EMORY UNIVERSITY | Campus Services

# CAD / Space Management Standards



2009 Edition

Emory University
Campus Services, a Division of Finance & Administration
301 FM Drive
Atlanta, Georgia 30322
Tel 404.712.8970
*An equal opportunity, affirmative action university*

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## SECTION 1 : INTRODUCTION

This standard is intended as a foundation for information sharing, and it will serve to simplify the transfer of data from the original building, or facility design applications to Emory University's facility management applications. The ultimate goal of Emory University, through the development and enforcement of this standard is to ensure the creation of an accurate and consistent electronic database and archive, or "information model," which can be made available throughout the entire life-cycle of its facilities, for purposes other than the original construction.

Recognizing the evolving nature of computer technology, Emory is committed to the development of this standard to keep pace with technology as it relates to current business practices in the AEC and facilities management industries. To this end, Emory University has adopted the United States National CAD Standard (NCS), Version 4.0, jointly published and copyrighted by the NIBS (*National Institute of Building Sciences*, the AIA *(American Institute of Architects)*, and the CSI *(Construction Specifications Institute)*. By adopting the NCS, the burden of maintaining a proprietary standard is eliminated, and the maintenance of electronic facility information is greatly streamlined and enhanced. For more information, please go to *http://www.buildingsmartalliance.org/ncs/*.

**This standard is soley intended for informational purposes only, and the requirement and submission of Drawings, Specifications and other documents in electronic format does not change any contractual or legal requirements. All electronic data/CAD documentation produced by the consultant will become the property of the University in accordance with project contract. The documentation may be re-used by the University without any additional compensation to the consultant. The consultant will not use the data/CAD documentation produced for non-project purposes without the written permission of the University. The following is the only acceptable disclaimer that shall be placed on any electronic document submittal:**

The submitted electronic file versions of Drawings, Specifications and other documents have been prepared specifically for this project. The information may be compiled from many sources and to the best of the Author's knowledge is accurate to industry standards, however, all information has NOT been field verified. Any and all uses of these files, or the information contained herein, is bound to the same terms and conditions specified under "Use of Architect's Drawings, Specifications and other Documents", as may be amended, of the Architect/Owner Agreement for this project.

### A note on BIM (Building Information Modelling)

Building Information Modeling (BIM) is rapidly transforming the practice of AEC document production. Many architectural and engineering firms are adopting this technology as their preferred design application, which has important implications on the entire project delivery process. While Emory encourages process improvement with BIM, it makes no formal requirement regarding the use of BIM on any project at present. If, however, a consultant uses a BIM application as part of the project delivery process, that the consultant must provide Emory with the final model(s) upon project close-out. This does not, however, relieve the other requirements set forth in this standard.

### FICM (Facilities Inventory Classification Manual)

For space planning and facilities management purposes, Emory classifies all of its built space according to the *Facilities Inventory Classification Manual (FICM)*, produced by the Post-Seconday Education xxx, last updated in 2006, with the following exceptions:

1) Emory does *not* include any covered , yet open exterior space in gross square footage calculations.

2) Emory *does* include unfinished attic space that contains major mechanical equipment, regardless of headroom height, in gross square footage calculations.

For more information on FICM, go to http://nces.ed.gov/pubs2006/ficm/index.asp

**All consultants must use this standard's methodology when performing and providing area calculations.**

## SECTION 2: SUMMARY OF BASIC REQUIREMENTS & DELIVERABLES

For practical purposes, construction projects can be classified into the following 5 basic types, based on scope, cost, and impact to the structure / infrastructure:

1) **Interior Project:** generally, finishes and furniture only
2) **Equipment Project:** replacement/ repair of existing equipment, as maintenance
3) **Minor Renovation:** some alteration to structure, architectural, or building system, generally less than $100,000
4) **Capital Project:** Major alteration to structure, architectural, or building system, generally more than $100,000, or new building
5) **Utility Project:** alteration to utility infrastructure, usually outside of any structure

