SECTION 01950 - RECORD DRAWINGS & SPACE FLOOR PLANS

1.1 RECORD DRAWINGS MATERIAL AND FORMAT

A. Definition

1. Final record drawings, or “as-builts”, are drawings, which are revised to reflect the changes during construction. These include architect’s field notes, change orders, construction change directives, as well as any other modifications.

B. The objective is to record changes on the original construction contract documents so that they can be used for building operations, maintenance, and changes in the future. In large projects, detailed record drawings of all systems should be developed. (See AIA Architect’s handbook, 2.9 Post-construction Services, pp. 3-4.)

C. Materials

1. Support
   a. Hard copy: At the time of the submission of the electronic copy, one (1) half-scale, blue line or black and white bond copy shall be submitted to the Project Manager for final review. Upon approval, the final set of record drawings shall be submitted. Preferred sheet sizes of final submission are 24”x36”, 30”x42”, and 36”x48”. All sheets in a set must be the same size.
   b. Electronic copy: AutoCAD file version 2008 or greater, following CAD Standards submitted on high-density disks or CD ROM to the Campus Planning, Design and Construction Management Archive Group. Any project submitted as CAD files must also provide final-quality hard copy, as defined above.

D. Format

1. Project Number: The University project number must be displayed prominently in the title block of each drawing.

2. Title Block: Each drawing must contain at least the following information in the title block:
   1. Building name
   2. Floor/area identification
   3. Date drawn
   4. Drawn by
   5. Project name
   6. University project number
   7. Drawing title
   8. Discipline
   9. Scale
   10. CAD filename (if applicable)
   11. Professional seal on hard copy
   12. Revision block

E. Room Numbers

1. Room numbers are entered as part of every drawing. Numbers are assigned by the Campus Planning, Design and Construction Management Archive Group. Consultant to provide one copy of the demo plan and two copies of the final floor plan at the end of Schematic Design.

F. Match Lines and Keyplan
1. Match lines will be used for all floors or areas which must be divided, to fit sheet size and scale.

2. A keyplan of the building or area will be added, in the lower right hand corner above the title block. The location of the drawing area will be shaded on the key plan. Keyplan orientation will match floor plan orientation.

G. North Arrow

1. True north is shown in a symbol located in the lower right corner of the sheet.

1.2 CAD STANDARDS

A. Definition: CAD (computer-aided design) involves the creation of drawings composed of discrete vectored entities as opposed to rastered or bitmapped drawings (for instance, scanned files). AutoCAD’s .dwg is the preferred format for all record drawings, and the only acceptable format for University of Rochester space floor plans. (AutoCAD release 2000 or higher as specified in contract or purchase order.) Any use of a translation process must result in 100% compatibility with the U of R’s computer hardware and software, including direct compatibility of all AutoCAD object types. All drawings will be created in “real time” and appropriately scaled down for plotting.

B. Layers

1. A list of standard layers is posted on the University of Rochester’s web site. The address and password to access these files will be made available upon request.

2. Drawing entities must be kept on the appropriate layers as shown.

C. Blocks

1. Blocks should be used at all times. Any object made up of more than 3 entities, used repeatedly, should be saved as a block and listed as such in the drafting library.

2. All blocks will be created on LAYER 0. The majority of blocks will have ATTRIBUTES, which will be entered for all blocks and not ignored. At the very least, take the default values for these blocks.

D. Hatch

1. Whenever the use of hatch is required, the hatch will be placed on a layer with the name HATCH.

E. Match Lines and Keyplans

1. Match lines will be used for all floors or areas which must be divided, to fit sheet size. They should appear on all divided drawings, and must accurately align between all divided areas.

2. A keyplan of the building or area will be added, in the lower right hand corner above the title block. The location or the drawing area will be shaded on the key plan. Keyplan orientation will match floor plan orientation.

F. North Arrow

1. True north is shown in a symbol located in the lower right corner of the sheet.

G. Text Style

1. The preferred text style is AutoCAD Roman simplex. Style should be consistent throughout.
H. Drawing Output

1. All final record drawings will be submitted on disk, accompanied by a plot of each drawing.

I. File Naming

1. The extension for all CAD files will be .DWG.

2. For record drawings, it is preferable that the filename reflect the building, area and discipline for each drawing.

3. For space floor plans, the filename will consist of the 3-letter building or four number section code, with a three-letter code for River Campus, South Campus and University Properties, four or five number code (depending on the building) for Medical Center and Strong Memorial Hospital, followed by the code for the level or floor, with a letter designation for floors with more than one drawing.

