535334

Geometric, Dimensioning and Tolerancing

# Drawing Interpretation

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# Outline

- Engineering Drawing
- Types of Engineering Drawing
- Main Components of Engineering Drawing

# Engineering Drawing (1)

- The engineering drawing is one of the most important communication tools that a company can possess.
- Drawings are not only art, but also legal documents.
  - Pricing uses it to calculate product costs.
  - Purchasing uses it to order raw materials.
  - Routing uses it to determine the sequence of machine tools used to produce the part.
  - …

# Engineering Drawing (2)

- Tooling uses it to make production, inspection, and assembly fixtures.
- Production uses the drawing information to make the parts. Inspection uses it to verify the parts have met the specifications.
- Assembly uses it to make sure the parts fit as specified.

# Cost of Engineering Drawing Error

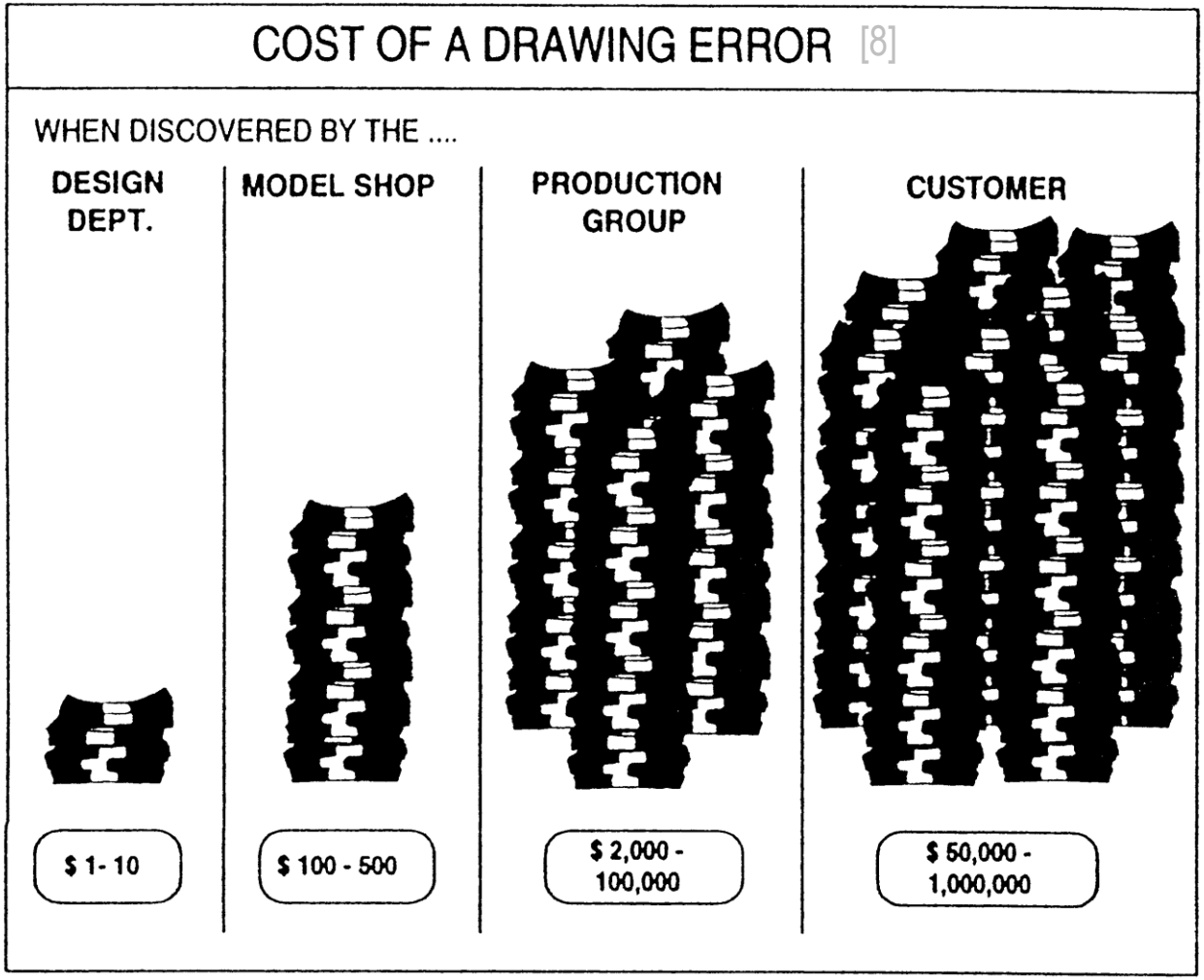



**FIGURE 1-2 How Costs of a Drawing Error can Increase as the Drawing Moves Through the Organization**

# Drawing Types (1)

- Note
- Detail
- Assembly

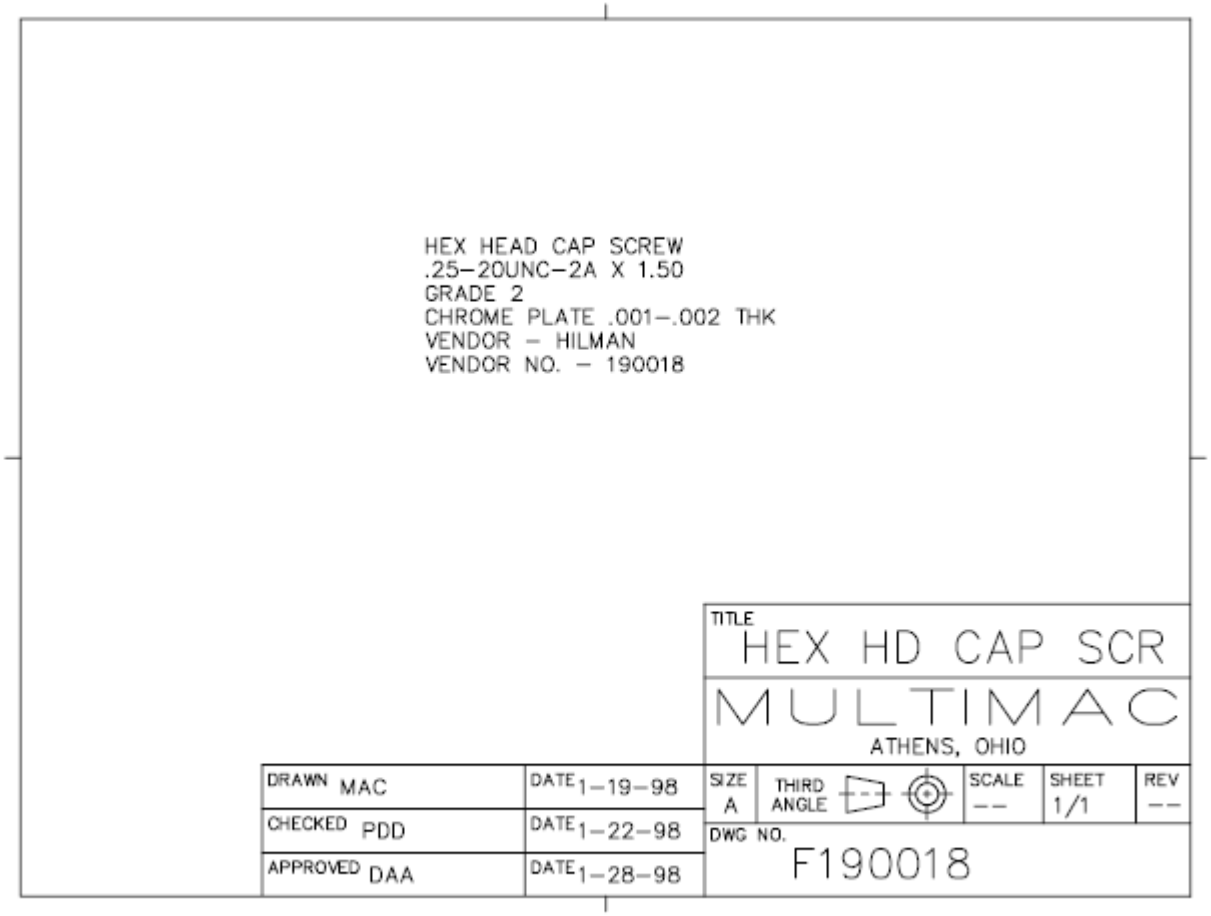



**Figure 4-1** Note drawing

# Drawing Types (2)

- Note
- Detail

  The detail drawing should show all the specifications for one unique part.

- Assembly

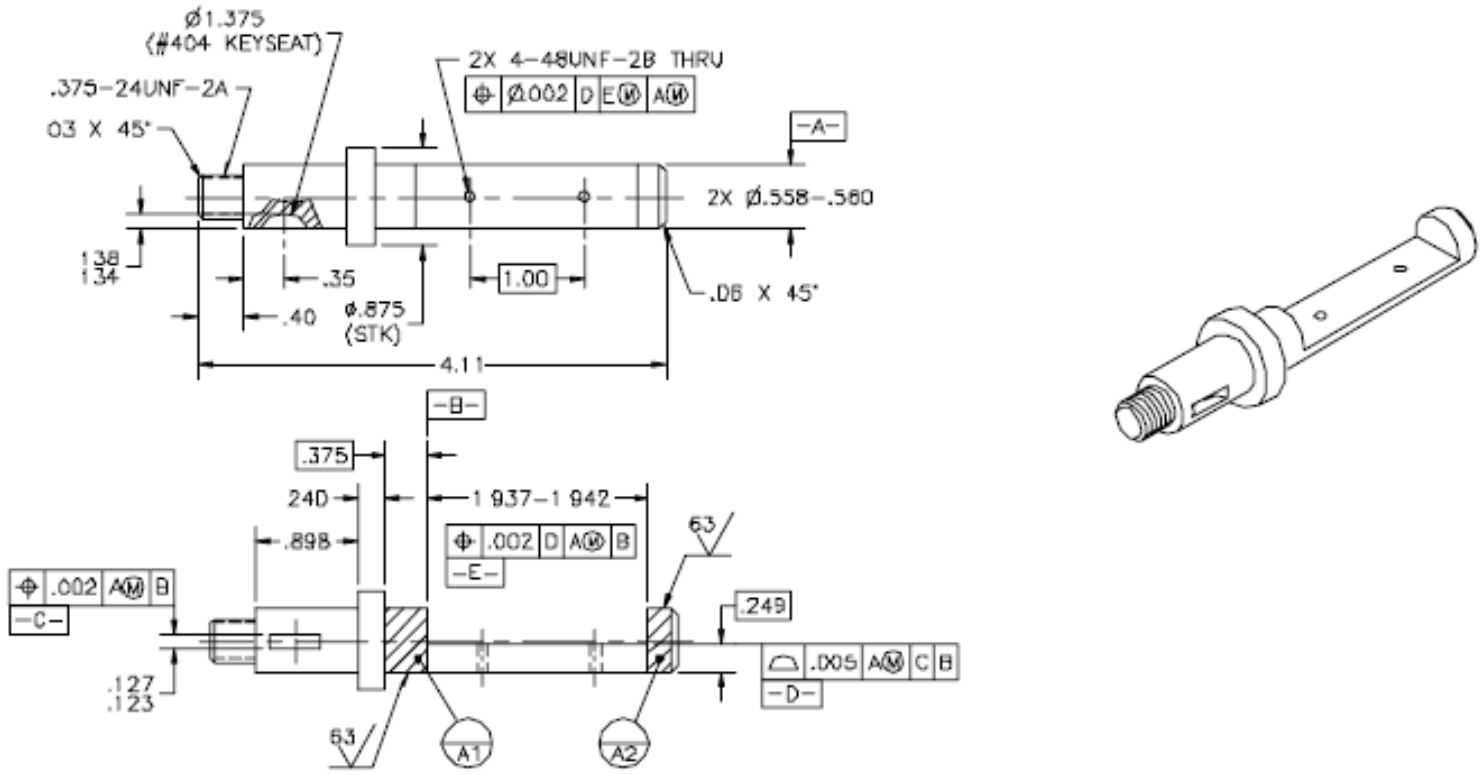
# Drawing Types (3)

- Note
- Detail
- Assembly

Categorized as subassembly or final assembly.

Usually drawn in one of two forms: exploded pictorial view or 2-D sectioned view.

Two common elements of assembly drawings are identification balloons and parts lists.