The electronic documentation requirements, (including acceptable file format) for each type of project will vary and are summarized below. While an effort has been made to apply practical expectations for each type of project, please note that paper documents should be converted to electronic via scanning, with the goal of making all of the information accessible through the Emory intranet. Also, if drawings were created with CAD, then the documentation *must* be submitted in DWG format. The lists should be understood to be distinct types of information, not necessarily a separate document, as one document could conceivably contain more than one type of information, or each information item may take more than one document. **All submitted documentation, regardless or format, shall be labeled with the Emory building ID number, as well as either the capital project number or work order number associated with the project, without exception.** For an explanation of the Emory building ID, please refer to section 4, Room Numbering Guide. The project manager for the project will be responsible for ensuring that the proper project number is communicated to the contractor.

The following is a summary of expected electronic documentation to be submitted for each project type, and each item should be considered as applicable to the particular project's scope of work:

**1) Interior Project:**

- Finish schedule, or finish specifications (XLS, DOC, PDF, DWG)
- Finish plan, showing location of specified finishes (PDF, DWG)
- Furniture specifications (XLS, DOC, PDF, DWG)
- Furniture plan, showing location of all furniture (PDF, DWG)
- Signage plan, showing all signage locations and specifications(PDF, DWG)
- Warranties (PDF)

**2) Equipment Project:**

- Equipment Specifications and O&M manuals (PDF, DOC, HTML)

- Equipment plan, showing location of replacement equipment (PDF, DWG)
- Shop drawings, (PDF, DWG)

- Warranties (PDF)
- Test Reports, such as Testing and Balance, fire pump test (DOC, XLS, PDF)

**3) Minor Renovation:**

- **Any items from #1 or #2 that apply**
-

- All architectural drawings and specifications created to permit, or complete the project (PDF, DWG)

- All major discipline drawings and specs, (eg. mechanical or electrical) if affected (PDF, DWG)
- All subcontractor shop drawings, used to fabricate or install elements (PDF, DWG)

**4) Capital Project:**

- **Any items from #1, #2, or #3 that apply**
- **There are additional requirements that apply to Capital Projects:**
    - As early in the design development phase as possible, and **no later than the 100% DD submittal**, all architectural floor plans ***must*** be submitted with a written request for CS IT to provide a room numbering schema in time for the final room numbers to be placed on all drawings in the 100% CD set. (PDF, DWG) (refer to Section 4, Space Numbering Guide, for details)
    - At 100% CD phase, all major discipline drawings (TIF, PDF, or DWG) **with the additional requirement that all architectural drawings *must* be submitted in DWG format. (see section 3, Emory Space Planning file format)**
    - At close-out, or no later than 6 months afterwards, all major discipline drawings, shop drawings ***must*** **be submitted in DWG format.**

**5) Utility Project:**

- All pertinent discipline drawings and specifications, especially civil topological or utility surveys. If a civil survey was not produced, any utility location reports (PDF,DWG)
- All Civil utility and topological surveys should be compatible with AutoCAD Map 3D 2008, without loss of fidelity, and be GIS referenced to the Georgia State Plane coordinate system.

**Emory standard discipline and drawing type indicators**

For the purpose of creating a searchable archive, Emory classifies all drawings according to one of the following disciplines and drawing type. If a consultant chooses to name a drawing by a discipline or type not included in the list below, it must be submitted with a file name that begins with the closest discipline's letter designator, and end with the closest drawing type's two-letter designator.

