

DRAWING AND CONSTRUCTION DOCUMENT STANDARDS

General

Prepare documents utilizing the standards below. Documents that the Architect/Engineer (A/E) is required to provide include but are not necessarily limited to the following:

- Construction Documents - Drawings.
- Base Drawings for Official U-M Floor Plans.
- Room Numbering/Key Plan Drawings.
- Record Drawings.
- Floor and Site Plans for Public Use.
- Construction Documents – Specifications.

References

[University of Michigan Design Deliverables](#)
[University of Michigan Design Guidelines Preferred Manufacturers List \(PML\)](#)
[University of Michigan Design Guidelines Technical Sections](#)
[University of Michigan Master Specifications](#)
[University of Michigan Standard General Conditions](#)
[University of Michigan Supplemental General Conditions](#)
[University of Michigan Front End Documents](#)
[University of Michigan Standard Details](#)

CAD Standards

The following are University of Michigan Architecture Engineering and Construction (AEC) drawing standards. At the beginning of the project coordinate specific project requirements with the Design Manager.

- Drawings shall be prepared on bond. Standard sheet size is 24 inches wide by 36 inches long. Other drawing sizes require the approval of the Manager of U-M Space Information (arranged through the Design Manager).
- CAD Format: Microstation is preferred. AutoCAD is acceptable.
- Provide one file per floor with no xrefs. Bind and insert and explode any xrefs.
- Explode/drop all attribute data to text using the Express tools or other method.
- Explode/drop all elements down to their basic element types: cells/blocks, lines, arc and polygons.
- Delete all unneeded elements from the file rather than the freezing or turning the layer off.

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- Line work should be clean. There should not be duplicate or additional overlapping elements or gaps.
- Standard font is Windows True Type Tahoma 1/8" x 1/8". The A/E must obtain approval from the Design Manager to provide a different font.
- Screening, shading, crosshatching, other indications of materials or locations, and text shall not obliterate significant information, and shall be capable of being reproduced without "bleeding" when the document is reduced to half size. Use screen patterns equal to or coarser than 50 percent, 50 line.

- Drawing Information – include the following:

- Include complete index to drawings on first or second sheet of the entire set and on first or second sheet of each series.

When sheets are added or deleted during the course of construction, final Record Drawing set shall have the index updated to reflect the final documents.

- Complete symbol and abbreviation legend(s) applicable to each series (where a series is a subset such as Architectural, Electrical, etc.) shall be included on first or second sheet of each series. It is not necessary to dedicate a whole sheet to legends. (Parts of the legend may be repeated on sheets throughout the sets or series as deemed appropriate by the A/E, but the legend on first or second sheet shall be comprehensive.
- The A/E shall show the location of all equipment in all locations on the drawings using accepted symbols shown in the Legend. Do not rely solely on notes. Examples include, but are not limited to, are: flow control and isolation valves, all types of dampers, turning vanes, access doors, clean-outs, etc.
- Scale shall be indicated by note and by graphic scale bar on each applicable drawing, detail and section. Any numbers or letters associated with the scale bar are to be a minimum 1/8 inch high. Where scale is applicable for entire drawing, scale references to be located near lower right corner of drawing.
- Plan sheets shall have north arrows, and all plans shall be consistent in their north arrow orientation, with the north arrow either oriented to the top or left of the sheet.
- Plan sheets shall include a tagged column grid on all drawing series (civil, architectural, mechanical, etc.), at all design phases.
- Where a portion of a plan or elevation appears on a sheet, a key plan shall be provided in the lower right portion of the drawing area to show the location of that portion relative to the whole.

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- o Cross-reference all plans, elevations, sections, and details as applicable.
 - o Floor live load capacities shall be listed on drawings.
 - o Drawings shall clearly distinguish between existing, new, and replacement work.
- Title Block Content:
 - o The University will identify the Project Title and project number, which the A/E shall put on each drawing.
 - o Sheet title shall be as descriptive as possible, shall always be unique within the drawing set.
 - o When submitting to the University any sheet with information not previously submitted, a note shall be included on one of the issuance lines on the title block, indicating purpose of submittal and date. This applies to design review and contract issuances as well as addenda, bulletins, etc. All such notations of issue shall remain on each sheet. In addition to the note on the issuance line, sheets which have already been released for bids shall have changes clearly delineated, by "clouding" or similar means.
 - o The title block, located at the lower right corner of the sheet shall contain the following information:
 - University of Michigan building number and building name
 - University of Michigan project number and/or Plant work order number
 - Project title
 - Sheet title
- Plans and specifications issued for regulatory approval shall be sealed by the Architect or Engineer responsible for the work. Each drawing sheet is to include the name and address of the company primarily responsible for its content regardless of whether or not it is the prime design profession for the project.
- The title sheet shall list all applicable building codes for the project, including but not limited to the building code, the electrical code, the mechanical code and the plumbing code. The construction document drawings are to include all information required by the applicable codes to be present on the drawings. .

Base Drawings for Official UM Floor Plans

- Drawings shall be provided in CAD format.

