UNIVERSITY of
HOUSTON

PLANT OPERATIONS
Facilities Planning & Construction Department

CAD Standards

1   INTRODUCTION

1.1   Overview
These standards are issued to promote the development of AutoCAD® drawings suitable for use in the University of Houston (UH) and University of Houston System (UHS). Consistency and compatibility with existing UH and UHS AutoCAD® documents can only be achieved when these standards are strictly adhered to.

The purpose of this document is to serve as a tight specification for producing and delivering CAD drawings and image files that document as-built conditions for construction projects. The guidelines are intended to ensure consistency of materials and to maximize both short and long term usability of construction documentation. Before a capital project can be closed out and final payment from UH and UHS is rendered, all specified materials must be submitted to the appropriate UHS project manager or representative in accordance with the CAD standards and special instructions described throughout this document. Please see Appendix H for the FPC Project Documents Closeout Requirements. A signed copy of the Materials Checklist will be required to indicate review and acceptance of final AutoCAD® record drawings. It is the responsibility of the vendor (architect, engineer, contractor, etc.) to assure that all materials adhere to the standards and guidelines set forth in this document.

UH and UHS requires adherence to the most current United States National CAD Standard which incorporates the American Institute of Architects (AIA) CAD Layer Guidelines (CLG) in addition to the UH requirements outlined in this document. For additional detail beyond what is outlined herein, please refer to the United States National CAD Standard® (NCS) for guidance http://www.nationalcadstandard.org.

Please direct any questions or comments about this document to the address below.
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1.2   Software
All project drawings must be submitted to the University of Houston in the most recent release of AutoCAD® software.

1.3   Key Terms
- As Built – Reflecting the exact condition of the building as it is constructed.
- AutoCAD® – CAD software from Autodesk.
- BIND (BOUND) - To make an external referenced drawing (XREF) a standard   block definition within the AutoCAD® drawing database.
- BLOCK – One or more AutoCAD® objects grouped to create a single object.
- CAD – Computer Aided Drafting.
- DWG – A native AutoCAD® file format.

- Layer – A logical grouping of data, like transparent acetate overlays on a drawing.
- Record Drawing – The production of Record Drawings is the capturing of the As-Built Document's annotation, comments, and mark-ups in a drawing format only.
- RVT – A native Revit file format.
- OFI – Office of Facilities Information.
- GPS – Global Positioning System
- THECB – Texas Higher Education Coordinating Board
- UH – University of Houston
- UHS - University of Houston System
- XREF/LINK – External reference. A drawing file linked (or attached) to another drawing.

2   SUBMITTAL REQUIREMENTS

2.1   Compliance
The University of Houston acknowledges that many of its construction firms do not use the same version of AutoCAD®. However, the University expects that service providers who work with other file formats will submit DWG formatted CAD files that are fully compliant with all of the outlined standards, and which have no loss of data that can result from standard CAD file translation procedures.

Non-compliance with this policy may result in the rejection of CAD files in addition to delayed rendering of final project payment.

2.2   Design
The University of Houston requires that polyline CAD drawings be submitted to the Office of Facilities Information (OFI) for design efficiency compliance according to the Texas Higher Education Coordinating Board (THECB) standards. Please see the applicable UH/UHS agreement/contract for clarification on distribution of drawings. All drawings submitted during the design phase must have the layering standards described in section 5 and the block standards in section 6 of this document.

2.3   Record Drawings
Record drawing files submitted to the University of Houston at project closeout must be in the DWG format; no other file format will be accepted. Refer to Appendix H for the FPC Project Documents Closeout Requirements for transmittal requirements and deliverables.

3   DRAWING STRUCTURE

3.1   Model Space and Paper Space
All AutoCAD® drawings submitted to the University of Houston must contain only one drawing model with one title block.
- *Model Space* - Floor plans elevations, sections, relevant dimensions and other drawings shall be in model space only. Draw all model space objects at full scale and to scale.

- *Paper space* - Each CAD file shall be set up to contain only one title block in paper space which references the building model contained in model space. Refer to section 6.3 for more information on the title block.

3.2 External References – XREF'S

All AutoCAD® drawings submitted to the University of Houston with external references must be **bound** to the drawings.

4   FILE STRUCTURE

4.1   Sheet Numbering

There are three components that make up the sheet numbers: the discipline designator, the sheet type designator, and the sheet sequence number. All University of Houston project sheets shall follow the sheet numbering standards described below.
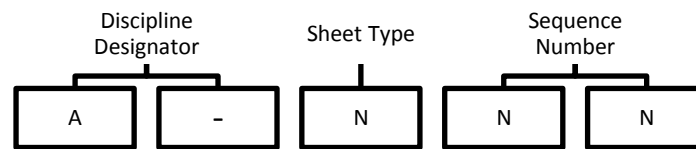
A = alphabetical character
N = numerical character

- *Discipline Designator* - Identifies the type of work that is included on the sheets, for example: architectural, plumbing, structural, etc. The discipline designator will be a single alphabetical character and a hyphen. See Appendix A for the primary list.
- *Sheet Types* - A single numerical character that represents the type of drawings that are on the sheet, for example: plans, elevations, schedules, etc. See Appendix B for the primary list.
- *Sequence Numbers* - Two numerical characters that place the sheets in order. Sequence numbering starts with 01 and can go up to 99; 00 is not permitted.

