Concepts I
ISO Drawing Rules
Tuesday 2nd Week

Layout
- Conventional ‘A’ sizes of drawing paper
- Blank drawing sheets contain the following
  - Title block
    - [Your title block should include organization, drawing number, title, date, name of draftsman, scale, units, sheet number, number to total sheets]
  - Frame (0.5” off paper edge)
  - Centering marks

<table>
<thead>
<tr>
<th>UNIVERSITY OF DENVER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part No. 2</td>
</tr>
<tr>
<td>C. Lengsfeld</td>
</tr>
<tr>
<td>Scale = 1:1</td>
</tr>
<tr>
<td>Sheet 3 of 5</td>
</tr>
</tbody>
</table>
Drawing the object

- Front view is always center view
- Use a third angle view
- Minimum of 3 views

Line Types and Thickness

- Each line type has a clear meaning within the drawing
- Mixing up the line types is equivalent to spelling a word incorrectly (the meaning of the sentence will be lost)
- ‘Thick’ lines are to be twice the thickness of ‘thin’ lines
ISO Type ‘A’ line

- Thick and continuous
- Use for visible edges, visible outlines, crests of screw threads, and section view lines.

ISO Type ‘B’ Line

- Thin, straight, and continuous
- Used for dimension and extension lines, leader lines, cross hatching
- Leader lines: a line referring to some specific feature
  - Type B line
  - A terminator (e.g., arrow, dot)
- Dimension lines: indicate size of feature (more later)
  - Two projection lines extending from part to actual dimension lines
  - Dimension lines extend the distance measured
  - Centered numerical value of the length
  - Two terminators (solid, narrow arrowheads)
- Cross-hatching lines: indicate cut material
  - Equi-spaced, 45, 30, or 60 degrees
  - Cover entire area of cut area
ISO Type ‘D’ Lines

- Thin, zigzag and continuous
- Used for showing the limits of section or limits of interrupted views in a machine drawing

ISO Type ‘F’ Line

- Thin, discontinuous and dashed
- Used for displaying hidden detail edges or outlines.
ISO Type ‘G’ Line

- Thin, discontinuous, and chain dotted — — — —

- Used to show center lines of either individual features or parts

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Dimensioning

- Dimensioning is necessary to define shape and form (i.e., precision, variability, function and relationship)
- Each feature shall be only dimensioned once!
- Decimal marker: ISO recommends that the dot in a decimal be replaced by a comma to reduce confusion

- 3.15 = 3,15
- 1,000,000 = 1 000 000

- Lettering: Recommended distance between letters and symbols is twice the line thickness
Acceptable and Unacceptable Dimensioning Practices

ISO standards recommend that abbreviations and symbols are used wherever possible to avoid a link to any particular language:

- $\phi$ or DIA = diameter
- CL = centerline
- CRS = centers
- CSK = countersunk
- PCD = pitch circle dia.
- R or RAD = radius
- THD = thread
- TOL = tolerance

Symbology
Tolerances
(In 3 weeks we will do the chapters dedicated to tolerancing)

- No feature of a component can be perfect (i.e., no surface flat, no hole round etc), because of the manufacturing process
- Thus, when dimensioning any feature
  - Basic nominal dimension
  - Permitted variability (tolerance)

<table>
<thead>
<tr>
<th>20.15</th>
<th>20 ± 0.1</th>
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<tbody>
<tr>
<td>19.99</td>
<td></td>
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</table>

Assembly Drawing

- Standard layout
- No dimensions
- Label parts
- Parts List

Note: In your parts list also include a column containing material type.
Detailed Drawing

- Standard layout
- Fully dimensioned
- Single part