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## **5.2 Drawing Information:**

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### **5.2.1 General Information:**

- .1 Final drawings for all projects shall be one of the following sizes: 11" x 17", 24" x 36" or 30" x 42". The dimensions refer to the outside edge or cut line. Use only one sheet size for each project. Any requirement to modify these dimensions must be addressed early in the project and be approved by the Department Project Manager.
- .2 Drawings of each submission phase should conform to the above standard sizes. Certain topographical plans, plot surveys and engineering projects that include large areas may require larger sheet sizes. The Department must approve all exceptions.
- .3 Tracings shall be of printable quality as judged by the Department. Refer to "Bidding Phase" Section 3.5.6 of this Manual.
- .4 Half-Size Drawings for Construction: Department may require the drawings to be reduced to 1/2 scale for bidding and construction purposes on major projects. Original drawings will be full size. Department may obtain the half-size drawings for bidding and construction phases – request for ½ size drawings are on the Bid Release Form, Department Form 6010. Half size drawings will be printed and available as authorized by Department.
- .5 Drafting Standards shall be as follows:
  - .1 Graphic scales, as established by Department on each sheet or detail.
  - .2 Minimum pen line thickness of 0 or .35mm.
  - .3 Minimum lettering height of 1/8".
- .6 List of items available to the Design Consultant on the Department web page under LIBRARY – (Forms & Publications) include:
  - .1 Department Coversheet (for seals and approval signatures) under Design Phase forms (3000 series) Coversheet (PDF Template).
  - .2 Title Block (for typical drawings) under Design Phase forms (3000 series) Title Block (PDF Template).
  - .3 Reference to the Project sign under Design Phase forms (3000 series) Project Sign (PDF Template).
  - .4 General Conditions and General Requirements (5000 series) for: Design-Bid-Build (DBB) Major Capital Projects (greater than \$5,000,000); Design-Bid-Build Minor Capital Projects (less than \$5,000,000); CMR Projects; Design-Build (D-B) Projects; are located on the Department web page under the 5000 Series.
  - .5 General Conditions & General Requirements Section of the Department Library = Bidding Requirements, Contract forms and Conditions of the Contract (Division 00) – this is available to the Consultant for coordination information, however the Department Bidding and Contract section will insert this information in the Contract Documents when the project is prepared for bidding.
- .7 Refer also to "Bidding Phase" Section 3.5.6 of this Manual.

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### **5.2.2 Large Format Document Standards:**

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- .1 All drawings at the Bidding phase prepared for Department projects must be submitted as detailed on the Bidding Documents – Quality Assurance Checklist, Department Form 6015. The US National CADD Standards will be utilized.
- .2 Software used to produce CADD drawings should be compatible with the AutoCAD latest release. Documents created in an alternate native software application will be converted to AutoCAD (latest release).
- .3 The contents of each diskette/CD will be identified on labels securely attached to each diskette/CD cover, and diskette/CD sleeve.

- .4 CADD drawing numbers: The title block on each drawing shall contain the project number and sheet number.
- .5 The Department recommends use of the AIA short or long layering guidelines as a standard layering format.
- .6 The Department requires all fonts be TrueType
- .7 If the project is required to utilize building information modeling (BIM) refer to the **Department** BIM Guidelines for additional information.
- .8 Within the title-block, "Drawing Prepared By" shall indicate the firm name and address of the consultant or sub-consultant who was responsible for preparation of that specific drawing and who will be subsequently stamping and sealing that sheet. Individual firm graphic logos (consultant or sub-consultant) shall not be inserted on the drawings.

Additional information about the drawing format may be obtained by contacting the Chief Architect at the Department. Telephone (860) 713-5631.

### 5.2.3 Record Drawing Submission:

As-built (record drawings) are required per the Consultant's contract – electronic copies shall be submitted to the **Department** at the completion of the construction project. All revisions, additions, changes and as built conditions shall be recorded. Submission shall include CADD files as well as PDF format. See Minimum PDF Requirements below for additional information.

- .1 CADD submission requirements:
  - .1 Delete all unused geometry that is not part of the final project.
  - .2 Find and delete all invisible objects.
  - .3 Delete all unused layers.
  - .4 Delete all unused layer filters.
  - .5 Delete or purge all unused data (text, blocks, nested objects, etc).
  - .6 Audit the file for any drawing file database errors and correct.
  - .7 Bind all xrefs into the final drawings.
- .2 For projects authored in BIM software such as Revit:
  - .1 Convert the files to CADD and submit as indicated above.
  - .2 Submit the model as follows:
    - .1 Purge and remove unused families, materials, and other objects from the Revit projects to reduce file size.
    - .2 Set the Path for Revit links in the Revit file and CAD links to "Relative".
    - .3 Include dependent files such as linked Revit models, CAD files, DWF markups, decal images, and external keynote files, or custom material assets.
    - .4 Detach the Revit model and associated Revit files. This removes the typical error messages when you copy central files using the operating system.
- .3 Record drawings must be submitted to the **Department** Project Manager before final payment is approved.

### 5.2.4 Architectural and Engineering Drawings, Minimum PDF Requirements:

- .1 **Statement of Need:**

Portable Document Format or PDF formatted electronic documents have become more sophisticated as time progresses. For both text and graphic files the PDF gives us the ability to review, share and store documents electronically in a format that is consistent for all who receive it. PDF software allows for

commenting and marking up documents and sharing those comments with others inside and outside of the organization. These commenting features are relatively intuitive.

We are moving to a paperless (or at least a less-paper) environment. In order to take advantage of these PDF software tools we need to have documents produced in a consistent, industry recognized manner.

