without the requirement to return them to the Manufacturer. Provide complete operations and maintenance manuals including diagnostics instructions for troubleshooting the microprocessor system. The Owner shall not be required to sign licensing agreements related to the use or maintenance or repair tools.
  - b. It is the intention of the Owner to obtain competitive bids for all maintenance and repair services and material for the elevator provided. Accordingly, the use of proprietary equipment or equipment requiring the use of any proprietary items throughout the life of the equipment is unacceptable. In addition, any special tools, prints, technical data, layouts, hardware, software, etc. required throughout the life of the equipment and which cannot be obtained from multiple suppliers, must be provided by the manufacturer to the Owner at substantial completion of the project.
6. An emergency telephone will be furnished by the Owner for field installation by the contractor.

## **DIVISION 15 – MECHANICAL**

### General Provisions

1. General:
  - a. Provide access doors for all maintenance items above inaccessible ceilings and into inaccessible walls. If necessary, fire rated access doors shall be used to preserve wall fire rating.
  - b. All new buildings shall contain storage space for a minimum of one complete change of air filters for all HVAC equipment. The storage space shall be dry and (preferably) accessible from the loading dock or service entrance.
  - c. Locate humidifiers, fan coil units, terminal boxes, and other equipment containing water over hallways rather than occupied or critical spaces wherever possible. Where necessary to locate such equipment over such spaces, provide secondary drain pans.
  - d. Provide adequate roof access (stairs or elevator) wherever serviceable equipment is roof mounted.
  - e. Provide control air compressor/filter-dryer for each building. Tie the control air into the closest adjacent building for backup whenever feasible.
  - f. In atriums or other multi-story open to roof areas, maintenance and accessibility should be a consideration when mounting fans, lights and other equipment above the floor.
  - g. Provide a minimum of three equivalent manufacturers and model numbers for all types of mechanical equipment.
  - h. Provide three (3) copies of bound and indexed operation and maintenance (O&M) manuals. Manuals shall be organized by systems and fully indexed by equipment type.
2. Pipes and Pipe Fittings:
  - a. ABS piping is unacceptable.
  - b. Do not install heating hot water, sprinkler piping, or other similar service piping susceptible to freezing in overhanging soffit areas or unheated areas.
  - c. On both domestic water and mechanical systems, no sweat connection valves shall be used. Use only flanged or threaded valves.

- d. Cast iron hub piping shall be used on all sanitary and storm sewer drains that are located under concrete floor slabs or under other inaccessible floor construction. No PVC piping shall be used under floor slabs unless it is required for chemical resistance.
  - e. All joints on copper pipe 2½ inches diameter and larger shall be brazed instead of soldered. Allow, at the contractor's option, the ProPress and Victaulic press fit methods of joining copper pipe.
  - f. Specify that heating water runouts to equipment such as VAV boxes be piped from the top or sides of mains. Runouts shall not come off the bottom of the main.
3. Valves:
- a. Include sufficient zone isolation/shut off valves in cold/hot water, heating hot water, chilled water, steam and other service piping to allow maintenance and replacement of terminal equipment without shutting down entire building.
  - b. Install valves on all lines that penetrate the floor from below.
  - c. Install valves on all branch lines off of main lines.
  - d. Install valves on all lines at locations such that each floor can be isolated independent of main building.
  - e. Any equipment such as showers, darkrooms, etc., requiring mixing of hot and cold water shall utilize a pressure compensated mixing valve rather than a temperature compensated mixing valve.
  - f. Install control valves where they can be reached from the floor where possible.
  - g. All valves and steam devices used on steam lines shall be rated for minimum 500 degrees F and 1½ times the working pressure.
4. Piping Specialties:
- a. Provide sufficient air vents in chilled and hot water piping systems to easily bleed entrapped air. Do not place air vents in ceilings of occupied spaces.
  - b. Pipe chases should be provided in sufficient size to accommodate maintenance personnel (at least three feet wide) and permanent lights provided. Do not locate pipe chases in custodial closets.