| | | | |
|---|---|---|---|
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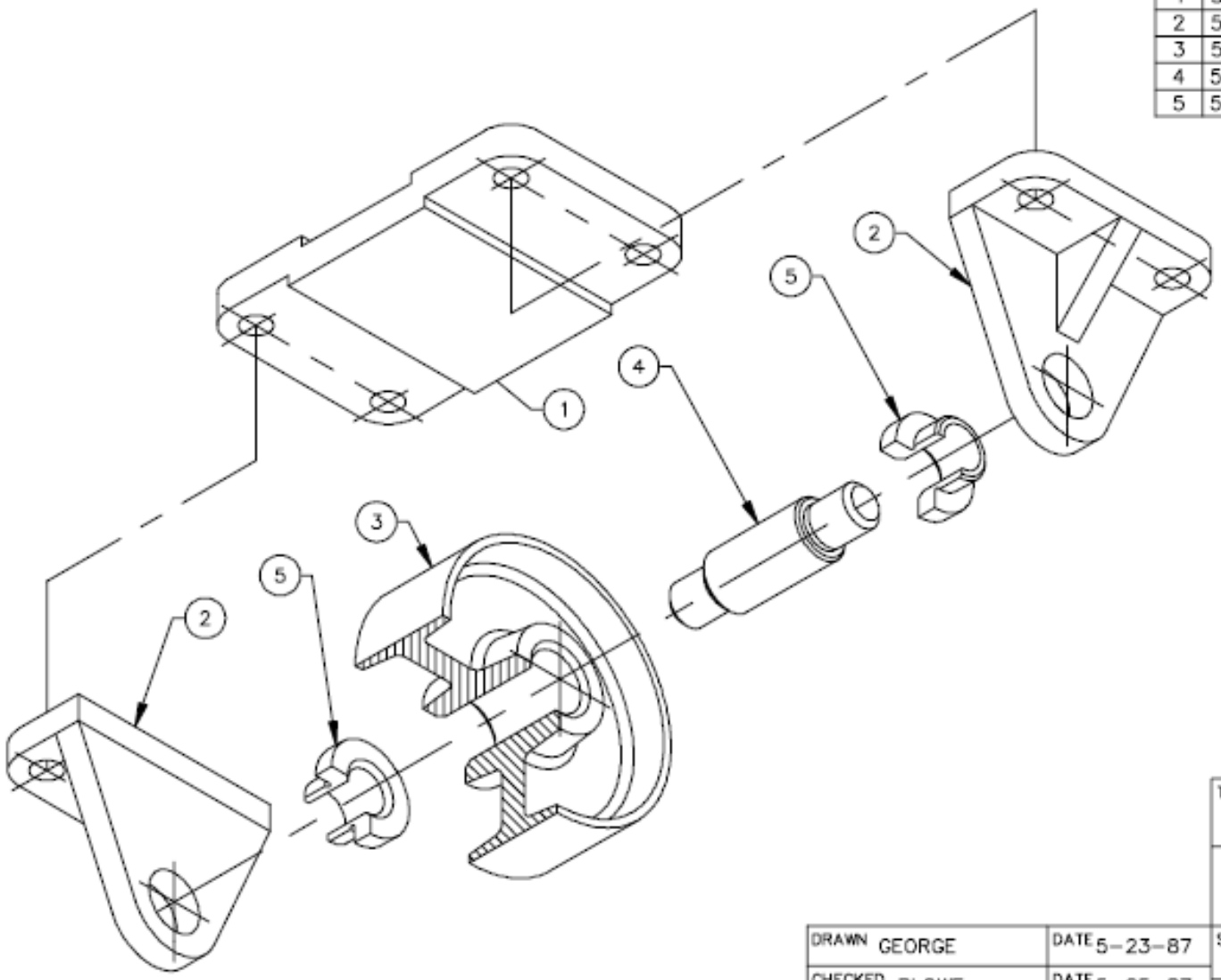
| HEAT TREAT: NONE<br>MATERIAL: 1018 CRS | DRAWN MAC DATE 2-3-98<br>CHECKED JANE DATE 2-3-98<br>APPROVED ZIMMERMANN DATE 2-8-98 | SIZE B<br>THIRD ANGLE<br>SCALE 1:1<br>SHEET 1/1<br>REV --<br>DWG NO. 204509432 | |

**Figure 4-4** Machined part made from bar stock

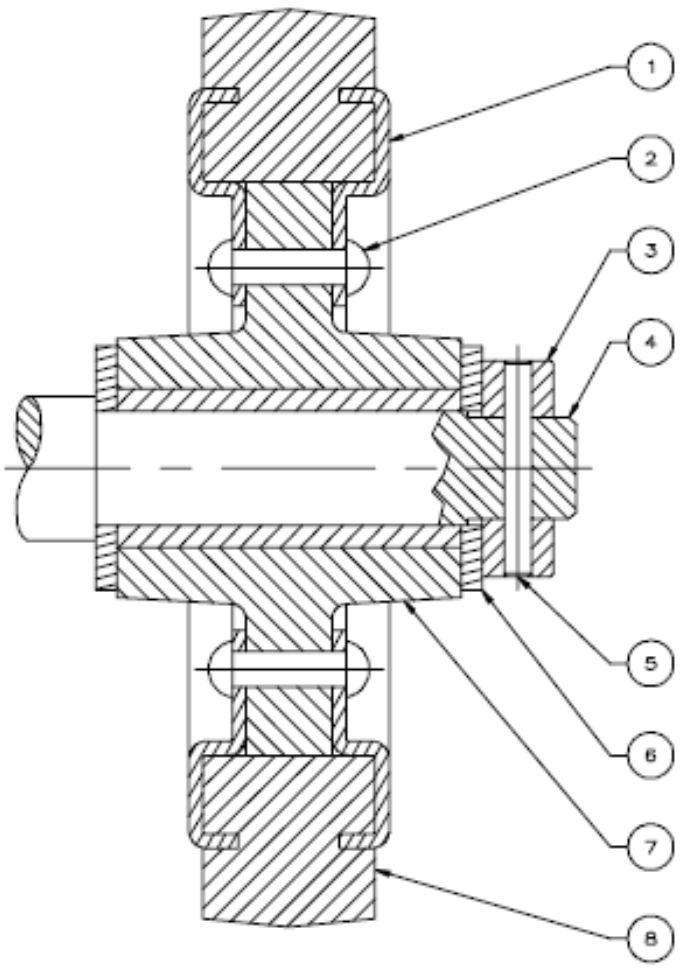



| PARTS LIST | | | |
|---|---|---|---|
| ITEM | PART NO. | DESCRIPTION | QTY |
| 1 | 509402148 | BASE | 1 |
| 2 | 509402124 | AXLE SUPPORT | 2 |
| 3 | 509402138 | WHEEL | 1 |
| 4 | 509402036 | AXLE | 1 |
| 5 | 508302009 | BUSHING | 2 |

TITLE
ASM, WHL SUPT

HULMANN–ROSE
TERRE HAUTE, IN

| | | | | | | |
|---|---|---|---|---|---|---|
| DRAWN GEORGE | DATE 5–23–87 | SIZE B | THIRD ANGLE | SCALE NONE | SHEET 1/1 | REV -- |
| CHECKED BLOWE | DATE 5–25–87 | DWG NO. 509402156 | | | | |
| APPROVED KRACTACSKI | DATE 5–28–87 | | | | | |




| PARTS LIST | | | |
|---|---|---|---|
| ITEM | PART NO. | DESCRIPTION | QTY |
| 1 | 2048697 | BRACKET | 2 |
| 2 | 2048663 | RIVET | 6 |
| 3 | 2048641 | RETAINER | 1 |
| 4 | 2048621 | SHAFT | 1 |
| 5 | 2048642 | PIN SPRING | 1 |
| 6 | 2048643 | SPACER | 2 |
| 7 | 2048692 | HUB WHEEL | 1 |
| 8 | 2048682 | WHEEL | 1 |



| | | | |
|---|---|---|---|
| DRAWN | WALLY COX | DATE | 7-6-98 |
| CHECKED | BOB WILD | DATE | 7-7-98 |
| APPROVED | ALI BENDROB | DATE | 7-7-98 |