   Building section codes are assigned by the Campus Planning, Design and Construction Management Archive Group.

   Example:  
   HUT2B.DWG = Hutchison Hall, Second floor, part b
   47004A.DWG = 4700 area, Fourth Floor, part a

J. Disk Naming

1. All disks will be labeled with at least the following information:

   a. University project number
   b. File names
   c. Date created
   d. Consultant’s name/firm name
   e. Number of disks in set

K. Drawing Index

1. Submit in MS Windows compatible text format or MS Office compatible word processor or spreadsheet to include the following:

   a. Drawing number
   b. File name
   c. Building and section
   d. Discipline
   e. Brief description of drawing

L. Plotting

1. Final plots will be done on mylar, with indelible liquid ink pens (see Material and Format Standards).

   a. All sheets in a set are to be uniform in size. Recommended sizes are 24” x 36”, 30” x 42” and 36” x 48”.

   b. All sheets must have a title block containing at least the following information:

      1. Building name
      2. Floor/area identification
      3. Date drawn
      4. Drawn by
      5. Project name
      6. University project number
      7. Drawing title
8. Discipline  
9. Scale  
10. CAD filename  

c. All sheets with match lines will be to the same scale.

2. Recommended plotting scales are:

3/32” = 1’-0”  
1/16” = 1’-0”  
1/8” = 1’-0”  
3/4” = 1’-0” (sections and details only)

1.3 GIS ATTRIBUTES

For all projects that have any site work completed, survey data must be submitted electronically, preferably in ESRI File Geodatabase format but would be accepted as a shape file. Geodatabase template with layering standards is available upon request. All data will be surveyed using a Licensed Professional Land Surveyor.

Submitted geodatabase will include measured locations for all buried utilities, with sufficiently accurate locations to enable instrument location of buried utilities at a later date. The contractor must arrange for survey of buried utilities to coincide with the hole being open.

Additionally, contractors will create unbroken linework in the drawings, meaning that a line representing a sewer pipe, for example, would be a single unbroken line between two manholes. Do not break lines into multiple pieces for labeling purposes.

It is expected that the following GIS attributes that apply to a project will be collected:

- The entire drawing will be referenced to State Plane coordinates, so that it can be loaded into ArcMap or AutoCAD and reviewed.
  - Horizontal Coordinate System: NAD83, New York State Plane, Western Zone, Feet
  - Vertical Datum: NAVD88, Feet
- Building outline with finish floor elevations (including rooftop)
- All trees (sizes and types)
- Topography lines of the area at 1 foot intervals
- Edges and tops of curbs/sidewalks
- Traffic Patterns/roadway lines
- Coordinates of all utilities must have X, Y, and Z coordinates surveyed – including new/existing and crossings exposed
- Top of pipe will be marked at every change in elevation, at every turn (45, 90), every branch connection, pipe ends, bends, junctions and every valve, vent, drain location. Additionally at 100’ intervals for longer runs of piping to ensure that grade is correct.
- Pipes must be represented by 3D GIS lines. The vertical position of the 3D line shall represent the bottom of the internal opening of the pipe. For runs of pipe that are 100’ or less, it will be acceptable to create two-point 3D lines, using invert elevations at each end of the pipe. For runs of pipe that are longer than 100’, invert elevations shall be used at the ends, and the top of pipe
shall be surveyed every 100’, at any bends or elbows, and at any significant changes in elevation. The top-of-pipe survey points shall be stored in the “survey points” layer, and will also be used to create mid-pipe “invert” elevations using the formula (invert=top of pipe-(inner diameter+((outer diameter-inner diameter)/2))) or similar method. These elevations will be used to create 3D line vertices.

- As-Built documentation of all new and modified existing utilities shall include elevation and state plane coordinates for the following components:
  - Catch basins/Storm Sewer Manholes
    - Invert elevation in and out of the structure, sump elevation, frame and grate elevation with coordinates for each corner of the structure.
  - Sanitary Manholes
    - Invert elevation in and out, every connection, RIM elevation and coordinates of the center of the structure.
  - Steam Vaults
    - Floor elevation, ceiling elevation, coordinates for all four corners of the structure, coordinates at the center of cover, or covers if there are multiple.
  - Valve Boxes
    - Elevation shall be taken on the body of the valve box, not the cover.
  - Pipe shall be dimensioned by diameter with a descriptor for material type.

- Dimension of Utility (i.e. pipe, vault, manhole, catch basin size etc.).