| Discipline | Type | Type (continued) |
|---|---|---|
| | | **SV** – SURVEY |
| **EC** - EMERGENCY CONTACT | **CP** - CEILING PLAN | **UP** - UTILITY PLAN |
| **EV** - EMERGENCY VALVE | **DP** - DEMOLITION PLAN | **LC** - LIFE CYCLE |
| **N** - NETCOM | **DT** - DETAILS | **RP –** ROOF PLAN |
| **V** - EVACUATION | **EP** - ELECTRICAL PLAN | **PW –** POWER PLAN |

| | | |
|---|---|---|
| **A** - ARCHITECTURAL<br>**C** - CIVIL<br>**E** - ELECTRICAL<br>**G** - GENERAL<br>**M** - MECHANICAL<br>**P** - PLUMBING<br>**S** - STRUCTURAL<br>**I** - INTERIOR<br>**Q** - EQUIPMENT<br>**F** - FIRE PROTECTION<br>**L** - LANDSCAPE<br>**LC** - LIFE CYCLE<br>**HA –** ABATEMENT | **EL** - ELEVATIONS<br>**QP** - EQUIPMENT<br>**XP** - EXISTING PLAN<br>**FS** - FIRE SAFETY<br>**KP** - FIRE SPRINKLER AND PIPING<br>**FP** - FLOOR PLAN<br>**NP** - FOUNDATION PLAN<br>**GP** - GRADING AND DRAINAGE<br>**HP** - HVAC PLAN<br>**LP** - LIGHTING PLAN<br>**NA** - NOT AVAILABLE<br>**DG** - PHASING DIAGRAM<br>**PZ** - PIPING<br>**PP** - PLUMBING PLAN<br>**SH** - SCHEDULES<br>**SC** - SECTIONS<br>**SP** - SITE PLAN | **SR –** SECURITY<br>**AV –** AUDIO VISUAL<br>**CM –** COMMUNICATION<br>**RD –** RISER DIAGRAM<br>**OD –** ONE LINE DIAGRAM<br>**OT –** OTHER<br>**FH –** FINISH PLAN<br>**EN –** ENLARGED PLAN<br>**IR –** IRRIGATION PLAN<br>**SD –** SHOP DRAWINGS<br>**CT –** CONTROLS<br>**PR –** PROFILE<br>**RW –** ROADWORK |

The following table illustrates the expected documentation for each project type, and corresponding acceptable formats, lower case indicating acceptable format, UPPER CASE indicating preferred format, and underlined text indicating required format. PDF may be substituted by TIF format. This list may also be used by project managers as a checklist for the specific project requirements.

| **Project Type →**<br>**Req'd Docs ↓** | **Interior** | **Equipment** | **Minor Renovation** | **Capital Project** | **Utility Infrastructure** |
|---|---|---|---|---|---|
| Warranty Info / Letter | **PDF, doc** | **PDF, doc** | **PDF, doc** | **PDF, doc** | **PDF, doc** |
| Operation/Maint. Manual(s) | **PDF, doc** | **PDF, doc** | **PDF, doc** | **PDF, doc** | **PDF, doc** |
| Finish/Furniture Specs / Plans | **pdf, DWG** | **na** | **pdf, DWG** | **DWG** | **na** |
| Equipment Plan | **na** | **pdf, DWG** | **pdf, DWG** | **DWG** | **DWG** |
| Test Reports | **na** | **PDF, xls, doc** | **PDF, xls, doc** | **PDF, xls, doc** | **PDF, xls, doc** |
| **Architectural** | **pdf, DWG** | **pdf, DWG** *as applies* | **pdf, DWG** | **DWG** | **na** |
| **Civil** | **na** | **na** | **na** | **DWG** | **DWG** |
| **Electrical** | **na** | **pdf, DWG** *as applies* | **pdf, DWG** *as applies* | **DWG** | **DWG** *as applies* |
| **Fire Protection** | **na** | **pdf, DWG** | **pdf, DWG** *as applies* | **DWG** | **na** |

