

## **SECTION 3: DISCIPLINE SPECIFIC DESIGN STANDARDS**

Latest Update 12-27-11, See underlined text

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## **SECTION 3 AD: ARCHITECTURAL DIVISION**

### **PART I: GENERAL DESIGN REQUIREMENTS**

#### **1. SCOPE:**

- 1.1. This division outlines the general objectives and criteria for the architectural design. It deals with general office, research and institutional buildings; however, principles herein shall be followed, where applicable, for special-purpose buildings. It is the intent that the design of both new and renovated buildings be developed in accordance with these Design Standards. Instances where existing conditions preclude compliance with the standards should be brought to the attention of the UM OFM Project Manager for discussion and resolution.

#### **2. UNIVERSITY MASTER PLAN:**

- 2.1. **The UM Master Plan Goals:** The Master Plan tracks a long history of unilateral building, often planned and funded by off-campus agencies and/or built for other uses, which has resulted in “a haphazard assemblage of buildings in a harsh environment” that does not constitute a suitably intelligible institutional identity. The Master Plan proposes to “continue the transformation of the campus into a coherent, welcoming and highly-imaged campus precinct,” and recognizes that an extraordinary improvement in the public environment, including the appearance of its buildings, is imperative if the University is to remain competitive among its peers for students and faculty. The plan further proposes to continue unifying the campus through the upgrading and use of consistent materials.

- a. The basis for an appropriate campus image has been set by the pervasive use of local “red-pink” brick and sand-colored mortar with buff Indiana limestone trim and matching paint colors. These materials utilized in the University’s first building, the classical revival Davidge Hall completed in 1812, and now an icon for the University’s patrimony and a National Historic Landmark, and has continued in various iterations to the present. This palette is the indigenous expression of Maryland state culture and it is indicative of the University of Maryland at large, as well as being common to much of east coast academia, particularly for public institutions and those based in science. The use of these materials and the architectural design shall represent the best quality effort of the time commensurate with the University’s strategic goals, and correspondingly, shall have a timeless quality appropriate for masonry construction as well as for a major public academic institution that recently celebrated its 200th anniversary.

#### **3. DESIGN SUBMISSIONS:**

- 3.1. The A/E shall submit design documents, proposals, drawings, sketches, calculations, specifications, etc. at various stages in the design process. For architectural requirements of each submission, refer to this division and the UM

#### 4. **CODES AND REGULATIONS:**

4.1. The design shall comply with the codes, standards, guidelines, and regulations listed in Section 2: General Design Standards of these Design Standards, and at a minimum, with the most recent edition of all the codes that have been adopted by the State of Maryland. The technical requirements of these codes shall supplement all other standards, codes and regulations imposed by the University which may be initiated subsequent to the program preparation. The Office of Environmental Health and Safety (EHS) is the appointed campus Occupational Safety and Health Coordinator and the University Fire Marshal and as such will review all design documents. When a specific project warrants variance from the governing codes and regulations, a request shall be submitted in writing to UM at the Schematic Design Phase. Unless otherwise noted the latest edition of the codes in effect at the time the design contract is awarded will be used throughout the design and construction of that project.

#### 5. **COORDINATION:**

5.1. **Architectural Design:** The architectural design must be coordinated with the civil, structural, mechanical, fire protection, electrical, and specialty designs to permit the A/E submissions and reviews by UM to be made effectively.

5.2. **Site Visits:** On a renovation or alteration project, the architect shall make necessary visits to the site to ensure coordination with existing conditions and to make certain that there is adequate space and service clearance for the proposed layout and equipment. The architect shall not rely solely on original construction document or earlier renovation drawings, as they may not represent the actual existing conditions. The A/E team shall check building dimensions to confirm the accuracy of archived record drawings.

#### 6. **ECONOMICAL DESIGN:**

6.1. **General:** Architectural materials shall be selected and designed to permit acceptable competitive bids. Materials and components shall be efficient and economical for construction and maintenance.

6.2. **Equipment Selection:** Equipment specified should be nonproprietary, except where no other source is available to meet performance requirements. Where a proprietary selection UM is deemed necessary, a request shall be submitted in writing to early in the design stage. Materials selected shall be suitable for the application and shall be coordinated with other aspects of the project.