Example Sheet Numbers:

A-204: Architectural Elevations, fourth sheet
P-102: Plumbing Floor Plan, second sheet

4.2   File Naming

All AutoCAD® drawing files submitted to the University of Houston must use the naming convention described in this section in order to provide convenient and clear structure for organizing drawing files. Each drawing sheet in the project's plan set shall be saved as an individual file. Drawing files must be composed of the building number, followed by the sheet number (see section 4.1), and lastly the year of project completion. Each component must be separated by an underscore. BLD#_SHEET NUMBER_YEAR.dwg
Example File Names:
506_A-103_2011.dwg

5   LAYERS

5.1   Standard Layers
Layers shall be based on the AIA CAD Layer Guidelines obtained from the United States National CAD Standard. Please refer to the National CAD Standard for guidance. The University of Houston has defined a list of layers designated for internal space management uses. These layers are:
- A-SPACE-IDEN - This layer will contain the "Space Tag Info Block" at the room and floor level. See section 6.2 for more information about the "Space Tag Info Block."
- A-AREA-SPACE-PPLN - This layer will contain the closed polylines for each room. The closed polyline for each room will calculate the room area and shall follow the inside surfaces of the interior walls of a room.
- A-AREA-GROSS - This layer will contain the closed polyline for the individual floors of a building. The closed polyline will calculate the gross area around the outside faces of exterior walls (disregarding cornices, pilasters, buttresses, etc., which extend beyond the wall faces) for all floors of a building or areas that house floor surfaces including attics, basements, sub-basements, penthouses, mechanical rooms, etc.

5.2   General Layer Rules
The following layering rules must always be followed:
- Use the minimum number of layers necessary to adequately separate entities in each drawing.
- Purge each drawing of unused layers prior to submittal. The drawing file should contain only those layers necessary for displaying and plotting the information and drawing entities contained in each drawing.

6   SYMBOLS AND BLOCKS

6.1   Symbols
All drawings must contain the following symbols:
- *Scale* - A symbol that shows the size of a floor plan in relation to feet.
- *North Arrow* - A symbol that indicates which side of the floor plan is north.

6.2   Space Tag Info Block
- *Room* - Each space or room shall have a respective "Space Tag Info Block" with room number, space name, and area in square feet. Refer to Appendix C for an example of this block. The room area attribute or parameter contained in the A-AREA-SPACE-PPLN layer shall have a link with this block to provide an automatic field update. This block shall provide data that can be exported from each floor plan. The layer for this block is A-SPACE-IDEN.

- *Floor* - Each floor plan shall contain the "Space Tag Info Block" at the floor level that contains the floor number, floor name, and floor area in square feet. Refer to Appendix C for an example of this block. The area attribute or parameter contained in the A-AREA-GROSS shall have a link with this block to provide an automatic field update.

6.3   Title blocks

All AutoCAD® drawings submitted to the University of Houston must use the title block template provided by UH and should contain the information listed below. There should be no information outside of the title block, including text. See Appendix E for sample title blocks.

- Issue date
- Sheet number
- Sheet title
- Revision history
- Drawing phase
- University of Houston project number (if applicable)
- Architect, engineer, consultant information

6.4   Schedules

All schedules (equipment, electrical, material, etc.) must be contained in a block with attributes that can be used to produce an automatic table. All applicable information must be included, examples of schedules can be found in Appendix D.

7   SETTINGS

7.1   Text Style

Text styles and fonts may vary, but the University of Houston requires the use of SIMPLEX.shx in drawings. Special fonts which are not packaged with AutoCAD® are not allowed. Dimensions, labels, and notes should not be less than 1/8" height on printed drawings.

7.2   Drawing Units

All CAD drawing models should be drafted at full scale and to scale, in architectural units or engineering units.

7.3   Line types and Line Weights

Drawing line types and line weights must comply with those provided in the United States National CAD Standard.

8   ROOM NUMBERING

Building and room numbers are assigned by the Office of Facilities Information (OFI). Please refer to the OFI Building and Room Numbering Protocol for more details. The University of Houston requires that polyline CAD drawings be submitted for room numbering during the design phase. Please see section 2.2 for design drawing requirements.

9   GEOGRAPHIC INFORMATION SYSTEMS (GIS) STANDARDS

This section will be updated at a later date.

10 3D GEOMETRIC REPRESENTATION

This section will be updated at a later date.