



Construction Document Guidelines

This document is intended to guide Design Consultants in preparing required documentation for their work done for the University of Missouri - Columbia. If any questions arise, the consultant is encouraged to ask the MU Project Manager assigned to their project for guidance. If the MU Project Manager cannot provide immediate help, they will be able to refer you to someone who can answer your questions.

The following information is provided to outline the requirements for submitting design documents in physical and electronic media. The information is organized by design phase resulting in some information being repeated from section to section. Where the design phase references “approved electronic form” refer to Section III Document Format and Criteria for specific requirements.

Printing of all **bid** and **construction** sets are done by the Owner through a third-party contractor. Depending on the consultant agreement, **review** sets may be printed by the consultant and included as a Basic Service, printed by the consultant as a reimbursable expense, or printed by the Owner through a third-party. Documents to be printed by the Owner must be submitted at least four business days before the date they are required to be used unless approved in advance by the MU Project Manager. For bid sets, that means four business days before advertisement date. It is suggested that four business days be added to the review schedules.

Where the consultant is providing all review sets or originals for printing by the Owner, furnish the drawings and project manual as outlined under each submittal phase below. Optionally, where included in the Consultant Agreement or directed by the MU Project Manager, the procedure outlined in [Section V](#) below may be used for electronic transfer of **review** documents **only**. If this procedure is used, the documents must be submitted two days in advance rather than the four days required for printed documents. This procedure, if used, **must** be used for all documents including those submitted by subconsultants.

The prime consultant on the project is responsible for coordinating all document submittals including the quality and content of the submittals of their sub-consultants. Costs for re-printing, re-assembly, or project delays due to the consultant’s failure to follow these guidelines may affect the consultant’s fees or reimbursements. We urge the consultant to discuss any questions or issues with the MU Project Manager in advance of submittals.

I. General Requirements

A. Drawing Assembly Requirements

1. Project drawings are to be assembled such that, when printed full size, each set can be managed. The minimum full size is 24" x 36" with the maximum of 36" x 48". The maximum number of sheets in a volume (one binding) is limited to 100 sheets. If a set is over 100 sheets it should be divided into two or more volumes.
2. The prime consultant shall examine sheets submitted by their sub-consultants before submitting to the University and assure that **all** sheets are consistently the same size and printed to scale.
3. A graphic scale is to be printed on all sheets.
4. Drawings should be assembled in the following order unless approved otherwise by the MU Project Manager.
 - a. Cover Sheet
 - b. Site/Civil/Survey
 - c. Architectural including code sheets
 - d. Structural
 - e. Mechanical/HVAC
 - f. Fire Protection
 - g. Plumbing
 - h. Electrical

B. Project Manual Assembly Requirements

1. Project manuals are to be assembled such that when printed the volume (one binding) is no more than 400 physical sheets (up to 800 pages printed both sides). If the project manual is over 400 physical sheets, it should be divided into two or more volumes.
2. Specification divisions must follow the outline provided in the Division 1 documents provided to the consultant from the University of Missouri Facilities Planning and Development.
3. All specification pages shall be individually numbered with the specification division number followed by the page number.
4. The table of contents provided in Division 1 shall be filled out completely by the consultant and included with every review submittal except Schematic Design or Programming documents.
5. The project manual shall be assembled such that all "slip sheets" or blank pages required to make the pagination work correctly are inserted.

6. All specification sections shall have the words “End of Section” printed on the last page below the final text of that section.

II. Submittal Requirements

A. Schematic Design

1. Only printed, non-reproducible drawings and specifications are required.
2. If printing is done by owner, drawings and specifications can be provided on any 20-24 lb. bond paper. Alternatively, this submittal can be done electronically in accordance with [Section V](#) below.

B. Design Development

1. Printed, non-reproducible drawings, specifications and or reports are required.
2. Electronic versions of the architectural floor plans are to be provided to the MU Project Manager. These plans will be used by the Owner to provide the Consultant with room numbers for the affected areas. Comply with [Electronic Document Format and Criteria](#) below.
3. If printing is done by owner, drawings and specifications can be provided on any 20-24 lb. bond paper. Alternatively, this submittal can be done electronically in accordance with [Section V](#) below.