TITLE
ASM WHEEL

BEAVER FALLS DESIGN
ATHENS, OHIO

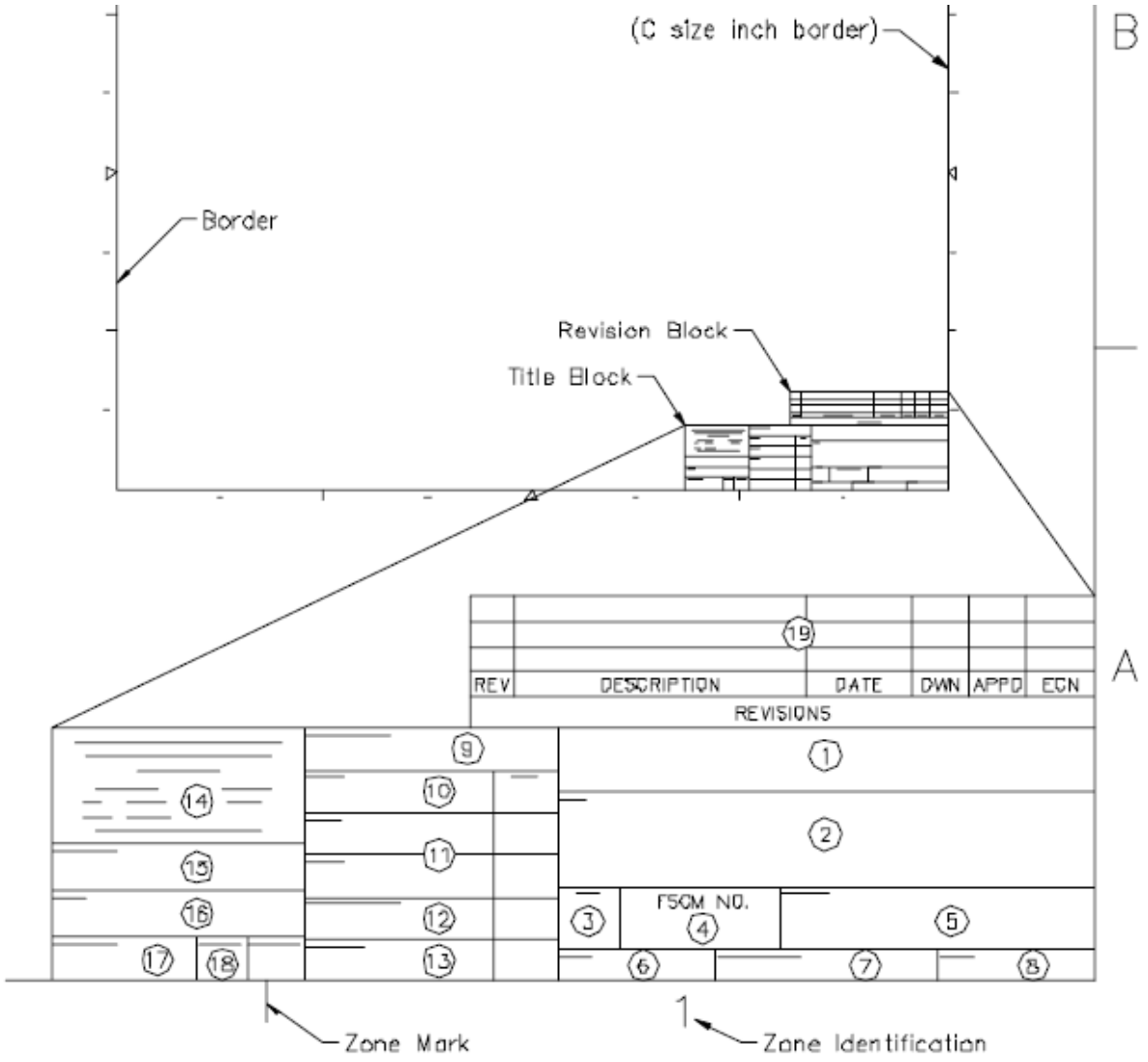
| SIZE | | SCALE | SHEET | REV |
|---|---|---|---|---|
| B | THIRD ANGLE | NONE | 1/1 | -- |

DWG NO.
2048698

INCH

# Border

- Zones
- Centre Marks



# Title Blocks

- Company Name and Address
- Drawing Title
- Drawing Number
- Scale
- Release Date
- Sheet Number
- Drawn and Date
- Check, Design, Approve, and Dates
- Tolerances (Linear and Angular)
- Treatment
- Finish
- Revision Blocks
- Part Lists
- View Projection

