Week 6 - Lecture
Product Documentation

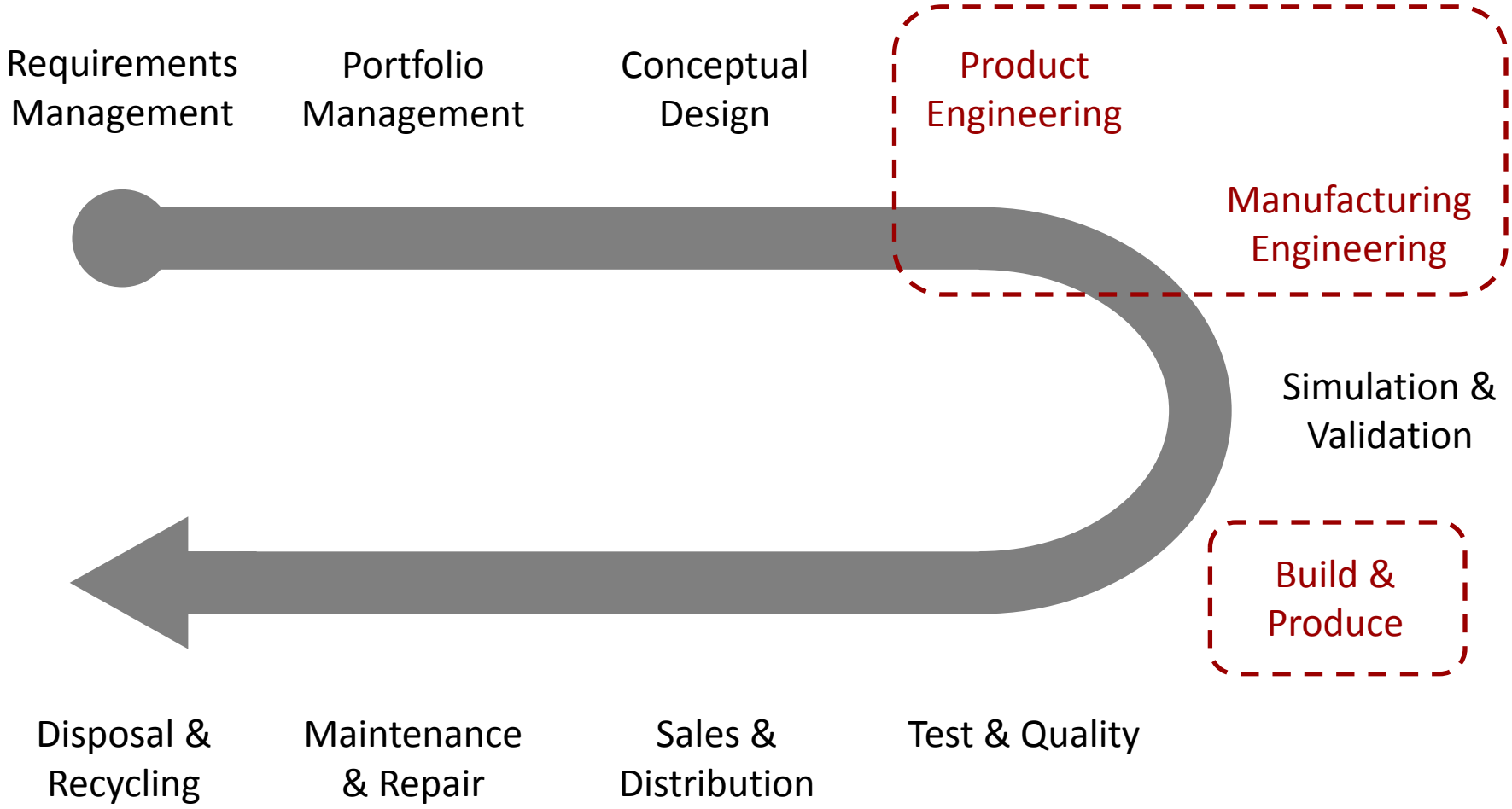
Team Project – Task 1

- Submit conceptual sketch of side handle release design.
- Submit Project Task List