#### 7. **GENERAL DESIGN CONSIDERATIONS:**

7.1. **Electronic Drawing Files:** The A/E shall prepare electronic design drawings, utilizing the UM standard drawing templates, in accordance with Section 4 of these Design Standards. The UM standard drawing templates can be accessed

through the UM web page address included in Section 2 of these Design Standards.

- 7.2. General Project Files:** Non CAD type project files such as fee proposals, studies, reports, cost estimates, calculations, and specifications shall be submitted to UM on a CD-R as part of the project closeout document requirements. For additional requirements see Section 4 of these Design Standards.
- 7.3. Floor Plans and Details:** Full size floor plans shall be drawn to a minimum scale of 1/8 inch per foot. Floor plans for mechanical equipment rooms, main electric room, electric rooms, BDF & IDF rooms, server rooms, emergency generator room, fire command center and all other areas where space conditions are such that close coordination between all disciplines is necessary shall be drawn to a minimum scale of 1/4 inch per foot. When partial floor plans are developed for projects these partial floor plans shall be drawn to a minimum scale of 1/4 inch per foot by each discipline. Where scaled details are necessary to indicate coordination between materials and equipment utilize a minimum scale of 1/2 inch per foot. Drawings shall be coordinated with the respective trades, and cross-sections and elevations provided. All floor plans shall include room numbers as indicated on the architectural drawings.
- 7.4. Interferences:** Coordinate the design with the structural, mechanical, and electrical system components to avoid interference and conflicts. Particular attention shall be given to avoidance of structural components, including beams, columns, bracing, column caps and concrete reinforcement, and to ensuring that all equipment and distribution systems fit adequately above intended ceiling heights. Coordinate the routing of all systems with all work of other disciplines. Consider space required for access for maintenance and repair of equipment.
- 7.5. Mechanical and Electrical Utility Shafts:** Utility shafts shall be shown to scale. Locate shafts aligned with the mechanical equipment rooms to minimize the routing of utilities between these spaces and the floors they serve. The A/E design shall clearly indicate that all piping and duct routing is shown, including their supports, as nearly as possible in the location where it is to be installed. All mechanical and electrical utility shafts shall be sized to accommodate future growth and expansion, and to accommodate the future routing of ducts, piping, and conduit. All shafts shall have full sized doors at every floor level. The design shall include removable sections of floor grating at every floor level. The spaces shall be provided with lighting at every level. The spaces shall be closely coordinated with the structural design to ensure that columns, beams and other structural elements do not encroach on the space required for current and future conduit, pipe and duct risers and other devices, including service space requirements.
- 7.6. Sleeves:**
- a. The architect shall coordinate with the mechanical, electrical, and structural engineers to ensure that structural design drawings include the locations of all sleeves for pipe, ducts, and conduits in walls, partitions,

and passing through footings, beams, and exterior walls below grade. The elevation of sleeves on foundation drawings must be indicated.

- b. All penetrations through floors, walls, partitions and roofs shall have sleeves. All sleeves and openings shall be sealed. All fire/smoke sealants for penetrations through rated fire/smoke assemblies shall be in compliance with these Design Standards to maintain all work under one subcontractor.

**7.7. Floor Penetrations:** All mechanical pits, cleanouts, manholes, trenches, etc., shall be shown on the structural plans. If membrane waterproofing is used, waterproofing under basement toilet rooms shall be dropped far enough to permit running the soil and waste pipes above the waterproofing so as to reduce the number of pipes passing through the membrane. Drainage piping required in connection with pressure slabs, and locations of pipes and sleeves passing through or under pressure slabs, shall be fully coordinated with the structural engineer.

