Creating Drawing Packages to Effectively Communicate Engineering Systems and Solutions

MEEG 304 – Machine Design: Elements

Drawing Packages

- Contains all the descriptive documentation needed to ensure a part or system can be manufactured and assembled.

- Drawing Package = a group of drawings and a bill of materials that communicate the details of a system or sub-system.

- Needs to be finished before any parts can be made.

- The final drawing package will be given to your customer.

Drawing Package Elements

- Package Content
  - Drawings for each component linked to parent assembly
  - One or more assembly drawings
    - 2D or 3D
    - Assembled or Exploded
    - Label all components
    - Include a Bill of Materials
    - Link to component drawings
  - May also include wiring, pneumatic and other diagrams to communicate and illustrate connectivity and installation.

Design Process & Graphic Communication

1) Assembly and Installation Instructions
2) "As-Built" Drawings
3) Schematics

Visualization  Communication  Documentation

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Drawing Package Organization

- Full Assembly & Bill of Materials
  - Sub Assembly #1
  - Sub Assembly #2
  - Sub Assembly #3
    - Parts in Sub Assembly #1
    - Parts in Sub Assembly #2
    - Parts in Sub Assembly #3
  - Etc...

Exploded Assembly

Part 1

Part 2
Example
2D Sectioned Assembly

Engineering Drawings
Typical Content

• Geometry of an object
• Material type and characteristics
• Manufacturing requirements
• Surface finishes and features
• Tolerances (primarily geometric)
• Other (e.g. assembly information)

Drawing Title Block

• Typical Title Block Contents:
  - Material
  - Scale
  - Tolerance
  - Description
  - Team name
  - Part number
  - Sheet “number” of “total number of sheets”
  - Part drawn by and date drawn
  - Checked by and date checked
  - File Name
  - Quantity

• Notes
  - Commonly used on all drawings
  - Used to communicate additional info
Dimensioning

Best Practices

• Present your drawing so that the machinist has to do as little math as possible!
• Extension lines don't touch object lines, leave a gap.
• Extension lines can cross other extension lines.
• Position dimensions outside body of part, preferably between views.
• Shorter dimensions are placed closer to object.
• When placing dimension lines, do so between extension lines, not object lines.
• Dimension lines should not cross other dimension or extension lines.

Dimensioning (cont.)

Best Practices

• When possible, place all dimensions for one feature in same view.
• Do not duplicate dimensions.
• When multiples of a feature exist, use format “number of features X dimension”. Example: “2 X .375”
• Line up dimension lines when possible.
• Locate cylindrical features in circular view.
• When calling out circular features (holes, cylinders), use diameter dimensions, not radius.
• Consider using ordinate dimensioning in a view that shows numerous features.

Engineering Drawings

The Legal Context

• Engineering Drawing:
  • Binding document or set of documents that disclosed graphically and in text the form and function of an object.
  • Legally binding if created by or approved (i.e. stamped) by a professional engineer.

Bill of Materials

• Bill of Materials Contents:
  • Part No.
  • Quantity
  • Material/Stock Size
  • Sheet #
  • Source
• Bill of Materials are needed for each full and sub assembly
• If the same part appears in multiple subassemblies it only needs to appear once in the drawing package.
• Common format: Table with Columns
• Typically included on the assembly drawing.
Purchased Parts

- Most manufactures provide electronic drawings.
- Do not need to be fully dimensioned in drawing unless modified after they are purchased.
- Add a note for the material giving the part number and contact info of the company the part was purchased from.

Diagrams

- Same principles apply to assembly diagrams
  - Circuits
  - Pneumatic
  - Hydraulic
  - Logic
- Used to show connectivity and operation.
Don’t Forget about Sketching

- Technical sketches (i.e. to scale) are a great way to convey ideas.
- Attempting to sketch in SolidWorks often presents more obstacles than just using pencil and paper.
- Jumping into SolidWorks before your design intentions are clear causes problems. i.e. origins, planes, etc..

Installation Drawings

What are they?

- An Installation Drawing provides information for properly positioning and installing items relative to their supporting structure and adjacent items, as applicable.
- Information may include: 1) Dimensional Data, 2) Hardware Descriptions, and/or 3) General Configuration information for the installation site.
- An Installation Drawing does not establish item identification (item ID is accomplished with assembly drawings and the bill of materials).

Installation Drawing

Applications

An installation drawing is prepared to provide detailed installation information for:

- Functionally related items that cannot be effectively shown on an assembly drawing of the item to which it belongs (Control System, Electrical System, or Hydraulic System.)
- An assembly which is so large or complex that the major assembly drawing cannot accommodate all relevant data.
Thank you!

Questions?