5. Meters:
  - a. Provide differential pressure indicator (manometer) for all serviceable filters and locate the indicator where it can be readily observed. Mark on the indicator the “clean” and “replace filter” points.
6. Pumps:
  - a. Provide parallel stand-by pump for all primary pumped building systems, such as chilled water, heating and domestic hot water, etc.
  - b. Pumps shall be Bell & Gossett or equal.
  - c. Do not specify maintenance-free style pumps.
7. Mechanical Identification:
  - a. Mark location of air handlers, fan coil units, mixing boxes, etc., above ceilings with identifying “buttons” to facilitate maintenance through ceiling.
  - b. Tag roof top exhaust fans and associated fume hood to facilitate maintenance and identification. The university will provide examples of how tags should be numbered/lettered.
  - c. Utilize standard tag or placard to mark all major equipment. Tag all valves and provide valve chart for each floor.
  - d. Utilize ANSI color coding for various building service piping and ductwork. Mark each with name of service, direction of flow, and associated unit served where appropriate.
  - e. All systems handling hazardous materials must have appropriate marking and visual or audible alarms to protect building occupants and maintenance personnel. Mark exhaust fans on roof which handle hazardous fumes with appropriate color code.
  - f. Mark air handling units with large letters and numbers. Verify numbering/lettering scheme with the University Physical Plant.
  - g. All fire dampers shall be numbered and identified on chart in mechanical room.
  - h. All fire dampers shall be accessible through removable doors or panels without having to remove ceilings.

8. Mechanical Rooms and Equipment Locations:

- a. The Architect/Engineer shall, in the earliest stages of design development, be responsible for establishing and/or verifying programmatic requirements for mechanical rooms in order to:

Provide adequate safe access and manufacturer's recommended working clearances for all equipment.

Provide for replacement of the largest piece of equipment without removing permanent walls, large items of equipment or equipment essential to the principal on-going day to day building use.

Provide direct access from the exterior for major mechanical rooms wherever possible.

- b. In phased projects mechanical rooms shall be sized to include equipment for all the phases.
- c. Air handling units, zone control devices, such as VAV boxes, mixing boxes, reheat coils, etc., shall also be located to provide unobstructed access to filters, manual valves, zone control devices and automatic control equipment.
- d. Mechanical rooms shall be ventilated by a thermostatically controlled fan.
- e. Mechanical rooms shall have at least one floor drain, preferably several.
- f. The installation of any air handling units with cooling coils above the ceiling level shall include an emergency drain pan installed beneath the unit. This emergency drain pan shall be tied to the building automation system for high water alarm notification.

9. Ventilation

Outside air intakes shall not draw in exhaust air from adjacent systems, loading docks, parking lots, emergency generators, chemical storage, sewer manholes, etc.

10. Air Conditioning

Chilled water shall be used as the cooling medium for all new buildings unless specific approval is obtained from the University for an alternate method.

For projects in an existing building, if sufficient capacity is available in an existing chilled water system, chilled water shall be used as the cooling medium for any new or renovated spaces.

Direct Exchange (DX) systems shall not be used except after specific approval by the University.

#### 11. Refrigeration Systems

When refrigerant is to be removed from a system, it shall be sent out to a company that cleans reclaimed refrigerant and returned to the University in EPA approved containers. Paperwork documenting this process, how much refrigerant was removed, how much was returned etc. must be provided to the University. Installations shall be complete with dryers, sight glasses, thermostatic expansion valves and thermostatically controlled solenoid valves for pump-down operation (except for capillary tube units). Refrigerant liquid and suction piping shall be type "K" hard-drawn copper. Suction lines shall be insulated. The need for defrosting is not limited to electrical units. In larger installations, hot gas defrosts is required. Installation shall be provided with necessary protective devices, including, but not limited to, electrical overload devices, low suction-pressure cutouts, oil traps, crankcase heaters, anti-cycling timers and head pressure control. Monitor refrigerant pressure in equipment through the building automation system and provide alarm notification upon loss of charge.

Main piping fittings for dryers, sight glasses, expansion valves and controls shall be flared. A nitrogen purge shall be maintained while soldering all joints. Copper-to-copper joints shall be evacuated to 29.5 inches (water) gauge vacuum and held for at least 24 hours under this vacuum prior to charging the system with refrigerant. Refrigerant shall be approved by Physical Plant.

#### 12. Cooling Coil Condensate

Cooling coil condensate shall be piped to sanitary drains. Pumped condensate systems shall not be used, unless there is no alternate. Cooling coil condensate lines shall have cleanouts which allow access of all branches of the condensate drain system. Cooling coil condensate lines shall be minimum 1¼ inch ID. Lines less than 1½ inch shall be copper instead of PVC.