# View Projection

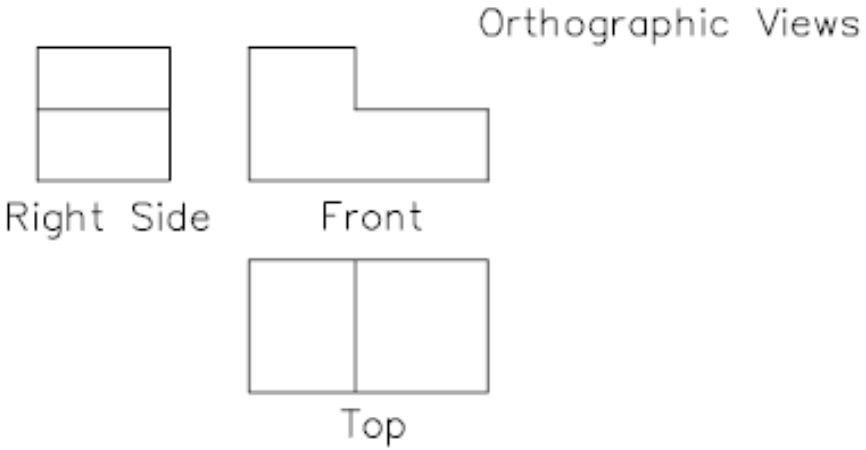



**Figure 4-10** First-angle projection

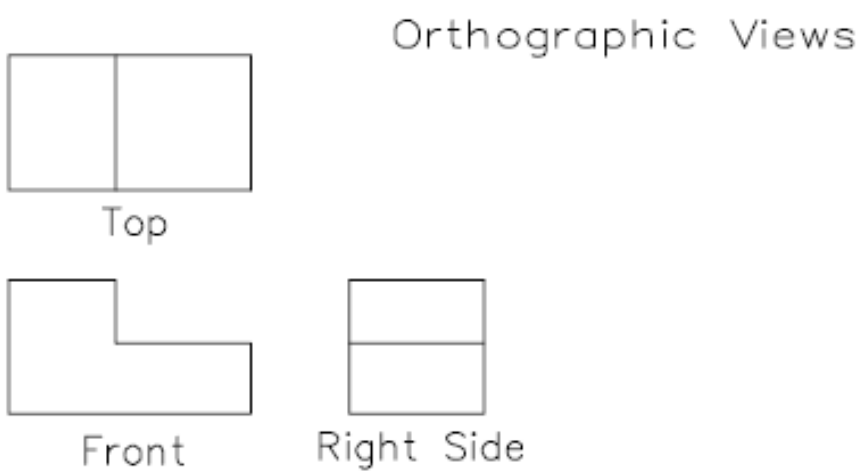



**Figure 4-11** Third-angle projection

# Section Views (1)

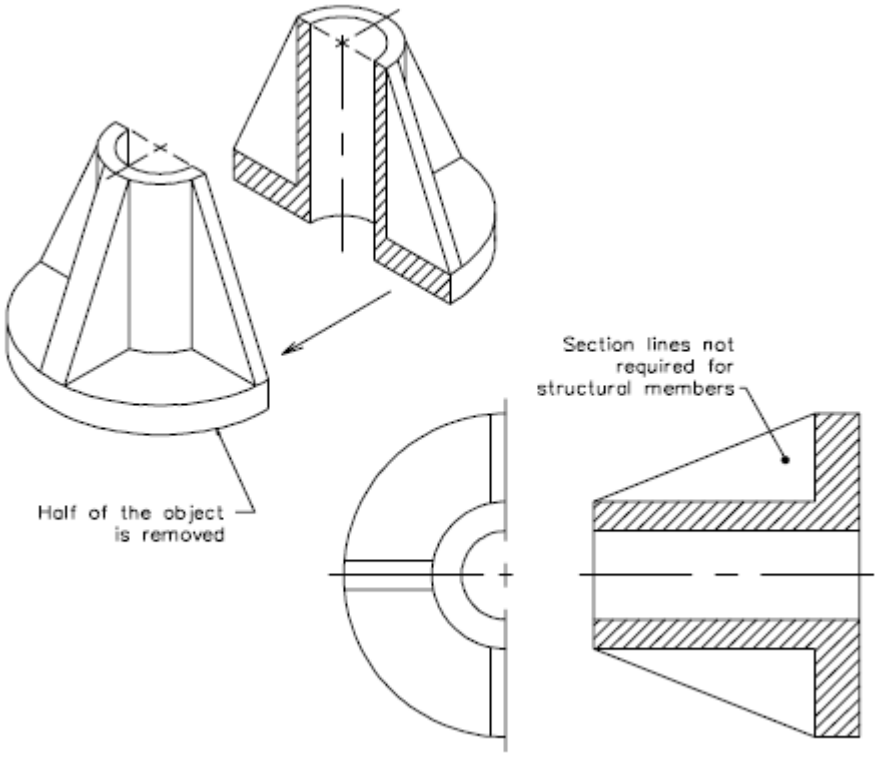



Figure 4-13 Full section

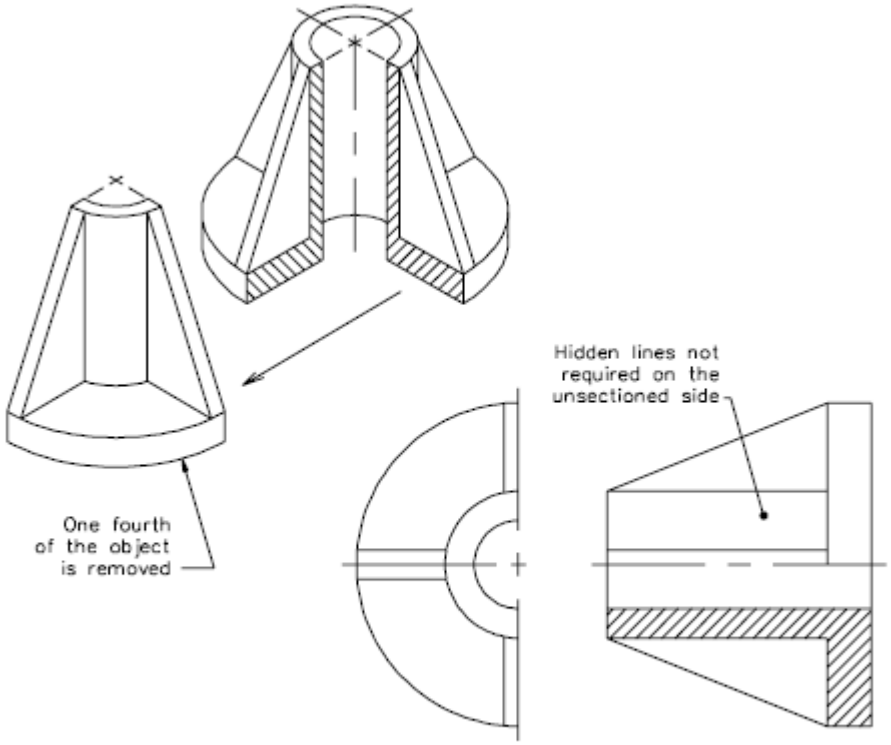



Figure 4-14 Half section

# Section Views (2)

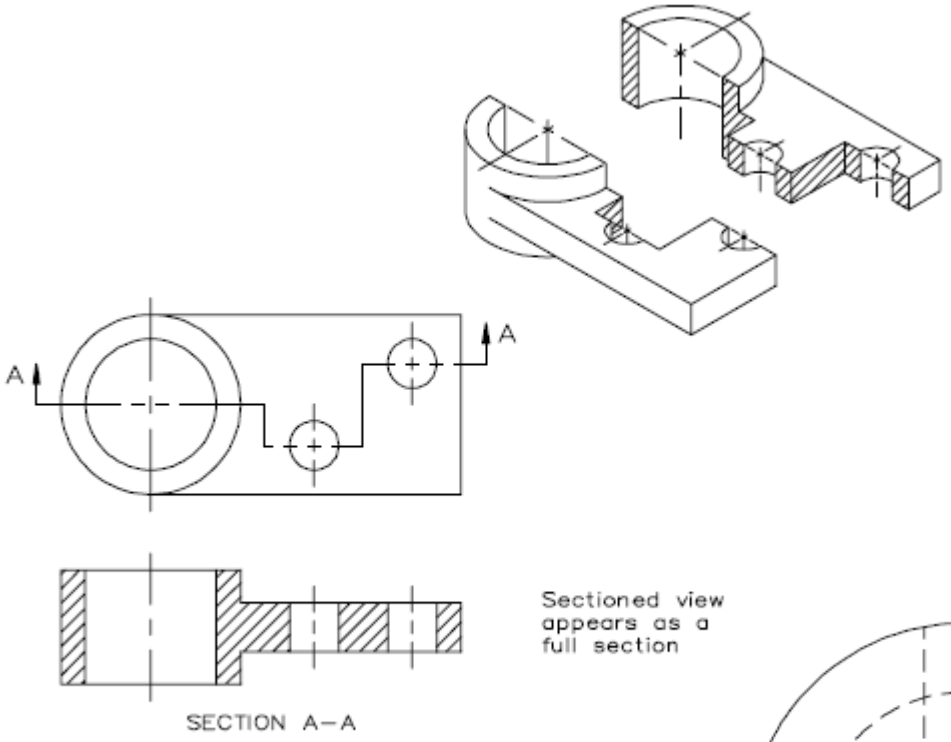



**Figure 4-15** Offset section

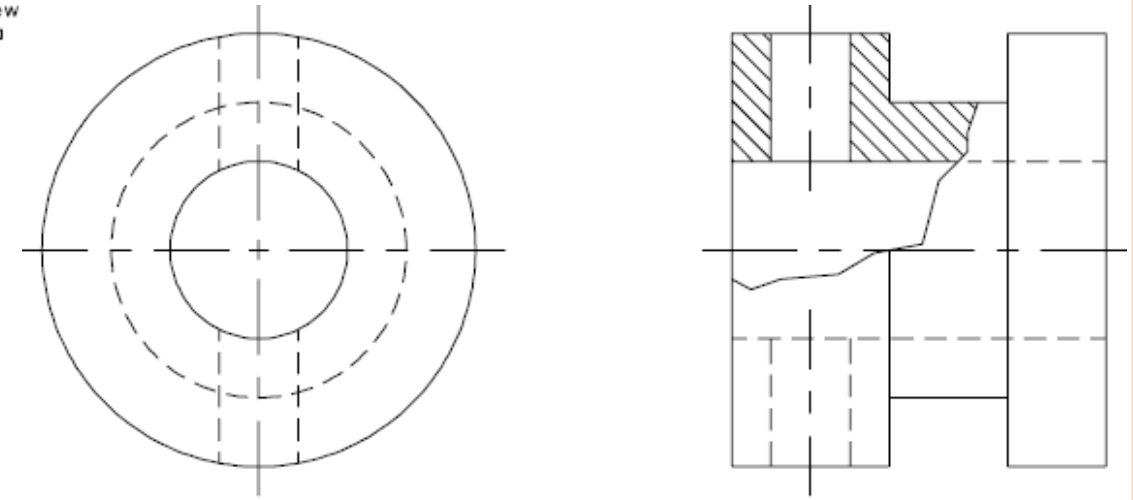