C. Other Reviews

1. Printed, non-reproducible drawings, specifications and or reports are required.
2. If printing is done by owner, drawings and specifications can be provided on any 20-24 lb. bond paper. Alternatively, this submittal can be done electronically in accordance with [Section V](#) below.

D. Bid Documents

1. Printing of bid documents is done by the Owner. Consultant provides original sealed documents in accordance with the Consultant Agreement. Drawings are to be provided on paper as specified in [Media Requirements for Bid Sets, Construction Sets, and Record Drawings](#) unless directed otherwise by the MU Project Manager.
2. Submit the table of contents in Word format to the Planning, Design and Construction Documents Center simultaneously with the submittal of documents to be printed.

E. Construction Issue Documents

1. Construction Issue Documents are bid documents that have been modified to include addenda and/or alternates that are accepted. Original sealed documents are to be provided per the Consultant Agreement to the Owner for printing on or before the date of the Pre-Construction Meeting. All sheets shall be re-plotted and the project manual shall be re-printed. The original bid date shall be left on the new plots and project manual. In addition, the consultant will note in the revision block the date of each change to that sheet including applicable addenda, alternates taken, and a notation the sheet was re-issued as a construction drawing along with the date of issue. Where feasible, changes on the drawings should be clouded for reference where changes are due to more than one addendum on the same sheet. The project manual shall have a note on the cover page that states "Construction Set Issued: XX/XX/XX" with the appropriate date in the place of the X's. Two CDs of electronic versions of the Construction Issue Documents shall be provided that comply with the [*Electronic Document Format and Criteria*](#) section below. For this submittal, paragraph [*III.D.4.d.\(3\)*](#) does not apply. These electronic documents are to be provided to the Planning, Design and Construction Document Center. Drawings are to be provided on paper as specified in [*Media Requirements for Bid Sets, Construction Sets, and Record Drawings*](#). Printing of construction documents are done by the Owner.

F. Bid Award

1. If no Construction Issue Documents (see E1 above) are requested by owner, electronic versions of the Bid Documents shall be provided that comply with the [*Electronic Document Format and Criteria*](#) section below. Two sets of Bid Documents including any and all addenda shall be furnished in approved electronic form within twenty-one (21) days after the date of bid opening. For this submittal, paragraph [*III.D.4.d.\(3\)*](#) does not apply. These electronic documents are to be provided to the Planning, Design and Construction Document Center.

G. Project Completion

1. Consultant shall furnish to the Owner one set of As-Built Record Drawings on Mylar (film), one set on engineering bond and one set of bound As-Built Record Specifications on paper as specified in [*Media Requirements for Bid Sets, Construction Sets, and Record Drawings*](#) below.

2. Consultant shall furnish to the Owner one set of As-built Record Drawings and Specifications in approved electronic forms.
3. All of the above are to be submitted to the Owner within twenty-one (21) days of receipt of the marked up blue-line drawings from the Contractor. These drawings shall indicate as-built conditions at final completion of the project based upon information supplied by the Contractor, and shall be of sufficient quality to facilitate reproduction. Bear in mind that final payment to the consultant will not be made until submittals meeting these conditions are made.
4. See [Section IV](#) for additional requirements and information on as-built (record) documents.

H. Reports, Studies, Surveys, etc.

1. Consultant shall furnish the Owner one set of final reports, studies, surveys, etc. in approved electronic form, in addition to and at the same time as, the requested paper and/or drawings. The Consultant shall make every effort to prepare the entire document using one of the specified software programs. If this is not possible the Consultant may provide the original files in their native format and, at the MU Project Manager's discretion, an Acrobat PDF file containing a printable version of the report in its entirety. Originals shall be provided as specified for project manuals in "[Media Requirements for Bid Sets, Construction Sets, and Record Drawings](#)" unless approved otherwise by the MU Project Manager.

- I. Deviation from these guidelines shall require prior approval by the MU Project Manager.