Lecture Topics

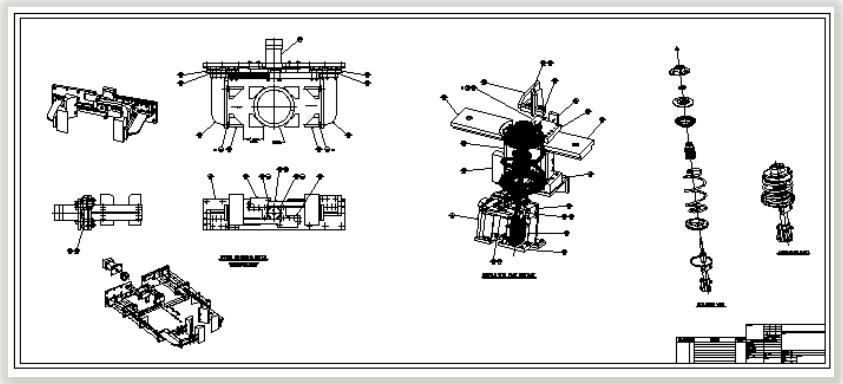
- Design Documentation Overview
- Design for Manufacturing Overview
- Design Documentation Future

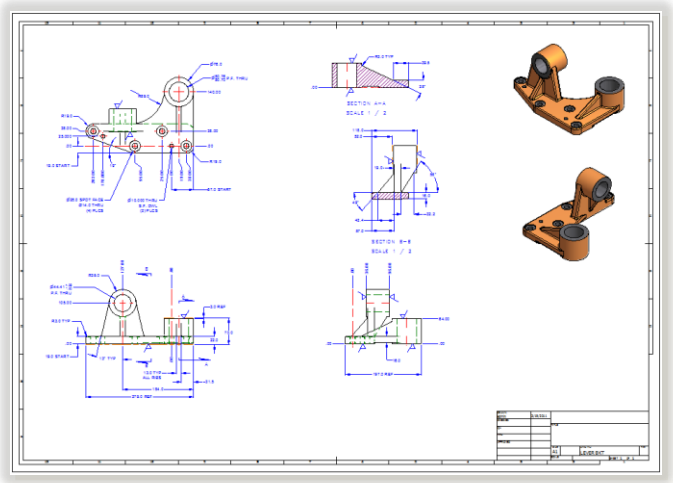
Product Lifecycle – Week 6



Design Documentation

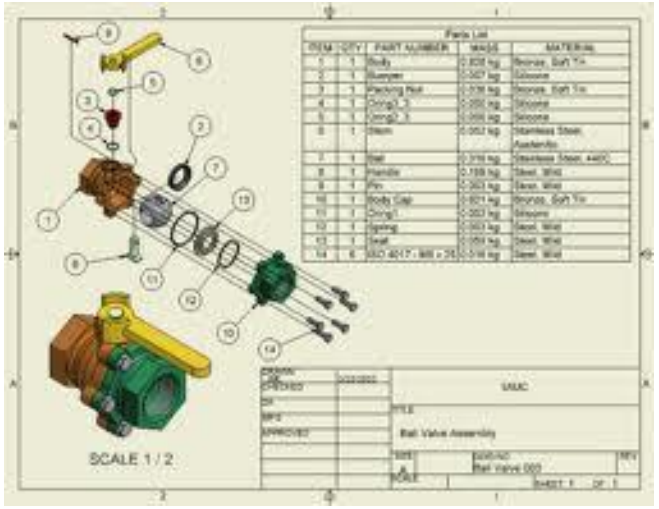
- Creation of digital and paper printed documents for communicating product manufacturing and assembly information.





Documentation Types Examples

- Component Detail Drawings
- Assembly Drawings
- Schematic Drawings
- Layout Drawings
- Process Drawings
- Bill of Material Documents



Design Documentation Purpose

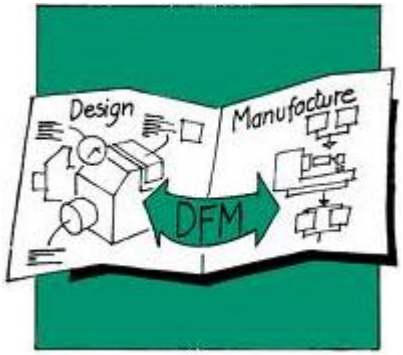
- Contract for Manufacturing Agreement
  - Provides formal documentation of the requirements of the form and fit of components from engineering to manufacturing.