- Must show both the supply and return lines for chilled, steam and high temp hot water piping, a single line representation is not acceptable.

- Utility labels with direction of flow.

- Always indicate pipe slope and direction of slope.

- Must show manhole and manhole piping details in scaled plan and sections, not less than ¼” = 1’ scale.

- Electrical/Telecom Duct banks marked on center line with approximate width/depth of concrete enclosure.

- Duct bank data will include how many conduits, voltage if applicable, how many spares, and type of conduit.

- Type of material used (steel, fiberglass, concrete etc.) identified by industry acronym standards.

- Indicate and detail thrust blocks for all pressure systems. Specify piping system joint type: bell & spigot, mechanically restrained joint, welded, threaded, flanged, etc.

- Vault locations with length, width, depth – including top of vault measurement.

- All Utility inverts at wall penetrations, manholes, catch basins and vaults.

- Top of rim/grate elevation and all four corners at all utility structures/vault box casings and covers.

- Any light pole/blue light, hydrant numbers will be noted on geodatabase.

1.4 SPACE FLOOR PLANS

A. Definition

1. Space floor plans are stylized-format floor plans created for all University buildings or structures. They provide the following information:
a. Accurate scale plan views of all floor levels of all University buildings.

b. Room numbers, no square footage needed.

c. Accurate location and size of major fixed equipment and furniture.

2. Consultants on projects for new construction or major renovation, affecting the architectural layout of a building or area, will be required to create space floor plans in addition to record drawings.

B. Method

1. All space floor plans are to be created in CAD, using AutoCAD version 2000 or greater (see CAD Standards for specifics on creating CAD files).

C. Format

1. Views: Structures are shown in plan only. The plan is taken to provide the best view of the entire floor, usually about four feet above the finished floor. The plan may vary in elevation throughout the sheet to accommodate irregular levels (e.g. a parking garage) but shall not be adjusted to bypass any major space (e.g. spaces under stairs or mezzanines).

2. Scope of View: View extends vertically down from the viewing plane to one floor below (example; major access to building is shown in ground floor plan only). Detail and partial views are shown without any projection beyond the immediate plan.

3. Stairs: Stairs and other features that continue between plans are broken such that the portion shown on an upper level exactly complements but does not duplicate the portion shown on the associated lower level. All parts are shown.

4. Features not visible:

   a. Discrete features not ordinarily visible to the occupant, such as void spaces, footings, unexcavated foundations, etc., are shown as accurately as possible.

   b. Composite elements of building features, such as attached finishes, embedded columns etc., are not distinguished as discrete elements.

D. Scale

1. Original: The original is created “real time” (e.g. life-size).

2. Plotted Drawings: All elements of the plan are plotted as closely to scale as physically possible. The use of conventions (except in line weight) does not extend to shape or size, as space floor plans are accurate record drawings. Stair treads, for example, are scaled so that the count of treads is correct, and the stair ends at the correct point.

E. Layout

1. Orientation

   a. All floors in a building will have the same orientation.

   b. The building main entrance will be to the bottom of the sheet as defined by the orientation of the text, whenever possible.

   2. Sheet Scope
a. Each floor or portion is to be plotted on a single standard sheet, of 24” x 36”.

b. Match lines will be used for all floors or areas which must be divided, to fit sheet size and scale.

c. Minor intermediate level details are to be shown on the same sheet as the most closely related full floor.

3. Keyplans: A keyplan of the building or area will be added, in the lower right hand corner above the title block. The location of the drawing area will be shaded on the key plan. Keyplan orientation will match floor plan orientation.

F. General Text Information

1. Title Block: All space floor plans will use the standard title block (provided by the Technical Section in the Campus Planning, Design and Construction Management Archive Group). The block contains spaces for the following information, and will be filled in completely.

   a. Building name
   b. Floor identification
   c. Date drawn
   d. Drawn by
   e. Building number (assigned by the Technical Section in the Campus Planning, Design and Construction Management Archive Group)
   f. Scale
   g. CAD file name

2. North: True north is shown in a symbol located in the lower right corner of the sheet.

3. Room Numbers: Room numbers are entered as part of every drawing. Numbers are assigned by the Space Analyst in the Campus Planning, Design and Construction Management Archive Group.

G. Material, File and Disk Format

1. All space floor plans will be submitted on disk, accompanied by a plot of each drawing. If the files do not fit on a single standard floppy disk, a Zip disk or optical media (CD-R) should be used. Any file compression used should be able to be uncompressed using standard data compression (zipping) software such as WinZip.

END OF SECTION 01950