III. Media Requirements for Bid Sets, Construction Sets, and Record Drawings

A. Paper for Project Manuals

1. Provide on acid free bond paper 20-24 lb weight.
2. Sample brands are:
 - a. Eaton Diamond White
 - b. Eaton Technaclear
 - c. Hammermill 20-lb. Bond
 - d. Xerox Image Elite

- B. Mylar (Film)
 - 1. Provide reproducible double matte, 4-mil first quality sheets.
 - 2. Sample brands are:
 - a. Bruning, Océ, HP, or equal.

- C. Paper for Drawing Originals
 - 1. Provide acid free bond paper 20-24 lb weight designed to work with xerographic equipment.
 - 2. Sample brands are:
 - a. Océ PPC Engineering Bond
 - b. Hammermill Panorama Engineering/Drafting Paper
 - c. Hewlett Packard Special Inkjet Paper

IV. Electronic Document Format and Criteria

- A. General File Submittal Requirements
 - 1. *These requirements are primarily for submittal of record sets.* For electronic document requirements for review documents see [V. Alternate Procedure for Submitting Review Drawings](#). Check with the MU Project Manager if there are any questions as to the format of any given submittal.
 - 2. Compressed files are not acceptable.
 - 3. Acceptable media are CD or DVD.

- B. Acrobat PDF Files
 - 1. Acrobat PDF files may be provided in addition to other files requested.

- C. Word processing files
 - 1. Microsoft Word
 - 2. File names shall be descriptive of the document content. An example of descriptive naming would be *ASPEC.DOC* for an Architectural specification.
 - 3. In naming files, make sure file name is in compliance with Microsoft Windows standards.

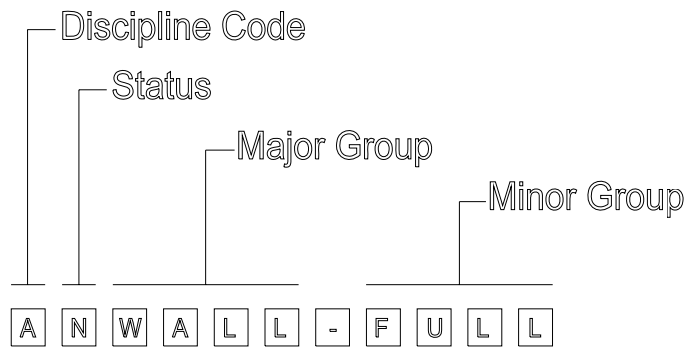
D. CAD files

1. AutoCAD DWG file format. If DWG conversion is not available, files may be submitted in AutoCAD compatible DXF file format. All files must be readable by the Owner; any files not readable or corrupted shall be resubmitted.
2. CAD files shall follow the U.S. National CAD Standard current version for file naming with file name containing the design discipline and sheet number.
 - a. File names shall be descriptive of the document content. An example of descriptive naming would be **99001A01.dwg** for the Architectural sheet file for drawing A-1 of the set or **M-DT01.dwg** for a Mechanical model space detail file.
3. Plot Control Files
 - a. A copy of the AutoCAD .PC* files shall be included with all drawings. One PC file should be included for each plot setup and should be stored in directories with the applicable file(s).
 - b. For example, if there is one prime consultant and two sub-consultants, it would be advisable that each consultant plot their drawings in one format and then create a PC* file for that format. The files submitted would then have one directory for each consultant with each directory containing one PC* file and multiple drawing files.
4. Drawing parameters on individual files shall comply with the following:
 - a. All model space plans shall be drawn full size scale 1" = 1".
 - b. Details, elevations, etc. should also be drawn full size where a scale applies. Schematics or standard details where a scale does not apply may be drawn at other scales or no scale.
 - c. X-ref and binding
 - (1) Drawings using separate reference files, X-ref, shall be bound into one file prior to submission of the construction and record sets.
 - (2) Each sheet contained in the physical drawing set shall be a separate file.
 - (3) When binding the file, all layers, colors, linetypes, and other settings shall be set as they were when the file was plotted to create the physical drawing set.
 - (4) Binding shall be done in such a way as to exclude the X-ref

file name within the layer names. When using AutoCAD, this shall be done using the “Bind, insert” option rather than the “Bind, bind” option during the binding process.