**7.8. Sustainability and Green Building Policy:** In accordance with the UM Green Building Policy outlined in Section 1 of these Design Standards, UM encourages the integration of sustainable and green building practices in the design of all renovation and new building projects, regardless of the intent to meet LEED™ certification requirements. The A/E team is encouraged to investigate and recommend the use of innovative and state-of-the-art use of materials, equipment, systems, and design approaches that hold promise for increases in energy efficiency, resource reuse and recycling, reduced energy consumption, and improved indoor air quality, operational efficiencies, and thermal performance of the project space. Where the intended use of such design practices conflicts with these Design Standards, the A/E team shall notify the UM OFM Project Manager during the Schematic Design phase, or as soon as possible thereafter, so that a discussion of the issues can be held and resolution can be reached. The Architect shall take the lead in encouraging all design team members to explore opportunities for the integration of discipline specific initiatives for sustainable design in the project as the design effort progresses. Specific design initiatives in the area of architectural design could include, but are not limited to, reductions in assigned square footage in an effort to reduce overall project size, use of recycled and salvaged materials, use of recyclable materials, daylighting techniques, open space design, adaptive reuse of existing structures, use of green roof design, limited use of ceilings, and integration of raised floors for future flexibility and ease of utility routing. In addition, the A/E shall include requirements for recycling of demolition and construction waste materials in the construction documents.

**7.9. Early Bid Packages:** When projects require early bid packages the A/E shall prepare the necessary construction documents for all work that cannot be installed in later bid packages. Early bid packages can include but are not limited to the following:

- a. Site development packages shall include all designs necessary for site improvement related to installation of site utilities, manholes, catch basins, etc.

- b. Foundation packages shall include the locations of all necessary piping and conduits that are to be installed below and/or through foundation slabs and walls.
- c. Slab installation packages shall include the locations of all necessary pipe sleeves, chases, sump pits, floor drains, roof drains, and trenches that are to be installed in the floor and roof slabs.

## 8. SPECIFICATIONS AND SUBSTITUTIONS:

**8.1. General:** In addition to the requirements in this section see UM Procedure Manual for Professional Architectural and Engineering Services for UM Construction and UM Service Centers, Latest Edition for specification requirements.

**8.2. Architectural Specifications:** A project specification incorporating sections for the architectural design shall be prepared, coordinated with drawings, and submitted to UM for review. The architectural specifications shall include the UM Standard header and footer arrangement as indicated in the M/E master specification sections. UM has developed selected architectural specification sections, and general requirement sections. The A/E shall review the UM master specifications table of contents, included in the appendices of these Design Standards, and select from the UM web page all appropriate specification sections necessary to suit the current project scope. The A/E shall edit the UM master specification sections to suit the requirements of the project. The A/E shall utilize their own specifications and/or other resources only in those cases where the UM master specifications do not include the required equipment, materials, or construction procedures to suit the current project. The UM master specifications can be accessed through the UM web page address included in Section 2 of these Design Standards. All text in the header, footer and body of each specification section shall be "Times New Roman, Size 12".

### 8.3. Mechanical and Electrical Specifications:

- a. A project specification incorporating sections for mechanical and electrical designs shall be prepared, coordinated with drawings, and submitted to UM for review. UM has developed a complete set of master specifications for mechanical and electrical divisions. The A/E shall review the UM master specifications table of contents, included in the appendices of these Design Standards, and select from the UM web page all appropriate specification sections necessary to suit the current project scope. The A/E shall edit the UM master specification sections to suit the requirements of the project. The A/E shall utilize their own specifications and/or other resources only in those cases where the UM master specifications do not include the required equipment, materials, or construction procedures to suit the current project. All text in the header, footer and body of each specification section shall be "Times New Roman, Size 12".

- b. For UM design projects that do not require a full set of mechanical or electrical specifications, UM has a condensed version of mechanical and electrical specifications that are to be used for those projects. The UM condensed specifications can be accessed through the UM web page address included in Section 2 of these Design Standards.

**8.4. Substitutions:** For specification sections provided by the A/E that are not based on the UM master specifications, the specification sections shall include the names of at least three manufacturers for every product. The A/E shall ascertain that every manufacturer listed is acceptable to UM, and that every manufacturer listed can provide a product that is acceptable in terms of performance, quality, size, service access and orientation. Even though the A/E may identify one manufacturer's product as the design basis, the other manufacturers' products will not be viewed as substitutions, but as equals. In addition, other manufacturers' products which are not listed, but can be considered as approved equals, shall not be viewed as substitutions. Only manufacturers' products which are not approved equals because of a deficiency in one or more significant aspects of the product will be considered to be substitutions. The design shall include sufficient space and service clearance such that the equal products of at least three (3) manufacturers can be used.