#### 13. Chemical Treatment

The Architect/Engineer shall coordinate with the Project Manager and the University's Water Treatment Consultant as to the required specifications for chemical cleaning and equipment to be furnished by the Contractor. The chemicals to be used by the Contractor for the specified initial treatment shall

be furnished by the University. All chemical treatments shall be performed by the University after systems have been cleaned, flushed, and filled.

After cleaning and chemically treating the HVAC system, the Contractor shall furnish the University in writing, the following information.

1. Date of initial treatment
2. Type of chemical(s) used for treatment
3. Estimated date that further treatment or testing will be required.

### Fire Protection Systems

1. In all buildings with fire alarm systems, all control valves, including post indicator and wall indicator valves, shall be electrically supervised by the fire alarm panel. At all locations that control valves are concealed above ceilings or behind access doors, a sign shall be provided on the ceiling below the valve or the access door indicating the location of the control valve.

In all buildings, all control valves that are located in spaces accessible by the occupants of the building shall be provided with lockable tamper prevention devices and locks (that shall be specified by the University).

Control valves shall only be installed in corridors, stairwells, mechanical rooms, fire pump rooms and sprinkler valve rooms and shall be easily accessible. The control valves shall be accessible with the use of no more than a six foot stepladder. Provide 24" x 24" access door for valves located above inaccessible ceiling types.

Control valves shall not be installed, above or below ceilings in classrooms, offices, conference rooms or any dormitory living quarters.

Each control valve shall be supplied with a sign indicating the area of the building that is served by the valve.

2. At all locations that inspector test valves (ITV) are concealed above ceilings or behind access doors, a sign shall be provided on the ceiling below the valve or on the access door indicating the location of the ITV.

Inspector test valves shall only be installed in mechanical rooms, corridors, stairwells, fire pump rooms, sprinkler valve rooms and custodial closets and shall be easily accessible. The ITV's shall be accessible with the use of no more than a six foot stepladder.

Inspector test valves shall not be installed, above or below ceilings, in classrooms, offices, conference rooms or in dormitory living quarters or in any

area requiring entry through a classroom, office, conference room or any dormitory living quarters.

Inspector test valves discharge shall be piped to a drain capable of handling the discharge at full flow or to the exterior of the building.

3. Drain valves shall only be installed in corridors, stairwells, mechanical rooms, fire pump rooms and sprinkler valve rooms and shall be easily accessible. The drain valves shall be accessible with the use of no more than a six foot stepladder.

Drain valves shall not be installed, above or below ceilings, in classrooms, offices, conference rooms or in dormitory living quarters, or in any area requiring entry through a classroom, office, conference room or any dormitory living quarter.

Main drains discharge shall be piped to the exterior of the building.

Auxiliary drain valves discharge shall be piped to a drain capable of handling the discharge at full flow or to the exterior of the building.

## Plumbing

### Restrooms

- a. In all restrooms in new construction and major renovation projects, touchless flush valves on urinals shall be used. Hard-wired type shall be installed where practical. Battery pack type shall be used in areas where hard-wired is not feasible.

Touchless devices should be as manufactured by Zurn or approved equal.

### Hallways

- a. Drinking Fountain; not recessed, wall mounted, surface mounted.

### Custodial Closets

- a. Service Sink; Floor mounted, cast iron or steel with baked enamel covering, acid/chemical resisting plastics, concrete or stone construction material; 28" maximum height from floor to rim, 24" x 24" (minimum size); Faucet – vacuum breaker, integral stops, spout with pail hook and nose end, top single brace, renewable units and valve seats.

### Laboratories

- a. Drain and waste lines shall be selected for chemical resistance **and** heat resistance where steam is used as a laboratory medium.

#### Domestic Water

- a. Shut off valves are required on each floor, on take-offs from all vertical risers, and at the connection to each piece of equipment.
- b. Dielectric or brass fittings shall be used when connecting piping of dissimilar metals.
- c. Drain valves shall be installed in accessible locations at all low points in the piping system to permit drainage and servicing.
- d. No iron pipe or fittings (including galvanized) shall be used in any potable water system.

