

Detail and Assembly Drawings – Working Drawings

Working Drawings

- Working Drawings are usually multiview drawings with complete dimensions and notes added. They must provide all necessary information for the manufacture of parts and for assembly.
- Nothing must be left to guess.
- A set of Working Drawings include the Assembly Drawing and Detail Sheet(s)
- Follows ANSI or ISO Standards

Number of Details Per Sheet

- If the component or machine is composed of few parts, all the details may be shown on one large sheet.
- When larger or more complicated mechanisms are represented, the details may be drawn on several large sheets and the assembly is drawn on a separate sheet.

Title Block or Record Strip

- The Title Block is to show all necessary information not given on the directly on the drawing.
- Every company has their own Title Block, but most have similar information.
- Usually shown on the right side and lower left on drawing (some exceptions may occur)
- Information that is generally given on a Title Block:
 - Name of the object represented.
 - Name and address of the manufacturer.
 - Drawing number or tool number (used to identify each drawing)
 - Scale factor of the drawing.
 - Dates (completion of drawing, checked, and/or manufactured)
 - Paper size.
 - Tolerance block.
- The following people can sign off on the Title Block
 - Designer
 - Checker
 - Engineer
 - Owner / Manufacturer
 - Builder (machinist)
 - Customer

Title Block or Record Strip (continued)

- Other information may be given such as the following:
 - Material used in the process.
 - Quantity
 - Heat Treatment
 - Finish
 - Hardness
 - Estimated Weight
 - Other items depending on the organization and needs

List of Materials

- The List of Materials provides itemized information about the parts or the drawing.
- Usually shown on the Assembly View
- Helps the purchasing department to requisition (order) each component part
- List of Materials Location:
 - Usually above the Title Block
 - Often seen on the Assembly Drawing
- Other Names for List of Materials
 - Parts List
 - List of Parts
 - Bill of Materials
 - Materials List
 - Stock List
- Items normally seen or found on the List of Materials:
 - Part Identification Number
 - Number Required
 - Nomenclature or Description
 - Zoning
 - Material
 - Material Specification
 - Size
 - Notes
 - Suppliers (Reid, Carr Lane, DE-STA-CO, etc.)
 - STK, PUR or STD

Checking

- The importance of accuracy in technical drawing cannot be overestimated. Errors sometimes cause tremendous unnecessary expenditures.
- Someone other than the person whom designed the drawing usually does the checking.
- Checkers find minor and/or major errors before the drawing goes into production.
- Checkers basically pay for themselves and are cost savers to their companies.

Drawing Revisions

- Changes in design, changes in tools, desires of customers, or errors in design or production necessitate changes on drawings.
- All changes are verified and recorded on the drawing.
- Drawings are updated with the information and changes are listed in the Revision Block usually located in the upper right-hand corner of the border or above the title block.
- If the change is considerable, a new drawing may be made and the old drawings stamped "OBSOLETE" and placed in a separate file.
- When changes are made they should be described briefly and dated with the initials of the person making the change. Zoning is also appropriate.
 - Use words like the following in the description to make changes:
 - "WAS" – "NOW"
 - "TO" – "FROM"
 - "ADDED" – "REMOVED"

Assembly Drawings

- Shows the parts of a machine or component assembled (put together) on a drawing, with all their functional pieces in their proper location related to how it will be used.
- Assembly Drawings should show the following:
 - **Views** – show only views necessary. Show how the parts fit together in the assembly and show the function of the components. The assembly drawing purports to show *relationship of parts*, not *shapes*.
 - **Sections** – since assemblies often have parts fitting into or overlapping other parts, hidden lines become confusing and sectioning should be incorporated. Any kind of section may be used as needed.
 - **Hidden Lines** – should be used wherever necessary for clarity. Sometimes removed or not used at all.

Assembly Drawings (continued)

- **Dimensions** – as a rule, dimensions are not given on assembly drawings, since they are given completely on the detail drawings. If dimensions are given, they are limited to some function of the object as a whole i.e., maximum height or maximum opening between jaws or slide capacity.
- **General Notes** – information related to the overall integrity of the assembly.
- **Part Identification** – also known as **Ballooning**. Circles containing part numbers are placed adjacent to the parts, with leaders terminated by arrowheads touching the part. Circles are placed in orderly horizontal or vertical rows and not scattered over the sheet. Leaders are never allowed to cross, and never drawn horizontally or vertically.
 - **Part Identification – Balloon and Number Sizes:**
 - 7/16" Balloon – 1/8" Text
 - 1/2" Balloon – 3/16" Text
 - 5/8" Balloon – 1/4" Text

Detail Drawings

- A drawing of a single piece that gives all the information for producing or manufacturing the part and/or component.
- A Detail Drawing shows all of the following:
 - Proper views and line types
 - Accurate dimensions to produce the part
 - Sections to show complex interior components
 - Completed Title Block with no Parts List
 - Part Identification – Ballooning
 - Part Labels – Name of Part, Quantity, Material and Specific Notes
 - General Notes related to the specific part component(s)

Drawing Notes

- Notes supply information to a drawing that cannot be visualized by any person.
- Notes eliminate numerous repetitions.
- When notes become long and extensive a separate sheet called a Specification Sheet or Spec Sheet should be used.
- There are two classification types of Notes
 - General – notes that apply to the entire drawing.
 - Examples of General Notes:
 - FAO – Finish All Over
 - Remove Burrs and Sharp Edges
 - All Small Radii .25
 - All Fillets and Rounds .125

Drawing Notes (continued)

- Specific – notes that apply to specific features.
 - Examples of Specific Notes:
 - Finish Only Top Surfaces
 - Stamp Number on Part
 - Heat Treatment
 - Dimensional Note - .500 Drill – 8 Holes
- General Notes may be referenced from the field of a drawing or list of materials. This is done with the note number enclosed in an equilateral triangle called a **Flag**.