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- All full height wall lines shall be merged to a single A-WALL level, partial height walls merged to A-WALL-PRHT, all movable partitions to A-WALL-MOVE, all windows/glazing merged to A-GLAZ, all doors merged to A-DOOR etc.
- UM AEC Space Information and FIC maintains standards for Level/Weight/Color/Line. These are the only levels that should be used in floor plans. Contact the Design Manager to obtain a list of these standards.

Room Numbering Assignment Procedure

- Do not assign room numbers. UM Space Information is responsible for all room numbering. Submit floor plans for room numbers to the Design Manager who will forward them to AEC-Floorplans@bf.umich.edu. Submittals of plans should be according to the following schedule:
- **Schematic Design:** Submit pdf's of floor plans for initial room numbering assignments. Plans should display only walls, doors, windows, structural, stairs and toilet rooms. Remove all architectural symbols, references, column lines etc.
- **Design Development/CD Phase:** Submit pdf's showing any architectural changes (walls, doors openings) along with room numbers as assigned at Schematic phase. Indicate areas that have been changed with revision bubbles.
- **Bid/construction Phase:** Provide CAD files of all architectural floor plans for UM to begin creation of official UM floor plans. Include one elevation or section drawing (CAD or pdf) indicating all floor elevations. These drawings will become the base plans for **Official UM Floor Plans (Key Plans)**.

Record Drawings

- The A/E shall require that the contractors submit "Record" drawings for the project at hand and shall revise the permanent record drawings to reflect the as-built changes.
- Submit both a bond copy and an electronic copy of record drawings.
- In addition to a record set of PDFs or TIFFs, include CAD files for all disciplines. Each file should have layers displayed as printed for the Construction Set.

Floor and Site Plans – Public Use

Floor Plans

- Floor plans *should* contain:
 - Walls
 - Doors
 - Windows
 - Stairs
 - Elevators.

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- Floor Plans **may** contain:
 - Fixed furniture in class rooms, offices, conference rooms, and laboratories (but **should not** contain labels identifying any fixed furniture in these areas)
 - Restroom fixtures
 - Thematic room type floor plans (See Color & Label Guideline below for suggested colors and labels.)
 - Thematic department floor plans, **with the exception of following**, all of which should be labeled as “Support Departments:”
 - Unit for Laboratory Animal Medicine (ULAM)
 - Plant Operations spaces, such as Mechanical, Maintenance, or Custodial
- Floor Plans **should not** contain:
 - Utility tunnel information (tunnel walls, doors to tunnels, and/or access hatches)
 - Mechanical equipment, piping layouts
 - Card access control system information (card reader and control panel locations, and wiring diagrams)
 - Security system information (security sensor, camera, video recorder and control panel locations, and wiring diagrams)
 - Columns and column lines

Site Plans

Site plans should not contain any reference (visual or textual) to utility tunnels, roof access or mechanical and electrical spaces.

Document Format

- Provide one *pdf* file per floor.
- The original size should be either 8.5” x 11” or 11” x 17”.

Color & Label Guideline

A guideline is provided in the Appendix to assist A/Es and is not a requirement.

Direct questions regarding plans for public use to:

Manager, Space Information & FIC
The University of Michigan
Architecture, Engineering & Construction
(734) 615-9023

Specifications Requirements

General

AEC maintains within its Design Guidelines both a [Preferred Manufacturers List](#) and [Technical Sections](#). These components of the Design Guidelines reflect the needs and experiences of the University in regards to the specific equipment being addressed. The A/E shall select manufacturers from the list that are able to supply the products needed for the given project and whenever possible shall include at least three acceptable manufacturers. The Preferred Manufacturers List shall not substitute for the A/E's professional judgment. In the unusual circumstance where the listed products are not suitable, the A/E must present cogent justification for using other products and must obtain the written approval for these products from the Design Manager. The A/E shall incorporate the standards in the Technical Sections in the project specifications.

University Architecture and Engineering maintains a [Master Specification](#) for use by in-house designers. A/Es may use these specifications, but must edit these specifications to make them project specific. However, they should not substitute these specifications for their professional judgment regarding the requirements of each individual project. Use of these specifications will not relieve the A/E from the obligations of the contract, stated or implied, that pertain to their performance or the performance of their product.

The general requirements (Division 1) and technical portions (Divisions 2 through 16) of the specifications may be included on drawings, or in book (project manual) form. Generally, projects with anticipated construction costs of more than 1 million dollars are required to take the project manual approach. Consult with the Design Manager.

On small projects, produce specifications on drawings as follows:

- Arrange Division 1 general requirements and Division 2 through 14 technical specifications at the head of Architectural trade drawings.
- Arrange Division 15 technical specifications at the head of Mechanical trade drawings.
- Arrange Division 16 technical specifications at the head of Electrical trade drawings.

Project manuals must contain Front End Documents in addition to general requirements and technical specifications. See paragraphs below titled "University of Michigan Standard General Conditions" and "Other Standard Documents".

Specification Standard: The University recommends compliance with the principles and practices outlined in the CSI Manual of Practice.

Use of the 3-Part Section Format is mandatory.