#### Heating, Ventilation, and Air Conditioning

1. Indoor design conditions for cooled & heated spaces shall be 74°F dry bulb & 50% relative humidity for summer and 69°F dry bulb for winter. Summer outdoor design temperature shall be 95°F dry bulb and 74°F wet bulb. Winter outdoor design temperature shall be minus (-) 10°F.
2. Design quantities of outside air for ventilation of occupied spaces shall be as per current ASHRAE requirements.
3. Ventilation rates (No. of air changes) for spaces such as restrooms, mechanical rooms, etc. shall be as per current ASHRAE requirements.
4. Provide adequate freeze proofing for all air handling equipment with high percentage of outside air. Provide coils that can be drained.
5. Provide stand-by or redundant equipment, cycled or alternating lead-lag sequence for critical needs (e.g., standby compressors on refrigeration for food storage).
6. Use dual independent refrigeration circuits on HVAC equipment where available, particularly when serving critical areas.
7. Utilize semi-hermetic compressors rather than hermetic compressors for all HVAC/refrigerant equipment larger than 10 nominal tons, where available.
8. Provide minimum 5 year parts and labor warranty on HVAC compressors.
9. Aluminum tubing in HVAC coils is unacceptable.

10. All air handlers and fan coil units shall be located with provisions for sufficient space to service units, (e.g., change filters, sheaves, bearings, motors and coils, lubricate components and replace belts).
11. Air handling unit fans should be specified to mid-range speed instead of near maximum. Units should be sized so the motor will be smaller horsepower than the maximum allowed for fan size.
12. Specify variable frequency drives instead of vortex dampers for air flow volume control.
13. Piping and conduit shall be run parallel and perpendicular to building structure (walls, ceilings, and floors).
14. Drain pans in air handling units and fan coil units shall be double layer insulated, tilted in two directions so it will drain no matter how the unit is set.
15. Drain lines that carry condensate from two or more units shall be minimum 1 ¼ inch diameter.
16. Cooling coils shall be selected at a face velocity that will permit all condensate to drain into the drain pan and will not allow blow over.
17. On air handling units, heating and cooling coils shall be adequately separated (minimum 15 inches) to properly install the freeze stat.

When possible, factory install the freeze stat across the coil and route to a connection outside of the unit housing.

18. Condensate trap and cleanout detail is available from the PEC department.

#### Variable Frequency Drives

1. All VFD's shall be provided with a manual constant speed bypass circuit. The bypass circuit shall be provided in the drive enclosure.
2. Ensure that sheaves are sized properly to run fan in bypass.

#### Air Distribution

1. Use care in locating outside air intake relative to exhausts, vents, or other discharges. Do not locate near loading docks, parking areas, or other vehicular traffic areas.

2. Transferred return air for ventilation (second hand ventilation air) is unacceptable.
3. Where fume hoods are present, provision must be made for make-up-air, such as hoods being of the “add-air” or “auxiliary-air” design and including a motor operated shut off valve in the exhaust stack.
4. All fire dampers shall have access doors.
5. No interior duct insulation (liner) shall be used, except for transfer ducts
  - a. Duct insulation shall be exterior duct wrap or
  - b. Factory fabricated insulated, double wall, with solid metal inner liner or perforated inner liner with mylar to encapsulate insulation.
6. Double wall air handling units, VAV boxes and terminal boxes shall be specified with internal metal wall so that no interior insulation is exposed to the air stream. Internal metal wall shall be solid, not perforated.
7. Keep air handling equipment clean during construction:
  - a. If equipment is going to be operated during construction, change filters once/month or more often if needed and install filter media over return grilles.
  - b. Keep fan coil units clean by covering inlet and outlet during construction when not in use.
  - c. Building must be turned over to the University upon project completion with clean air handling equipment and duct systems; including a clean set of air filters installed in the air handling equipment and with a quantity of filters for one additional change left in the building.

#### Laboratory Buildings

1. “Co-Mingling” or mixing of general laboratory exhaust and exhaust directly from fume hoods is allowable as long as it is accomplished in compliance with any applicable building and life safety codes.
2. Variable air volume control dampers controlling the exhaust flow from fume hoods and general room exhaust shall fail OPEN upon loss of control power or control air.

**DIVISION 16 - ELECTRICAL (Refer to "Electrical Basis of Design Standards and Guidelines" document that can be found at <http://www.wright.edu/admin/construction/forms/> web site.)**