**Figure 4-16** Broken-out section

# Section Views (3)

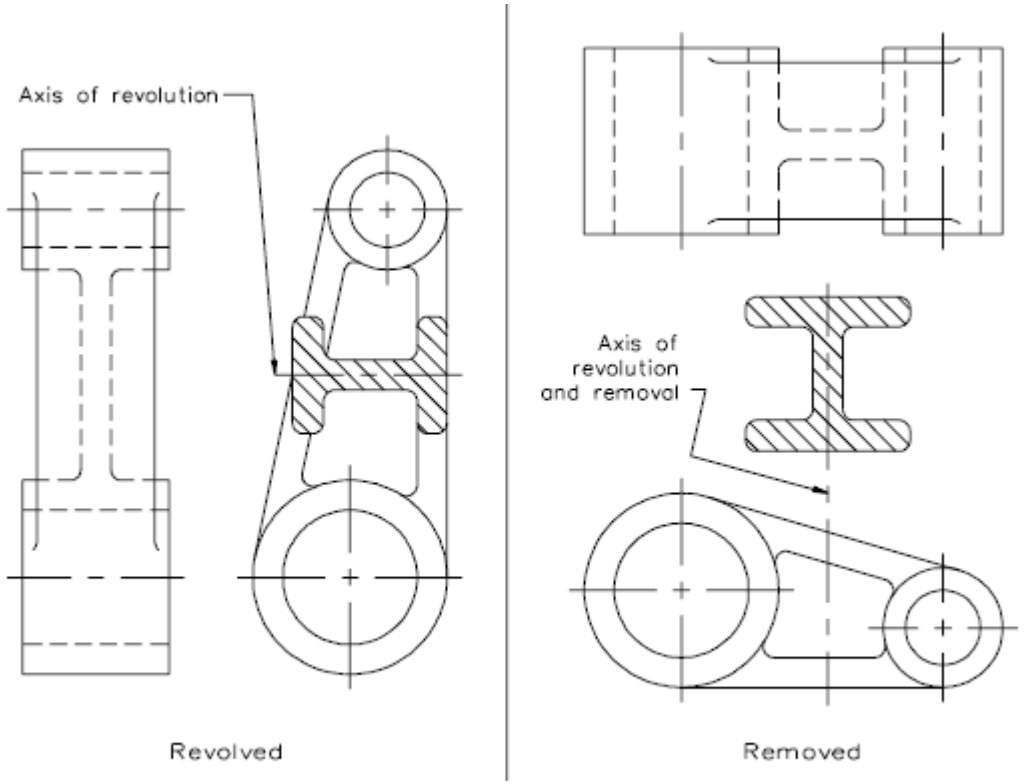



**Figure 4-17** Revolved and removed section

# Conventional Breaks

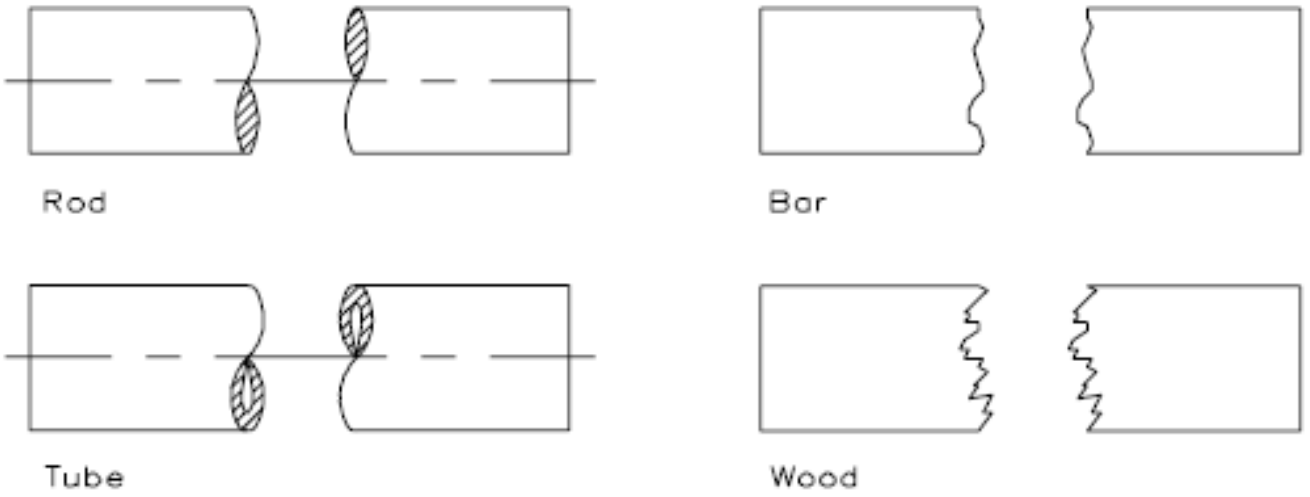



**Figure 4-18** Conventional breaks

# Feature Rotation

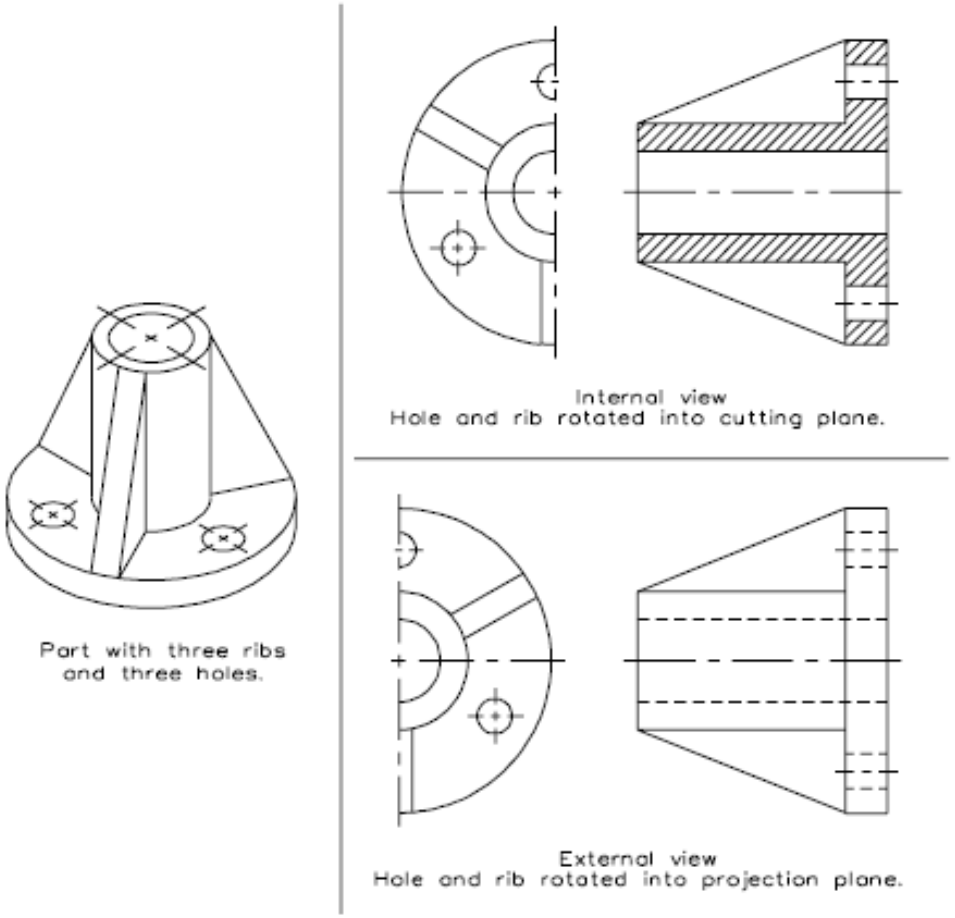



**Figure 4-20** Internal and external feature rotation

# General Dimensions

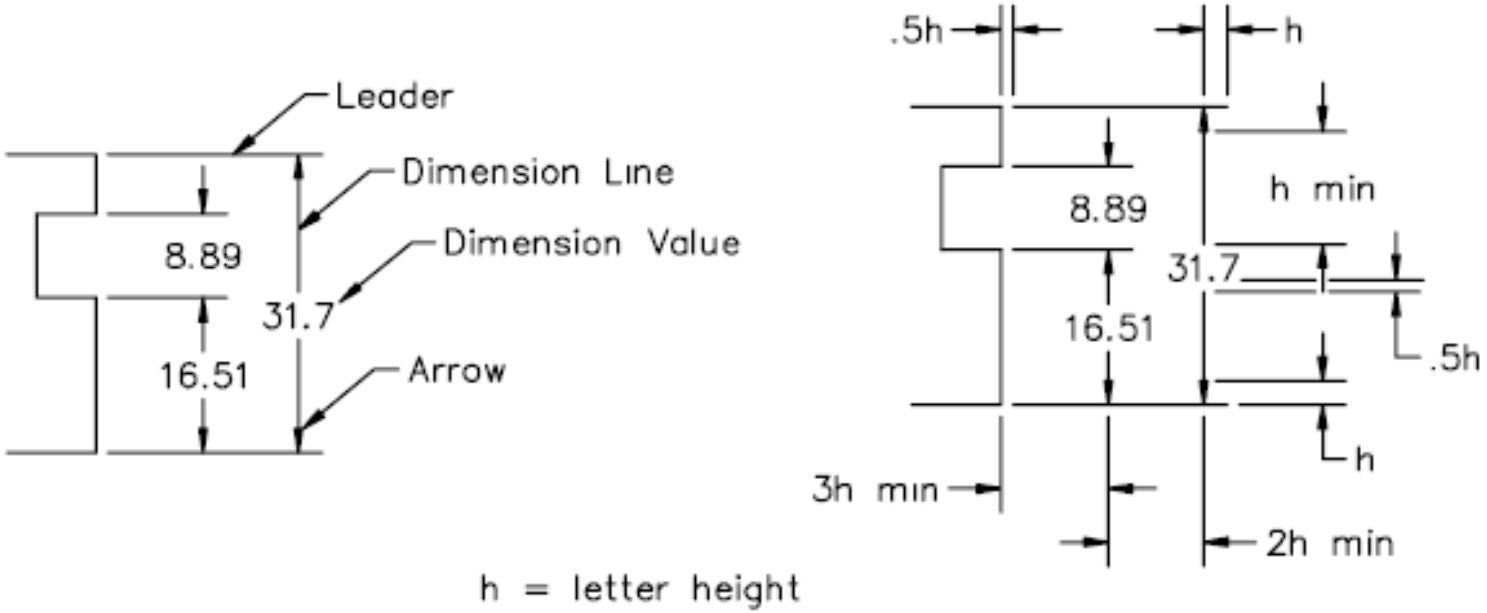



**Figure 4-24** Dimension elements and measurements

- Provide a minimum of 10 mm from the object outline to the first dimension line
- Provide a minimum of 6 mm between dimension lines
- Place shorter dimensions inside longer dimensions
- Avoid crossing dimension lines with extension lines or other dimension lines
- Dimension where the true size contour of the object is shown
- Place dimensions that apply to two views between the views
- Dimension the size and location of size features in the same view

