CAD Standards & Detail Management

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CM 25-2 How do you manage CAD standards and Detail Libraries within a multidiscipline environment? We'll discuss available technologies and demonstrate how to use AutoCAD® DesignCenter™ and some custom-built tools to manage and access detail content. Learn about one company's experience and real-world methods and discuss management of multiple CAD standards and detail management for multiple disciplines.

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About the Speaker:

Tom has been involved in architecture and engineering for 25 years and as a CAD manager for 16 years. Together with a B.S. in Engineering Technology in Architecture, he brings solid industry education and practical hands-on experience and application to his presentations.

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Objectives:

Objectives depend on what the company does:

Case Study:
       Architecture and Engineering firm that provides design services.
       Designs and creates Building Construction Contract Documents.
       Markets served: Science & Technology, K-12, C&U, Government, Historic Preservation.

- **Provide a resource to the Drafters for easy retrieval of Contract Document content.**
  (If you are drawing from scratch, you're wasting time.)

- **Develop a system to minimize time spent on searching for project sheet and detail material.**
  (Must not have too many items to search through - very important)

- **Simplify the storage system and the process to create details and sheets.**
  (The resource must be "knowable". The resource must be an identifiable system to the users so that they understand where to look for content. A process for maintaining this material must be part of the system.)

- **Standardize the quality of the drawings and details so that the drawings "read" consistently.**

- **Improve content quality of construction documents.**
  (The source must be changed so that mistakes in the library of details are not repeated.)
  (Do so using an iterative process.)

- **Develop complete training resources and implement a training program.**

- **Create an organizing principle and storage structure for the firm.**
  (A system that can be used by all disciplines and market segment groups.)
  Organizational examples:
        Uniform Drawing System, UDS, (drawing section)
        CSI/Master Format
        Arch. Graphic Standards?
  Construction Types: Steel Frame, Masonry Bearing, Wood frame

What kind of Content are we discussing?

Definitions: **Single Detail:** A Single detail is a drawing **file** that contains a single detail.

Pre-drawn Sheet: A Pre-drawn Sheet is a complete sheet already composed within a single drawing **Sheet file** with no externally referenced content. These can be details or other content.

Possible Pre-drawn Sheet Content:

Typical: Cover Sheet
Symbols Legend/Abbrevs.
Partition Types
Typical mounting heights
ADA-Barrier-free Details

Others: Wall Sections
Plan Details
Roof Details
Ceiling Details
Exit Stair Elevators, Escalators Details
Casework
Door Details
Door Frame types
Window Details
Window Frame types
Louver Details
Louver Frame types

Single Details or Pre-drawn Sheets?

Single details require more work. Putting single details into a sheet requires finding, inserting, titling, making the viewports, scaling the viewports.

Pre-drawn sheet: Pre-drawn sheets have most work done because the content is already there! It is a whole lot easier to erase unwanted material from a pre-drawn sheet than it is to build the content from a library. *50% of the time can be saved using pre-drawn sheets.* EYP has begun to develop families of Pre-drawn sheets. Examples of Families: Brick veneer on Steel Frame. Suspended ceiling details.

Exclusive Development: It is most likely that there will not be exclusive development of pre-drawn sheet files over single detail content because new content will continue to appear from different sources.

Preference? Pre-drawn content is easier to manage because there are fewer items through which to search. Also, data within fewer files are easier to bring to compliance.

Involving Management:

Your task is to convince management of the following:

- There need for developing a system for organizing Details into pre-drawn sheets and to have a source library for Contract Document material.
- Only broad-based usage of a system will squeeze efficiency and productivity from this effort.
- That management ask that staffer's use the system that is developed.
- That there be support for training in the use of the system. (If there isn't training, will the system be used?)

Research: Peer company survey:

Company Survey

Question:	Response
Company maintains library of Single Details	100%
Company maintains library of pre-drawn sheets	60%
Company supports staff positions to manage library:	
Part time	55%
Full time	0%
Detail sheets take what % of original time:	avg: 50%
To what % are details Standards Compliant	78%
Does the CAD System enforce standards	70%

(35 Firms contacted)

Research: Internal Survey:

Library Development at EYP

Discipline	Single Details	Standards Compliant
Architecture	60%	30%
Electrical	75%	15%
Hvac	90%	90%
Interiors	0%	0%
Plumbing/Fire	90%	50%
Telecom	35%	50%
Structural	98%	65%

Some issues to be addressed:

- Who must be involved?
- Each market segment may have different approaches.
- Each group may want to develop different resources in different ways.
- How to get the senior technical staff to participate: Why them? What do they offer?
- Management will not support a Detail Master. (person whose job it is to put together a library.)
- What to do when management will not fund such an effort?