Use of the Page Format is encouraged, but is not mandatory.

Use the 1995 CSI MASTER FORMAT Section numbers and titles for organizing Documents and specifications within Project Manuals. Comply with guidelines for contents of each Division and Section of the specifications.

Language and Terminology

Compliance with the recommendations of Manual of Practice Chapter 4 "Specification Language" is strongly encouraged. The following requirements are mandatory:

Write specifications as if addressed to the General Contractor. Do not address specifications to "This Contractor" or "The subcontractor." Where specific parties must be referred to for clarity, use language similar to the following: "Engage a licensed Professional Engineer to perform calculations," or "Require Installer to examine substrate prior to installation."

Eliminate the term "by others" from drawings and specifications. If work is not part of the Contract, say so directly using (N.I.C.) or similar constructions. If, for example, a mechanical item is shown on an architectural sheet for clarity, use the phrase "work of Division 15" or "by mechanical trades."

Eliminate the term "or equal" from specifications. The University requires Contractors to bid only products specified as "approved." List not less than three alternative, equivalent manufacturers for each generic product specified, unless no other equivalent products exist.

University of Michigan Standard General Conditions

The University maintains its own [Standard General Conditions](#) and [Supplemental General Conditions](#). Obtain a copy of these documents and make sure the specification writer is fully familiar with it.

In general, Special Conditions are not required. However an A/E may wish to modify language concerning shop drawing review or other items. Coordinate use of Special Conditions with the Design Manager.

Other Standard Documents

The University maintains a series of standard documents coordinated with the Standard General Conditions. Consult with the Design Manager to obtain further information. [Project Manual \(Front End Documents\)](#).

Appendix - Thematic Floor Plan Standards

	Circulation	010	
	Classrooms	100's	
	Classroom	110	
	Classroom Service	115	
	Laboratory Facilities	200's	
	Laboratories	210, 220, 250	Do not label or distinguish between Class, Open and Research Laboratories
	Laboratory Service	215, 225, 255	
	Office Facilities	300's	
	Office	310	
	Office Service	315	
	Conference Room	350	
	Conference Room Service	355	
	Study Facilities	400's	
	Study	410	Use single color for these four room types. Use text and/or furniture layout to distinguish the room types.
	Stacks	420	
	Study / Stacks	430	
	Processing	440	
	Study Service	455	
	Special Use Facilities	500's	
	Athletic or Physical Education	520	Use text to distinguish between the different room types in this section
	Spectator Seating	523	
	Athletic or Physical Education Service	525	
	Media Production	530	
	Media Production Service	535	
	Demonstration	550	
	Demonstration Service	555	
	Greenhouse	580	
	Greenhouse Service	585	
	Armory, Armory Service	510, 515	Contact UM Design Manager or Manager of Space Information for directions.
	Clinic, Clinic Service	540, 545	
	Field Building	560	
	<i>Animal Quarters, Animal Quarters Service</i>	<i>570, 575</i>	<i>Place in Support Facilities (700's)</i>
	General Use Facilities	600's	
	Note: If the building is primarily a general use building (e.g., Student Union) contact the Manager for Space Information for a more detailed Color Legend.		
	Assembly	610	Optional labels: Theater, Concert Hall, Chapel, etc.
	Assembly Service	615	
	Exhibition	620	Optional labels: Museums, Gallery, etc.
	Exhibition Service	625	
	Food Facility	630	Optional labels: Dining Hall, Cafeteria, Snack Bar, Restaurant, etc.
	Food Facility Service	635	
	Day Care	640	
	Day Care Service	645	
	Lounge	650	
	Lounge Service	655	
	Merchandising	660	Optional labels: Bookstore, Post Office, Ticket Office, Travel Office,
	Merchandising Service	665	
	Recreation	670	Optional labels: Exercise Room, Weight Room, Billiards Room, Game
	Recreation Service	675	
	Meeting Room	680	
	Meeting Room Service	685	

Support Facilities		700's and additional Room Types	
	Central Computer or Telecom & Service	710, 715	<i>These spaces should not be labeled nor should they contain any fixed furniture or mechanical information.</i>
	Shop & Service	720, 725	
	Central Storage & Service	730, 735	
	Vehicle Storage & Service	740, 745	
	Central Service & Service	750, 755	
	Hazardous Materials & Service	760, 765	
	Animal Quarters & Service	570, 575	
	Building or Custodial Services	020	
	Mechanical Rooms (including void spaces)	030	
	Unfinished or Shell Space	070	
Health Care Facilities		800's	
	Patient Room	810, 815, 820	Patient Room, Patient Room Service and Patient Bathrooms
	Patient Service	830, 835	Nurse Station & Service
	Patient Treatment & Examination	840, 845	Surgey & Service
	Patient Treatment & Examination	850, 855	Treatment/Examination & Service
	Patient Treatment & Examination	860, 865	Diagnostic Service Lab & Support
	Patient Treatment & Examination	870	Central Supplies
	Public Waiting Room	880	
Residential Facilities		900's	
Contact UM Design Manager or Manager of Space Information			