| | | | | | |
|---|---|---|---|---|---|
| **Landscape** | **na** | **na** | **pdf, DWG** *as applies* | **DWG** | **pdf, DWG** *as applies* |
| **Mechanical** | **na** | **pdf, DWG** *as applies* | **pdf, DWG** *as applies* | **DWG** | **DWG** *as applies* |
| **Plumbing** | **na** | **pdf, DWG** *as applies* | **pdf, DWG** *as applies* | **DWG** | **DWG** *as applies* |
| **Security / Alarm** | **na** | **pdf, DWG** *as applies* | **pdf, DWG** *as applies* | **DWG** | **na** |
| **Structural** | **na** | **na** | **na** | **DWG** | **na** |
| **Shop Drawings** | **na** | **pdf, DWG** *as applies* | **pdf, DWG** *as applies* | **pdf, DWG** *as applies* | **pdf, DWG** *as applies* |

***Emory University reserves the right to refuse acceptance of any electronic documentation that it deems not in compliance with the standards set forth in this document.***

## SECTION 3: CAD Drawing Conventions

As stated in the Introduction, Emory University has adopted the National CAD Standard, v 4.0, as a guide for all AEC consultants to use as they are preparing CAD documents for use on Emory projects. All consultants doing business with Emory are strongly encouraged to obtain the necessary license to this document to ensure that the CAD documents that they create are in compliance with NCS 4.0, and it is expected that all CAD files follow the recommendations set forth in this document, to the extent possible.

The NCS 4.0 can be summarized as follows:

- **AIA CAD Layer Guidelines**
  Originally produced by American Institute of Architects, this section describes layer naming hierarchy, such as Discipline Designator, Major Group, Minor Group, and Status fields. All layer names used in submitted CAD files ***must*** comply with these guidelines. (A list of Emory's internal standard layers is given below, with the discussion of the Emory Architectural Template File.)

- **Uniform Drawing System**
  Originally produced by the Construction Specifications Institute, this section is composed of interrelated modules consisting of standards, guidelines, and other tools for the organization of drawing information, and complements the CSI MasterFormat for specifications. Important topics cover file naming conventions, standard abbreviations, and standard symbology. It is expected that all CAD documentation submitted to Emory follow these guidelines to the extent possible.

- **Plotting Guidelines**
  The purpose of this section is to allow consistent black-and-white and color plotting from various configurations within CAD programs. An important development in this area is the fact that most CAD programs have evolved to allow for independent specifications of color and line width through the use of plot styles.

## Emory Space Planning Internal Standard and Template

The current CAD operating platform for Campus Services is AutoCAD 2008. It is not required that CAD documentation be created with this platform, but it is mandatory all submitted CAD documentation must be AutoCAD 2007 format compatible, and all .dwg files *must* be AutoCAD 2004 or later format. Early CAD file submittals (at or prior to 100% CD) will help identify problems with format.

All electronic files are placed in a web-based Electronic Document Management System (EDMS), and used for reference in maintaining and renovating the facility for the remainder of its life-cycle. This application includes a viewer feature that allows users without a DWG viewer program installed on their computer to view DWG files. It does not, however allow the use of reference files (xref's), and will not be able to view them. Therefore, all xref files must be bound to the parent file, as well as submitted separately. Additionally, any custom plot style file must be submitted with the parent file.

While most CAD files are placed into the EDMS as received, Campus Services Space Planning modifies architectural floor plans into linked production files for its CAFM application, which incorporates a two-way linkage from the graphic entities in the CAD files to non-graphic attribute data from an Oracle database. Since these files are shared with other applications, and play a vital role in the daily work processes at Emory, they must be maintained in a more rigorous and consistent manner. It therefore follows that in addition to the requirements set forth, Emory makes additional requirements for architectural floor plans, attic plans, and roof plans. An additional set of these drawing types should be submitted using the Production Template file provided with this standard. In addition to the requirements above, these CAD files have the following requirements:

- Must not contain any additional layers other than those already in the template file.
- Need only the inner and outermost surfaces of the wall components.
- All objects must be placed on the closest appropriate layer, and designated color *'By Layer'*.
- All three dimensional objects must be reduced to 2 dimensions,
- All blocks used, other than those contained in the template file, must be exploded into elemental objects, and placed on one provided layer for each original block definition. All block definitions must be purged from the file.
- Room numbers shall be single-line text, justified top-center, style Romans 10" (R10) and placed on the *'LNK_RM' layer*.