Managing the process:

- Involve the COO
- Does your company have a production management group or a COO? If not, why not?
- Ask the management group or COO to create a committee for developing the resources for details & pre-drawn sheets.
- Get the project done on the cheap: The committee formed shall be staff…
     - whose job will be benefited by this content or
     - whose projects will benefit.
- Involve management to make this effort part of employee performance reviews.
- If a multiple office firm, each office has a sub-committee to contribute content and man-power.
- The sub-committees are headed by a senior technical staffer.

Committees:

- Committees are slow moving
- Individual efforts bring varied results; consistency is key.
- Find balance between having enough people to get job done and too many to bog down the process.

Concerns for the project:

- Standards must be developed during early part of prototyping a system.
- Start with one discipline first to develop and test the standards and procedure.
- Copyright issues: Users may have material developed at other firms.

The Bottom Line:

How much can be saved?   Evaluate when are details added to a project?
                           DD + CD Phases – represent 60-80% of fee.
                           % of Detail sheets that could be pre-drawn? Up to 40%.
                           How efficient could these sheets be? Cut time by 50%
                           Rule of thumb: gain 5% +/- on fee. Example: On $750k fee, save $37.5k.
- Can your company afford to spend money on this development?
- Can your company afford not to invest in such an effort? What are your competitors doing?

CAD Standards in Detail Libraries:

Standards provide consistency in detail appearance and help the drafters understand how to work with the CAD drawings. Standards control the creation of the content of the drawings.

Create a complete Standard:
- Identify what your final form of the developed resource will be:
- Publish the standards for the project.
- The libraries should use the standards that your company will create: This depends on the client requirements. If the majority of your clients require the use of the AIA CAD Layer Guidelines or the National CAD Standard, then this is what your standard should be.
- HOW TO: Set up Rules for Drawing details: Have a document describing the process. This would describe how to draw the content, how to check that it is correct. (QC process.)

Write a HOW TO Document:

- This is a document describing the procedures for creating CAD drawings to a standard.
    - Show example single Detail file.
    - What to do in Modelspace
    - What to do in Paperspace
    - Show an example Detail Sheet
    - What to do in Modelspace
    - What to do in Paperspace
    - Layer list, Attributed titleblocks
    - Always save in Paperspace – Preview is important.
    - Show grid in Paperspace, titleblock, titles
    - Settings: PSLTSCALE, LTSCALE

- What AutoCAD DWT to use, where the DWT's are located for this standard. This DWT will include: Layers, Text Styles, Dimensions Styles.

What are the sources of Details and Pre-drawn Sheets?

- CAD Blocks, on-line manufacturers Web sites, past projects, old detail libraries, Vendors of libraries of details, Trade Association publishers, users who have developed content.

Analyze the condition of your sources:

- Run reports of layers, text styles, dimensions styles, block names.
- Where did your details originate?
- Do they fit into any standard?
- If there is consistency in the source's material, process in batches.

Rules of Thumb:

- It's a whole lot easier to erase blocks of details than it is to go find single details and insert.
- Tip on the detail content: See ADT Detailer in 2005
- Self-contained sheet files. Best policy: use no xrefs of content.
- The sheets shall have details always scaled 1:1 for editing purposes.

Applying technology:

Design Center:

- The Design Center is used to browse to the folders that contain the content.
- It can also be used as an analysis tool to look into drawings to discover what they contain and to see what problems they may pose.

Pre-Drawn Grids:

One way to make sure that drawings can fit through view ports is to create drawings that subdivide the sheet. These can be inserted at scales relating to the viewports. Here is one example.

20	16	12	8	4
19	15	11	7	3
18	14	10	6	2
17	13	9	5	1

Drawing Templates: - DWT's
- Details, starting from scratch with DWT's, with attached DWS.
- Define a naming standard for the DWT's.

Standards Checker: - DWS's

- DWS structure. How many and how to use?
- Exclusive structure: An exclusive DWS structure contains only those objects that are part of a standard for the drawing type. This type will enforce standards closely.
- Inclusive structure: An inclusive DWS structure contains objects of a standard for any the drawing type. This type of DWS will enforce standards only to the point that the much better.