## 9. ACCESSIBILITY:

**9.1. Access to Machines and Equipment:** Clearance shall be provided around machines and equipment to remove parts for repair or replacement. Door or window openings, removable panels in building walls, and corridors shall be arranged so that large machines or equipment parts can be removed or replaced without structural changes or movement of other equipment. The architect shall coordinate with the other design team members to provide openings and passageways of sufficient size so that standard equipment can be used. Particular attention shall be given to equipment such as boilers, large tanks, refrigeration machines, air handlers, and condensers. Water cooled chillers shall be located in an accessible at grade or below grade mechanical equipment room, and not on the roof or on upper floors. The placement of operating equipment over ceilings shall not be used, with the exception of terminal units. Requests for variance from this shall be submitted in writing to UM early during the design process. Accessible utility core spaces shall be provided for all major mechanical and electric utilities. Access through full-size man doors shall be provided. These spaces shall have adequate clearance for maintenance and future replacement of the equipment, risers and conduits with a minimum of three (3) feet between equipment and structural components or as in compliance with manufacturer's recommendations. Adequate space must be provided for possible future additional duct and pipe risers, conduits and equipment. Designs which indicate the routing of piping or ductwork across the floor within the path of travel for service or maintenance personnel will not be acceptable to UM, nor shall piping or ductwork be designed which would create a low clearance hazard. There shall be a minimum of seven (7) feet vertical clearance within the path of travel. Where the path of travel is not obvious, or where directed by UM, indicate the path of travel around all equipment requiring service access on the construction drawings. UM reserves the right to require a total or partial redesign of equipment layouts, at no additional cost or time delay, where the submitted design is, in the



opinion of UM Facilities Management, not in the best interest of UM. Coordinate with the engineers to provide adequate lighting levels in all mechanical and electrical spaces for service and maintenance.

**9.2. Parts Handling:** A suitable means shall be provided for lifting and moving cooler and condenser heads, fan sheaves, pump casings, strainer covers, motors, gear boxes, compressor casings, and similar parts weighing over fifty (50) pounds. The type of lifting equipment used in each case must be determined on the basis of the number of machines in a group, size and weight of parts, accessibility, and estimated use. Typical means of lifting included in past designs have included monorails, davits, and provisions for portable cranes.

**9.3. Overhead Equipment:**

**a. Mechanical Rooms:** Catwalks, ladders, chain wheels, etc., shall be provided, as required, in mechanical rooms to provide access to material and equipment that cannot be accessed from the floor without the use of a ladder or lift.

**b. Access Panels or Doors:**

(1) Panels or doors shall be provided for access to valves or other equipment requiring periodic service, access, maintenance, or examination above ceilings. The panels shall be a minimum size of 18 inches x 18 inches, but of sufficient size to permit clear and unobstructed access to perform the required maintenance.

(2) The A/E shall provide sufficient floor space for the maintenance and operation of the equipment. All such space shall be subject to UM review and approval.

**10. BUILDING OPERATION:**

**10.1.** Except for selected shutdown holidays, UM campus buildings are open to the public for business from 7:00 am to 6:00 pm, Monday through Friday, but many of the buildings on campus are occupied to a lesser extent at all hours of the day and night, seven days per week. In buildings where public spaces and/or research spaces adjacent to the project area require other hours of operation, the design shall identify construction phasing that has the least impact on the adjacent occupied areas. The design shall include requirements for off-hour work as required for work involving the shut down of systems or equipment serving the occupied areas.

**11. DEMOLITION:**

**11.1.** A/E shall include all necessary provisions for demolition in the construction documents. Demolition documents shall clearly define the limits of the demolition work including the disconnection and removal of all equipment and distribution systems serving the project area. A list of all equipment and systems intended for demolition, and those to be reused in the project design shall be submitted to UM Facilities Management for approval. The A/E shall request from the UM OFM

Project Manager a list of equipment to be identified as salvaged material to be turned over to the University.

- 11.2. The A/E shall include a phasing plan in the construction documents that indicates a method by which the work in the occupied building can be accomplished with the least possible disruption to the occupants of surrounding and adjacent spaces. The plan shall include provision for all temporary piping, ductwork, power, equipment and systems necessary to provide HVAC and plumbing services to all occupied areas interrupted by the construction work. The plan shall also include the requirement for off-hour work for all outages and disruption of all services to the occupied areas. The plan shall utilize, to the extent possible, the change of seasons in the calendar year to lessen the impact of system outages, performing work on heating systems in the summer months and performing work on cooling systems during the cold weather months. The plan shall consider the anticipated disruption to adjacent occupied areas that will be caused by work that involves the generation of excessive noise, dust, and vibration.