All consultants are already using the open PDF format to publish their documents. The software required to print to PDF format is readily available and not expensive. Consultants are required to submit their documents as follows:

### **.2 Requirements for all Project Phases:**

All electronic documents shall be presented in PDF 1.5 (or greater) file format, per ISO 32000-1 standard. All PDFs should be created directly from the native application (e.g. Revit, AutoCAD, Word, etc.). Drawing line work must be vector based and scale independent. All text must be provided as TrueType or OpenType font with the ability to search and select text. In accordance with the Guidelines for Construction PDF Documents (<http://cpcoalition.com/guidelines/>) all other drawing/specification details will be determined by the project team during the project execution planning phase and as required by the DAS / Department Consultants Procedure Manual and as obligated by contract.

#### **.1 Drawing pdf requirements:** In addition to the requirements above:

- Drawings must be submitted utilizing PDF/E formatting
- Drawing files will have page numbers that match the sheet number.
- Bookmarks will be used to speed navigation, the bookmarks shall follow the organization of the drawings – **every sheet should not** be bookmarked, the drawing bookmarks should be organized by major disciplines and sub-categories following the naming taxonomy of the drawing sheets.
- When printing from the drawing or modeling software the documents must be optimized for Optical Character Recognition (OCR).
- All drawings, in all disciplines, must be identical in size and title blocks must register for all sheets.

#### **.2 Project Manual pdf requirements:** In addition to the requirements above:

- Document files will be bookmarked by major division and then by section only, sub-category bookmarks are not permitted within the individual sections.

#### **.3 Record Drawing submissions:** In addition to the requirements above:

- Record drawings must be produced in PDF/A format.

#### **.4** For additional information please see Appendix A below:

## Appendix A

*The following has been extracted and modified from the referenced Construction PDF Coalition Guidelines (CPC guidelines <http://cpcoalition.com/guidelines/>)*

### **1.0 Consistency Across Disciplines:**

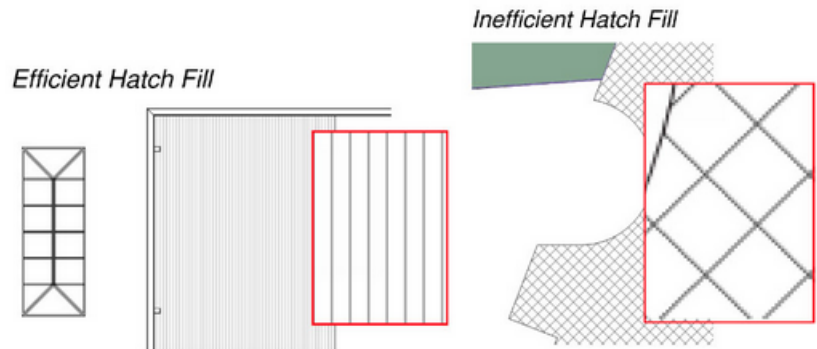
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- 1.1** In order to review documents in the most efficient manner possible, the following items shall be consistent across all PDFs generated for the project by all disciplines.
  - 1.1.1** Sheet size and orientation of sheets should be consistent so that if overlaid, they align – in accordance with NCS v5 UDS 2.2 Sheet sizes (US National CAD Standards).
  - 1.1.2** Consistent plot location in paper space through location of gridline intersections or other project baseline on similar sheet types amongst the set, across disciplines. For example floor plan or enlarged plan views.
  - 1.1.3** Scale of each sheet type/view to be consistent amongst the set, across disciplines. Scale should be determined for each sheet type (i.e. overall plans at 1/16", partial plans at 1/8", enlarged plans at 1/4", sections at 3/4" etc.) Reference UDS Module 4 (US National CAD Standards) and template project worksheet.
  - 1.1.4** Consistent gridline visibility (i.e. should be consistent for navigating across all sheets, across disciplines for alignment purposes).
  - 1.1.5** Naming convention should be consistent with like pages across disciplines as mandated by the State of Connecticut, organized by major disciplines and subcategories following the naming taxonomy of the drawing sheets. Please refer to the NCS Module 1 Drawing Set Organization Module 1.7 Appendix B.
  - 1.1.6** Each sheet should have a page label that matches the sheet name and number (e.g., A-101 First Level Floor Plan).
  - 1.1.7** If and when possible Hyperlinks created within the native application should be maintained within and between PDF sheet outputs

### **2.0 Creating PDF files:**

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- 2.1** The goal for creating PDF files is to streamline the flow of data for use in reviewing documents. This also pertains to documents used for construction and operations while minimizing overall file size. Best practices include the following:
  - 2.1.1** PDFs should be created directly from authoring application with output quality consistent with native file format.
  - 2.1.2** Use vector based lines when creating PDFs.
    - .1** Use efficient hatch fills so as not to inhibit PDF performance or increase file size. Complex line styles slow down rendering speed. Rather, simple lines styles provided within the native software program perform the best.



- 2.1.3 Use True Type fonts to allow search ability within the PDF (SHX are not searchable)
- 2.1.4 Limit information generated in PDF to what is agreed upon by the Project Team including the following
  - .1 Unused layers;
  - .2 Extraneous viewports;
  - .3 Unneeded Meta data
- 2.1.5 Maintain output scale when printing to PDF – **Print to Scale, avoid Fit to Page.**

### 3.0 Metadata:

- 3.1 *If available from source software*, document and element metadata can be used to produce a data-rich PDF, which allow for better navigation and searching of the document, as well as reduces the need for manual data input.
  - 3.1.1 Each sheet should contain the following metadata:
    - .1 Page # or Spec #;
    - .2 Project Title Name;
    - .3 Sheet Title;
    - .4 Revision;
    - .5 Date Issued;
    - .6 Author;
    - .7 Discipline;
    - .8 Document type (i.e., elevation, detail, floor plan, specification)

**End**  
**5.2 – Drawing Information**