- EXAMPLES: Details have one set of layers, Titleblocks another. Should they have one DWS or two?
- The folder containing the DWS files can be entered into the AutoCAD Support Files search path as a way to get the files to resolve when the attached DWS reference does not resolve.
- Define a naming standard for the DWS's.

ViewPort Toolbar

- Use the Viewport toolbar to browse and set Viewport scales. For drawings that have multiple scaled Viewports. Invaluable to know which Viewports are which scale in Paperspace.

Layer Translator

- Find the command under Tools > Standards > Layer Translator: Allows you to create a layer mapping file in DWS or DWG format for the translation of layers from one standard to another.

Batch Standards Checker

Installed with AutoCAD 2004 under the Programs > AutoDesk….This program will audit multiple drawing files against a DWS file to report on Layers, Text Styles, Dimension Styles and Linetypes. Reports to file format for later review.

Homegrown solutions:

- DSC   - Drawing scale controls Dimscale, LTScale, TestSize,
- ATL   - Annotation templates load Text and Dimension Styles
- MSC   - Multi-Script: Process scripts on multiple drawings
- Multiload   - Multi-Load: Loads multiple templates in multiple drawings
- LTL.   - Layer Template Load: Loads or updates layers within a drawing

Multi-file Processing:

- Multifile processing: Scripting, lisping and Multiscript.
- Migrating old details done in a consistent way

Concerns:

What are the tools with which the drafters are familiar? Tools for drafting, searching for data, Use tools that are too hard to train and use and the system will not work.

The Storage System - Library Structure:

Where to put all this stuff? There will be different locations for different types of content.

Content types:
- Single details
- Components of details
- Manufacturers detail data
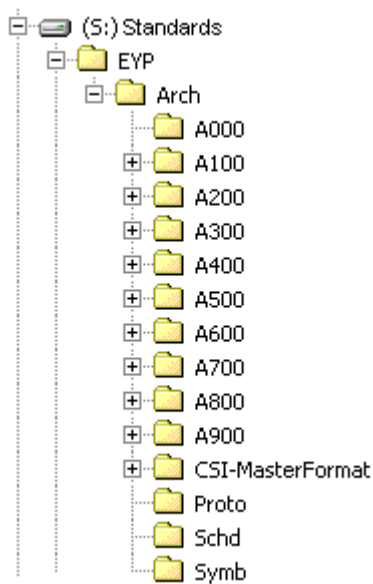- Assembled single construction details
- Sheets Files of details

- Sheets Files mockups of typical drawings: Drawing Lists, Legends, symbology, etc.

Sheet Files locations:

The first choice of a drafter is to use pre-drawn and mocked up sheets. These will be located at the most accessible location. It is here the drafter will look first for content. The folders are named for sheet type series after the UDS nomenclature; folders A000 – A900
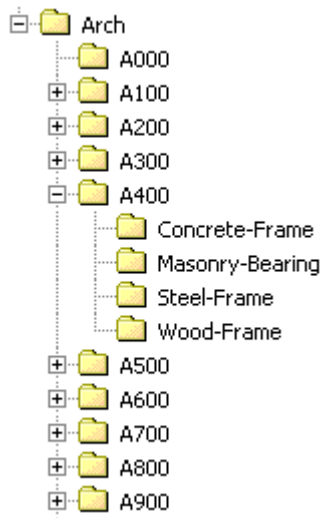
For example: A000 is the Architecture series for General Information in the drawing set.

The entire series is filed under the Company Standard on a drive dedicated for Standards. Each discipline's folder will have a similar structure:

Within each folder the contents will be categorized by content type:

```
⊟ 📁 Arch
      📁 A000
   ⊞ 📁 A100
   ⊞ 📁 A200
   ⊞ 📁 A300
   ⊟ 📁 A400
         📁 Concrete-Frame
         📁 Masonry-Bearing
         📁 Steel-Frame
         📁 Wood-Frame
   ⊞ 📁 A500
   ⊞ 📁 A600
   ⊞ 📁 A700
   ⊞ 📁 A800
   ⊞ 📁 A900
```

Single Details and source material for Detail content:

The next location the drafter will look is for single details. These will be located in folders named for CSI numbering and content, folder **CSI-MasterFormat**. The single details are filed in a separate location as they will be used as a secondary source.
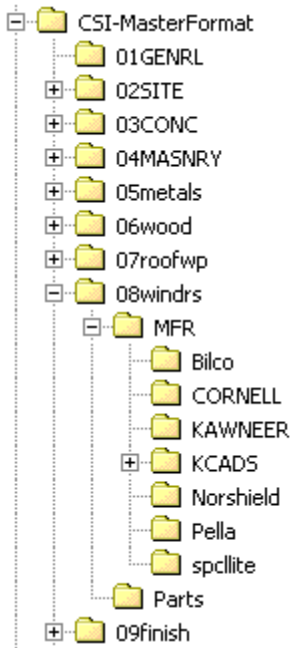
Here is the full series:
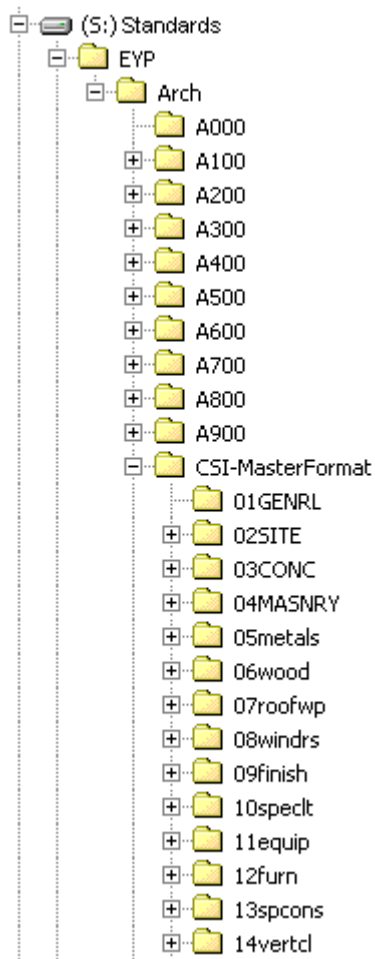
Sub-folders of the CSI numbering will contain two more content types:

- Manufacturers details or web-links to manufacturers located in a **MFR** folder. Folders are named for the manufacturer's materials which are accessed within.
- Components located within a **Parts** folder.
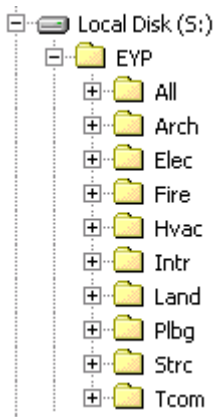
CAD Standards & Detail Management

```
CSI-MasterFormat
   01GENRL
   02SITE
   03CONC
   04MASNRY
   05metals
   06wood
   07roofwp
   08windrs
      MFR
         Bilco
         CORNELL
         KAWNEER
         KCADS
         Norshield
         Pella
         spcllite
      Parts
   09finish
```

How Multiple Standards and Disciplines coexist within the system:

Each Standard will have a location on the drive:

```
Local Disk (S:)
   EYP
   GSA
   LantDiv
   NPS
   OBO
```

Each discipline will have a location within the standard:

```
Local Disk (S:)
   EYP
      All
      Arch
      Elec
      Fire
      Hvac
      Intr
      Land
      Plbg
      Strc
      Tcom
```

Case Study

History:

Many motivated individuals have worked to create a detail library within the company. This effort has produced segments of the current single detail library. As the company has grown, new offices have added their own content to the mix.   Eventually, the amount of material created overwhelmed those who wished to use it: there was too much to search through. The material up to this point had been amassed of single details and published in a paper binder. There was no single point of contact for the management of the material within this library.

Changes in management has brought a new look at the problems of maintaining a library.   New cross-office group is now maintaining new simpler content.

Successes:

The Detail Library has ample material from which to pull content.
Experience gained through the different teams have indicated better strategies.
Quality of content has improved over time.

Failures:

Communication breakdowns, momentum fades.
Documentation is static because the team loses focus
The paper binder goes out of date.
Changes in standards forced the need to migrate to new standards

Conclusions:

Any effort not supported by a management initiative will have limited success.
Smaller teams function better.
Give the project to those who have the energy and focus to work on such a project.
Develop a system that has fewer resources through which to search.
Best policy would be to create a Detail Master, a person whose responsibility it is to maintain the library.

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