d. Layers

- (1) In plan drawings all entities shall be grouped on layers of like items. Linetype and color shall be set by layer.
- (2) Details and elevations entities shall be grouped on layers and with linetype and color by layer to the greatest extent possible.
- (3) Layer naming shall follow the U.S. National CAD Standard, current version of AIA CAD/Layer Guidelines for Layer Naming. Layer naming shall be systematic and consistent throughout a design disciplines drawings. Nested layers, a layer subservient to another layer, shall be



avoided. The number of layers used shall be as few as is practical for the scope of work and any unused layers deleted. A list of any additional layers and their definitions, not defined in the AIA CAD Layer Guidelines, shall be included with any files submitted.

- (4) The user definable character of the Discipline Code, in the second position, should be used to indicate Status. The Status Field is abbreviated to one character and is eliminated from the end of the layer name. This facilitates the use of layer filtering and sorting. The Discipline Code with Status options for layers would be as follows:

Discipline Code - First Position

<i>Disc. Code</i>	<i>Discipline</i>	<i>Disc. Code</i>	<i>Discipline</i>	<i>Disc. Code</i>	<i>Discipline</i>	<i>Disc. Code</i>	<i>Discipline</i>
<i>A</i>	<i>Architectural</i>	<i>H</i>	<i>Hazardous Mat'l</i>	<i>P</i>	<i>Plumbing</i>	<i>T</i>	<i>Telecommunications</i>
<i>C</i>	<i>Civil</i>	<i>I</i>	<i>Interiors</i>	<i>Q</i>	<i>Equipment</i>	<i>X</i>	<i>Other disciplines</i>
<i>F</i>	<i>Fire Protection</i>	<i>L</i>	<i>Landscape</i>	<i>R</i>	<i>Resource</i>	<i>Z</i>	<i>Contractor/shop drawings</i>
<i>G</i>	<i>General</i>	<i>M</i>	<i>Mechanical</i>	<i>S</i>	<i>Structural</i>		

Status Code - Second Position

<i>Disc. Code</i>	<i>Discipline</i>	<i>Disc. Code</i>	<i>Discipline</i>
<i>-</i>	<i>Existing</i>	<i>M</i>	<i>Items to be moved</i>
<i>D</i>	<i>Demolition</i>	<i>T</i>	<i>Temporary Work</i>
<i>N</i>	<i>New Work</i>	<i>R</i>	<i>Relocated Items</i>
<i>F</i>	<i>Future Work</i>	<i>X</i>	<i>Not in Contract</i>

Layer Examples

<i>Layer</i>	<i>Description</i>
<i>A-WALL-FULL</i>	<i>Architectural, existing, wall layer, full height</i>
<i>MNHVAC-EQPM</i>	<i>Mechanical, new, HVAC, equipment</i>
<i>EDANNO-TEXT</i>	<i>Electrical, demolition, annotation, text</i>
<i>FRFIRE-DEVC</i>	<i>Fire protection, relocated, fire alarm, device</i>

- e. Fonts - Drawing fonts shall be kept to a quantity of ten or less and a copy of each font used shall be included with any drawings submitted. The predominant font style in a drawing shall be created as "standard" style.

- E. Mapping and Site Plan Files – This section will be modified later to split the requirements between mapping, legal surveys and site surveys.
 - 1. Utility and survey CAD files guidelines are under development. Utility and survey CAD files shall be provided using the surveying firm's CAD standards. Those standards should be based on the surveying software used as well as the established coordinate and datum systems for the

Columbia/Boone County area. If further information is needed, the MU Project Manager will clarify these requirements

2. Site plan CAD files shall comply with the AIA CAD guidelines noted above unless approved in advance by the MU Project Manager.
3. Mapping, site plans, utility or survey CAD files shall be in compliance with the State Plane Coordinate System: Missouri Central Zone, Horizontal Datum: NAD 83, Vertical Datum: NGVD 29, Units: US Survey Feet, and the United States National Map Accuracy Standards.