**These types of files *must* be submitted no later than the issuance of 100% CD, and again at close-out reflecting any changes that may have occurred during the construction process.**

## List of Internal Standard Layers

**0**
**A-ANNO-GRID**
**A-ANNO-MISC**
**A-ANNO-SYMB-EVAC**
**A-ANNO-TTLB-EVAC**
**A-ANNO-TTLB-EMLC**
**A-ANNO-TTLB-NTCM**
**A-COLS**
**A-DOOR**
**A-EQPM-FIXD**
**A-FLOR-CASE**
**A-FLOR-EVTR**
**A-FLOR-HRAL**
**A-FLOR-LEVL**
**A-FLOR-OTLN**
**A-FLOR-PFIX**
**A-FLOR-STRS**
**A-GLAZ**
**A-ROOF**
**A-ROOF-OTLN**
**A-SITE**
**A-SPACE-SHADE**
**A-WALL-FULL**
**A-WALL-MOVE**
**A-WALL-PRHT**
**Defpoints**
**E-ANNO-TEXT**
**G-ANNO-GISL**
**GROSS_LOCATION**
**LNK_CATV**
**LNK_DATA**
**LNK_DATA_VOICE**
**LNK_EMP**
**LNK_EQUIP**
**LNK_FIBER**
**LNK_FLR**
**LNK_LABEL**
**LNK_ROOM**
**LNK_SPC**
**LNK_VOICE**
**VP**

## SECTION 4: Space Numbering Guide

It is the responsibility of Campus Services Space Planning to approve all space numbering schemes, and will provide room numbers in a timely fashion upon receipt of architectural floor plans at the 50% CD phase. The goal is to work with both end-users and the architectural design firm to have final space numbering reflected in all files contained in the 100% CD set. In order to help facilitate this process, below is the Emory Space Numbering Guide, which may be used in early design, and submitted for approval at anytime before 100% CD.

There are two equally important purposes for space numbering and the accompanying signage; one is to easily direct a visitor to a person or function, and the second is to manage the space and its attributes within the CAFM database. Therefore ALL spaces MUST be identified and numbered with a unique identifier, even though all spaces may not be given physical signage. This unique identifier will be a combination of three fields, the Emory Building I.D. (a number assigned by CS IT to each building), the Floor ID, plus a unique Space Number.

**Following are the basic guidelines:**

1. All floors will be designated by a "FLOOR ID" representing the level. This ID should begin with the lowest occupied level as "01". This may be followed by a description i.e. "01" = ENTRY or "02" = PLAZA etc. but the level itself will not be denoted as "Lower Level" or "Plaza Level". If a level is used exclusively for mechanical equipment or is less than ten percent (10%) of the area of a typical floor, it may be designated as "0B" = BASEMENT or "SB" = SUB-BASEMENT. A Floor ID will be assigned to all levels including roofs, penthouses, and penthouse roofs. The intent is to have a designation that clearly denotes the floor location relative to the entire facility. If a new building is to connect to existing facilities, consideration must be given to match the level designation and description of the adjoining facility.

2. If there are less than 10 levels, including roof and penthouse levels, and if no level can have more than 99 spaces, the space number will consist of three digits with the first digit designating the level number, the second and third representing the space. If either condition is not met, the number will consist of four digits.

3. If the facility is part of a complex, or has distinct features that may benefit from duplicating numbers on a single level, the number may be prefaced with a letter. For example the School of Law "M" designates MacMillan and "G" designates Gambrell Hall at the Callaway Center "N" designates North, "C" designates Central and "S" designates South.