# Tolerance Representation

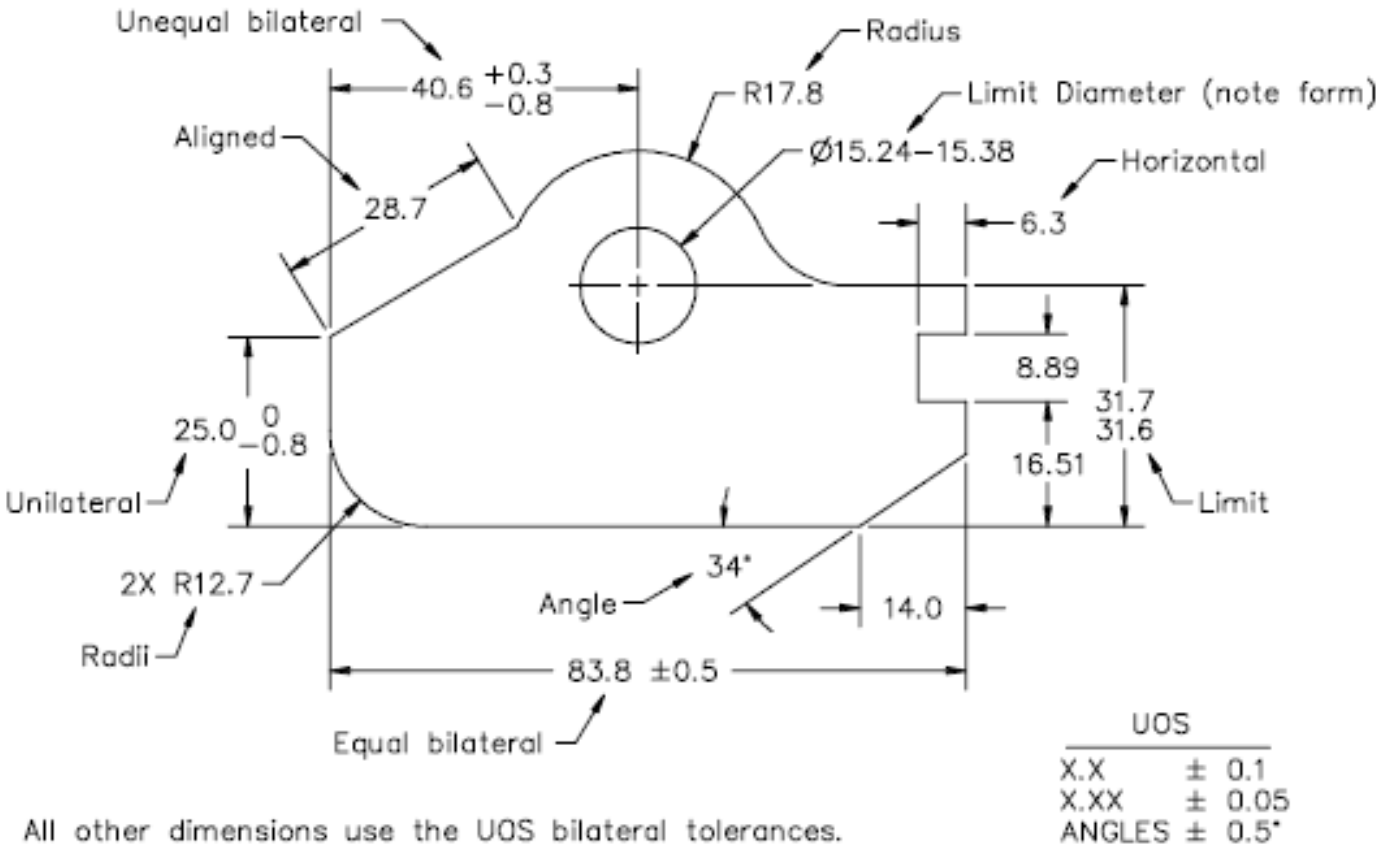



**Figure 4-23** General dimension types

# Surface Texture

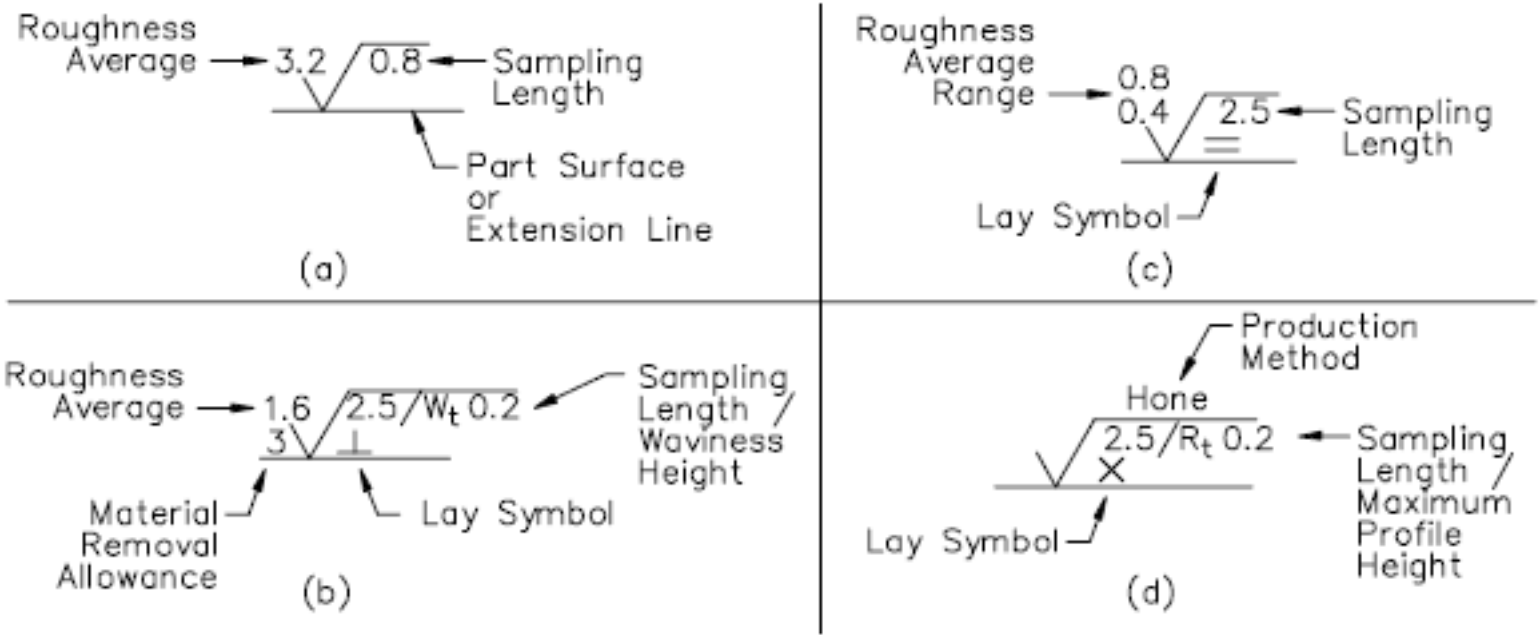



**Figure 4-26** Surface texture examples and attributes

# Reference Links/Books


[1] Geometrical Dimensioning and Tolerancing for Design, Manufacturing and Inspection (Georg Henzold)

[2] Mechanical Tolerance Stackup and Analysis (Bryan R. Fischer)

[3] Geometric Dimensioning and Tolerancing (James D. Meadows)

[4] www.engr.sjsu.edu

[5] www.engr.mun.ca

[6] engineering.armstrong.edu

[7] www.me.metu.edu.tr

[8] Dimensioning and Tolerancing Handbook (Paul J. Drake, Jr.)

[9] Geometric Dimensioning and Tolerancing (A. Krulikoski)