## 12. MECHANICAL AND ELECTRICAL EQUIPMENT ROOM LAYOUTS:

- 12.1. **General:** The architect shall work with the engineer at the outset of the project to identify the sizes, shapes and locations of required spaces as dedicated mechanical and electrical equipment rooms. These rooms shall be arranged as penthouse mechanical and electrical rooms and lower level mechanical and electrical rooms to accommodate the building plumbing, HVAC, and electrical equipment and associated pipe and duct distribution systems. Lower level mechanical and electrical rooms shall be located either on grade or below grade with sufficient access to loading docks and/or public streets to facilitate the removal/replacement of equipment. The following additional requirements shall be included in the design:
  - a. **Equipment Room Separation:** Separation of mechanical and electrical rooms shall be maintained, with appropriate physical barriers to prevent flow or migration of fluids from mechanical to electrical spaces. It is preferable that the floor elevation of the electrical room be higher than the adjacent mechanical rooms.
  - b. **Future Equipment Space:** When directed by UM, or as required by the project program, provide space for future equipment such as chillers, pumps, and cooling towers. For future roof mounted equipment the design shall include the necessary structural supports and roof penetrations for piping and conduits.
  - c. **Equipment Room Stacking and Vertical Relationship to Main Electric and Tela/Data BDF Rooms:** It is UM's preference to stack all electric rooms and Tela/Data BDF closets in vertical alignment with their respective basement and/or penthouse level main electric rooms and between floors to facilitate the routing of wiring and conduit and to minimize cross-connect runs in the basement or penthouse level.

**12.2. Mechanical Equipment Rooms:** All mechanical rooms shall be designed to accommodate the required equipment in accordance with the manufacturer's operating and service clearance requirements, and in accordance with the accessibility requirements of these Design Standards. Equipment layouts shall include space for efficient and economical transitions and connections to all equipment in accordance with good engineering practice. Include in the mechanical equipment room the following areas:

- a. **Office Area:** Provide an office area of approximately one hundred (100) square feet with a work desk, lock box, telephone, and PC work station. This area shall be enclosed by a wire cage system for the walls, and ceiling, and a door with a lock.
- b. **Stock Storage Area:** Provide a stock storage area sized appropriately for a stock of maintenance materials to serve the equipment in the room.
- c. **Separate Chiller Room:** Where refrigeration equipment is included in the design, a separate mechanical room shall be provided to house the refrigeration equipment to isolate and contain potential refrigerant leaks.

**12.3. Electrical Equipment Rooms:** All electrical equipment rooms shall be designed to accommodate the required equipment in accordance with the manufacturer's operating and service clearance requirements, and in accordance with the accessibility requirements of these Design Standards.

### **13. VIBRATION AND NOISE CONTROL:**

**13.1.** In mechanical equipment rooms where the designed construction mass is not sufficient to provide a proper noise barrier, the Architect shall coordinate with the A/E team and UM to ensure that the appropriate acoustical treatment of the mechanical equipment rooms are included in the design. To prevent excessive use of such treatment, the A/E shall consider placement of such spaces adjacent to unoccupied and transient spaces to use as buffer zones to assist in attenuating sound transmission. The location of such spaces shall be considered in the layout of spaces on each floor as well as location on floors above and below critical spaces. For additional information see Section 3 AD and Section 3 MD of these Design Standards.

### **14. COMMISSIONING:**

**14.1.** The A/E team shall include the requirement for commissioning of all mechanical, electrical, and appropriate building systems by an independent commissioning agent to be hired by UM or the CM, as directed by the UM OFM Project Manager. The design specifications shall include all descriptions, commissioning forms, reports, and procedures required to completely test and demonstrate the operation of systems provided by the project. The testing and demonstration of each system shall include, at a minimum, normal operation and control sequences, failure modes, monitoring and control systems, life safety operations, security operations, and all remote monitoring and notification.

**END OF SECTION 3 AD - PART I**