4. Space numbering must first be looked at to provide for direction. Where the numbering begins is therefore usually specific to the facility. Numbers should begin where the main entrance to the floor occurs - usually this is at the main entrance to the building or on upper floors, at the elevator lobby. From this point numbering should ascend in a clockwise direction.

   The level number 'x'100 (eg. 100, 200, etc.) should not be used except for major common spaces in a logical location. Reading Rooms, Board Rooms etc.

5. Spaces should be numbered, not doors. If there is more than one door opening into a single space, all doors should have the same number. There may be exceptions to this rule, for example a space that opens onto two separate corridors. If in order to make sense for direction to a room, to have two different numbers, the "official" number assigned to the space will be the lower number. The other number will be associated with a Space Name = "see QQQQ" where "QQQQ" = the official number.

6. Moving in the direction of travel (typically clockwise), even numbers should be on the left, odd on the right. Numbers should be similar to street numbering, sequential across the corridor skipping numbers as necessary to maintain number relationship.

7. If the plan suggests that spaces may be divided in the future, sequential numbers can be held in reserve. Since alpha suffixes are used for rooms inside rooms, if spaces are added in the future between two consecutive numbers, a decimal system will be used, i.e. a new space added between 302 and 303 would be 302.1.

8. Spaces inside spaces shall have the main space number followed by an alpha character, i.e. Spaces inside Space 302 would be designated 302A, 302B, 302C etc.

Spaces inside 302B would be designated 302BA, 302BB etc. If a space is inside a large numbered space, such as a library reading room or an open office plan, the individual spaces may have their own sequential number.

9. Cubicles inside large spaces should be given the main space number followed by an alpha designation. If there are both permanent rooms and cubicles in the same space, the permanent rooms should be numbered first.

10. All spaces, including Restrooms, Janitor's Closets, Storage and ITD Telecom/Network, should be numbered sequentially with other spaces.

11. Stairs, Corridors, Vestibules, Elevators, Lobbies and other spaces typically not numbered with a sign (Stair signs should have stair number on sign) are numbered as follows: [Level] [S, C, V, E or L] [Descriptive letter (S=south, N=north etc.) or number] example - 2S3; 1CN; 3E1; 1L2

12. Floor Openings (upper levels of atriums, lobbies etc.), Crawl Spaces (or unexcavated spaces), significant Mechanical Shafts (Y), Roofs, Exterior Spaces, and other usually non occupied areas that may not be numbered in the field, will also be assigned numbers as follows: [Level] [(FO, CS, Y, R, X] [Sequential Number] for example – 2FO3; BCS2; 1Y5; 8R1; 1X2

## SECTION 5: Evacuation Maps

For all capital projects, it is the responsibility of the architectural design firm to produce Evacuation Route maps for signage as required by building code. Posting of evacuation signage is usually required at time of inspection for certification of occupancy. Emory facilities comprise over 300 buildings and Strives to maintain a consistent standard to all evacuation signage across campus. Therefore all evacuation maps *must* be created using the provided Evacuation Map template file, and the accompanying example. It is important to note that the standard evacuation maps and template are based on a paper space environment, and dependent on the previously described Space Planning Production floor plan files. **All evacuation maps must be approved in writing by the Emory Police / Fire Safety Office prior to posting.**

## SECTION 6: Document Upload Application (FTP) Guide

Campus Services IT has developed an web application that allows the upload of all electronic documentation to an ftp site. The url address for accessing this application is:
*http://www.fm.emory.edu/*

**For the purpose of documenting the many submittals that Emory receives, all electronic file submittals *must* be made using this application, unless specific written approval from CSIT is given to submit using an alternative procedure.**

The project manager for the project will provide the contractor with a login ID and password associated with the project. On the login page, there is a hyperlink to the Document Upload System Quick User Guide, which give detailed instructions on using the application. For reference, the same file may be found here:
*ftp://ftp.fmd.emory.edu/FIMS/SPACE/0000/*