
Indiana University – Approach to CAD

Purpose

The Facilities Information Management System (F.I.M.S.) is a collaborative effort of facility departments on all Indiana University campuses to provide valuable, free-flowing facilities information that enables users to manage and maximize the use of the physical resources of Indiana University. F.I.M.S. uses information technology in three main areas: CAD (Computer Aided Design), GIS (Geographic Information System), and a Relational Database that integrates other areas of facility information with a maintenance management system. The IU CAD Standards are an integral part of F.I.M.S. and support the overall goal of developing and maintaining accurate facilities information by establishing a common set of guidelines and definitions for the production and maintenance of this digital data. By conforming to these standards, Indiana University can continue to achieve significant benefits including:

- reduction of effort required for IU to produce digitized facility drawings and for drawing manipulation and modification
- drawing file development that supports the building construction/management life cycle
- consistency and quality across all elements of the IU CAD Data Library
- the ability to share and transfer CAD data among departments within the University, and to external consultants working on facilities projects
- the ability to perform university-wide facility analysis

Many IU offices are responsible for differing aspects of facility and infrastructure management. Some of these groups are the University Architect's Office, Engineering Services, Bureau of Facilities Programming and Utilization, Space Management and Utilities. To support ongoing activities, these University offices depend on existing as-builts, design documents, and maps that are of varied detail and scale with questionable accuracy and reliability in order to make decisions. To improve the accuracy and accessibility of relevant computer-aided design and drafting and map-related information for its staff, the University Architect's Office would like to establish standards for the acquisition and maintenance of CAD and mapping information to support the development of a geographic information system (GIS) in the near future. The GIS would be applied as an information management tool to support a variety of issues and requirements to which the various offices must respond.

To rectify some of the discrepancies in the CAD and mapping products developed by IU staff or delivered to IU by contractors, IU has established these standards for use in the development of all graphic facilities information. These standards will reduce the digitizing effort required by IU resources, while leveraging contractor funds to acquire digital graphic data for the IU CAD Data Library.

It is the intent of the University Architect's Office to use files created in a CAD format as a basis for integration in F.I.M.S., including the development and maintenance of a GIS. This document outlines the basic preparation of the CAD and map files, with a focus on the graphic components of these files. Specifics on the attribute data/spatial data standards that will be linked to the graphic components has not been incorporated as part of this document.

Target CAD System/Translation Issues

The target CAD system designated for IU is AutoCAD Release 2007. If a consultant will be providing CAD documentation to IU and is NOT using at least AutoCAD Release 2000, it is strongly recommended that a test procedure available from the University Architect's Office be completed before any final CAD documentation is prepared. This test will cover object types (such as line polylines, polygons, arcs, circles, ellipse), fonts, blocks, colors, hatching, layers and layer-names and linetypes. In the event that a non-AutoCAD source CAD system has trouble translating certain object types, it will be determined by the University Architect's Office (on a case-by-case basis) whether this limitation is significant enough for the source CAD system to be deemed UNACCEPTABLE for use in preparing CAD documentation for Indiana University.

General Drawing Guidelines

Prototype drawings and a block library accompany this document to further streamline the consistent development of CAD files. More information about these prototype drawings may be found in Appendix E - Plotting.

The following guidelines should be used to establish an approach to the development of IU electronic drawings.

- All CAD elements must be drawn to the best possible dimensions available. For further clarification refer to Appendix F - Accuracy Guidelines and Deliverables.
- To support use and manipulation of model and sheet information, every layer must be defined by its name and its use based on the layering standards.
- All objects, layers and linetypes must be defined as "BYLAYER".
- All blocks must be created on layer "0". Nested blocks should be avoided.

- Text styles and fonts may vary, but the use of font ROMANS.shx for most applications is desirable. **Special fonts which are not packaged with AutoCAD are not allowed.**
- Dimensioning styles should be consistent and associative. This gives internally accurate, mathematically correct totals; and changes in dimensioned entities are automatically reflected in the dimension text. In some instances where existing conditions are being dimensioned, overriding the AutoCAD-generated dimensions may be desired. You may do this by “exploding” the dimension blocks or disabling the AutoCAD dimension variable (Dimaso) for associative dimensioning.
- **No submission of any CAD drawing deliverable will be acceptable if it contains references to external source drawings (Xrefs).** All externally referenced data sources that were used during the CAD drawing production phase should be inserted and bound, resulting in a self-contained drawing file. All bound layers should be renamed to the original layer name.
- Drawing and extents must be checked to ensure that there are no objects outside the drawing limits. All drawings shall be submitted with the drawing display zoomed to the drawing extents.
- The purge command should be invoked to delete all unreferenced blocks, layers and linetypes.
- Every final plotted drawing sheet is to have its own separate electronic drawing file. Each file should have a unique name reflecting the final sheet name. **Each sheet should also be clearly marked if it is As-Built or a Record Drawing.**

Example: **A101.dwg**, architectural sheet A101, from a project number

Drawing Environments (Model Space & Layouts)

AutoCAD allows the user to choose between two drawing environments: model space and paper space. Model space is AutoCAD’s working mode for creating the model. The model is a subset of a building’s geometry and it’s physical components such as walls, doors, windows, columns, beams, outlets, ducts, etc. The model is drawn at full scale (life-size). Paper space enables the user to take the model and create a variety of views or scales on a sheet for plotting. Each sheet represents one plotted drawing - plotted at full scale (1=1).

IU drawings are to be drawn with the following approaches for using model space and paper space:

Model Space

The primary drawing or model is to be created in model space. This two-dimensional drawing that includes base plan elements must be drawn to full scale. Any additional items that help define the model or add model data such as

details, dimensions, elevations, plan notes/key notes, room numbers/names, schedules, or sections should be drawn to full scale in model space. Consistency in keeping related model elements in model space along with proper layer assignments will allow the use of x-refs and the ability to keep information dynamic and updated among disciplines.

Layouts / Paper Space

Secondary drawing elements will be created in Layouts / Paper Space. Unlike model space the features represented here are scaled to fit on the sheet. The various views of the drawing are referenced from the model created in model space. General project graphic elements such as title blocks, legends, key plans, plan titles, riser diagrams and schematic diagrams, and sheet-specific notes should be drawn in paper space.

Categories of files (Buildings & Outside Utilities)

Buildings

A model space file (or electronic drawing) for a building will contain all the information (architectural, electrical, interior design, mechanical, plumbing, etc.) in the plan view for each floor or level. The purpose of this drawing is to act as the sole archive of "As-Built" information. Eventually this drawing will provide the graphics for F.I.M.S. and be referenced for the production of remodeling documents.

User coordinate systems will be identical between levels. If one level was inserted on another, vertical elements (risers, columns, bearing walls, etc.) will be aligned.

The default scale for text and symbology will be 3/32"=1' or 1:128 (linetype scale: 64).

North will be to the top or right side of the drawing area.

Outside Utilities

A model space file for outside utilities will cover the entire campus. Unlike the building drawings the outside utility drawings will be divided by layer sets and geographic locations.

All drawings will reference the same coordinate system.