V. **Record Documents**

A. Procedure

1. Original drawings are issued at the time of advertisement in the form of plots on specified bond paper. This set of sealed drawings is not changed for subsequent addenda, change orders, or as-built (record) conditions. Rather, this set of drawings is a permanent record of the “as designed” condition. Record drawings are created based on information provided to the consultant by the contractor on marked-up field drawings in addition to changes made by change orders or field changes noted by the consultant. The procedure below pertains to these Record Drawings.

B. Retention by Consultant

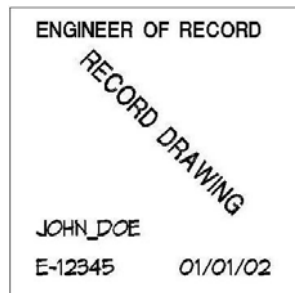
1. The consultant is encouraged to keep a copy of the electronic files in their original format complete with all referenced files.

C. Submission of Record Drawings

1. Record drawings are submitted as outlined in the sections above. In addition, the following should apply:
 - a. “Cloud” all revisions from original drawings and note the source of revision, i.e. addenda, change order, or construction change as well as the date of the change. The revision symbol should be a triangle with a number unique to the individual change within the triangle. This symbol shall appear in the revision block on the drawing border and must be keyed to the appropriate “cloud” to specifically identify each change.
 - b. Apply a disclaimer to the electronic version that would appear in the plotted version noting the document is an as-built document. A suggested disclaimer is:

“These design drawings have been altered to indicate as-built information supplied by the construction contractor. The Engineer-of-Record is not responsible for the accuracy of said information. A record of as-designed drawings are maintained by the Owner”

- c. A block similar to the one below should be inserted in the place of the Engineer or Architect’s seal.



VI. Alternate Procedure for Submitting Review Drawings

A. General Requirements

At the option of the consultant or as directed by the MU Project Manager, electronic files for review sets may be submitted to the University for direct printing. If the Consultant Agreement contains provisions for the consultant printing review sets, and this option is chosen, the Consultant Agreement will be amended accordingly. If the Consultant Agreement requires electronic files to be submitted, this provision is mandatory. The following shall apply to documents submitted electronically.

1. Drawings

- a. All files must be created in Bluebeam Pushbutton PDF™ or Adobe Acrobat 6.0 Professional (or later version). If the consultant wishes to use a different software package; the software must be approved in writing, in advance, by the Documents Coordinator within Planning, Design and Construction. **Plot files using the standard AutoCAD plot format (.plt) or AutoCAD drawing files (.dwg) will be rejected and the consultant will have to resubmit the proper files in such time as to prevent delays in the project review process.**

- b. One PDF file is to be created for each volume of drawings to be printed. Pages shall be coordinated for plot orientation as landscape. All pages shall be oriented the same direction within the file such that all pages can be read as the file is normally opened.
- c. The first page shall be the cover sheet labeled **COVER**. This page shall have a list of all sheets in the plan set listed in the order the plans are printed. See the Consultant Guidelines and Design Procedures of the University of Missouri for further requirements for the cover sheet. The title of each additional page shall reflect the sheet number, for example A1.01, A1.02, M1.03, M1.10, etc. All page numbers shall be reflected in the bookmarks within the PDF document.

2. Project Manual (Specifications)

- a. The project manual (specifications) shall be submitted for printing in Adobe Acrobat format.
- b. Only one file per volume shall be submitted containing all specifications from all consultants on the project.
- c. The file shall contain all “slip sheets” or blank pages required to make the pagination work correctly.
- d. All sections shall be “bookmarked” within the PDF file for quick look-up capability and the specification shall be compiled in searchable PDF format.

3. The primary consultant is responsible for reviewing and assembling documents from all sub-consultants to assure they conform to these guidelines.

- a. **Submittals not in this format and in the file structure described will be rejected and the consultant will have to resubmit the proper files in such time as to prevent delays in the project review process.**

B. Procedure

- 1. Refer to the PD&C Documents Coordinator (Phone 573-882-0455) for the proper way to transfer files to the PD&C LeapFile site for printing or contact the MU Project Manager.