- Quality Control
  - Provides the component tolerance, relationship, specification requirements of components to manufacturing.

- Communication
  - Used to communicate design elements outside of engineering and instructions for manufacturing and related tasks.

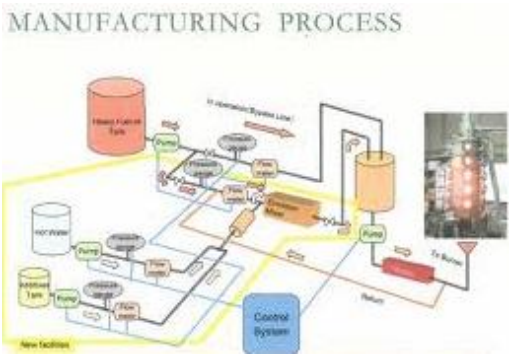
Design for Manufacturing (DFM)

- Design for Manufacturing is the process of proactively developing products to:
  - Optimize all the manufacturing functions
  - Assure the best cost, quality, reliability, time, and etc.
  - Ensure the lack of manufacturability doesn't compromise functionality, styling, product delivery, and etc.

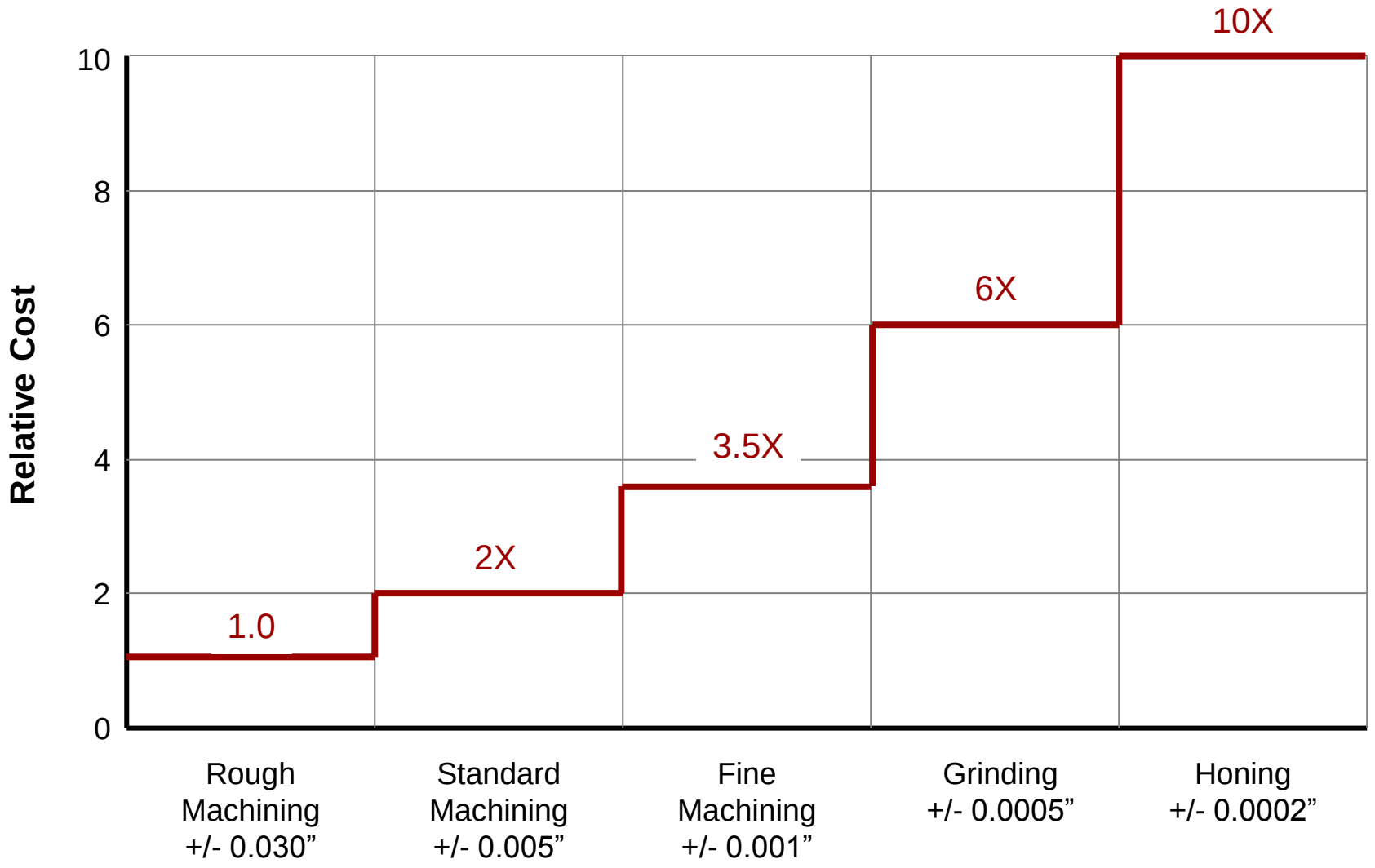


Items to Consider and Communicate

- Material Type
- Manufacturing Process
- Tolerance Requirements
- Finish & Treatment Requirements
- Setup Required for Manufacturing

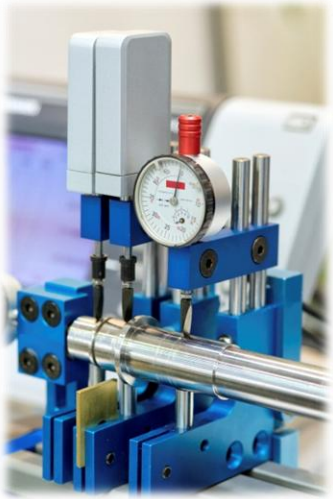


Manufacturing Process Cost

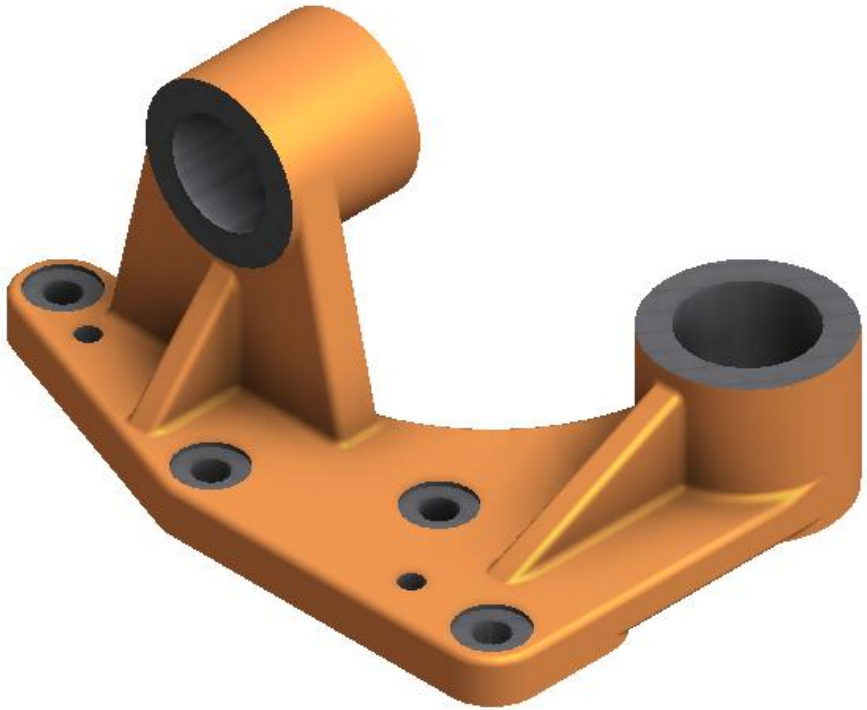


Quality Assurance

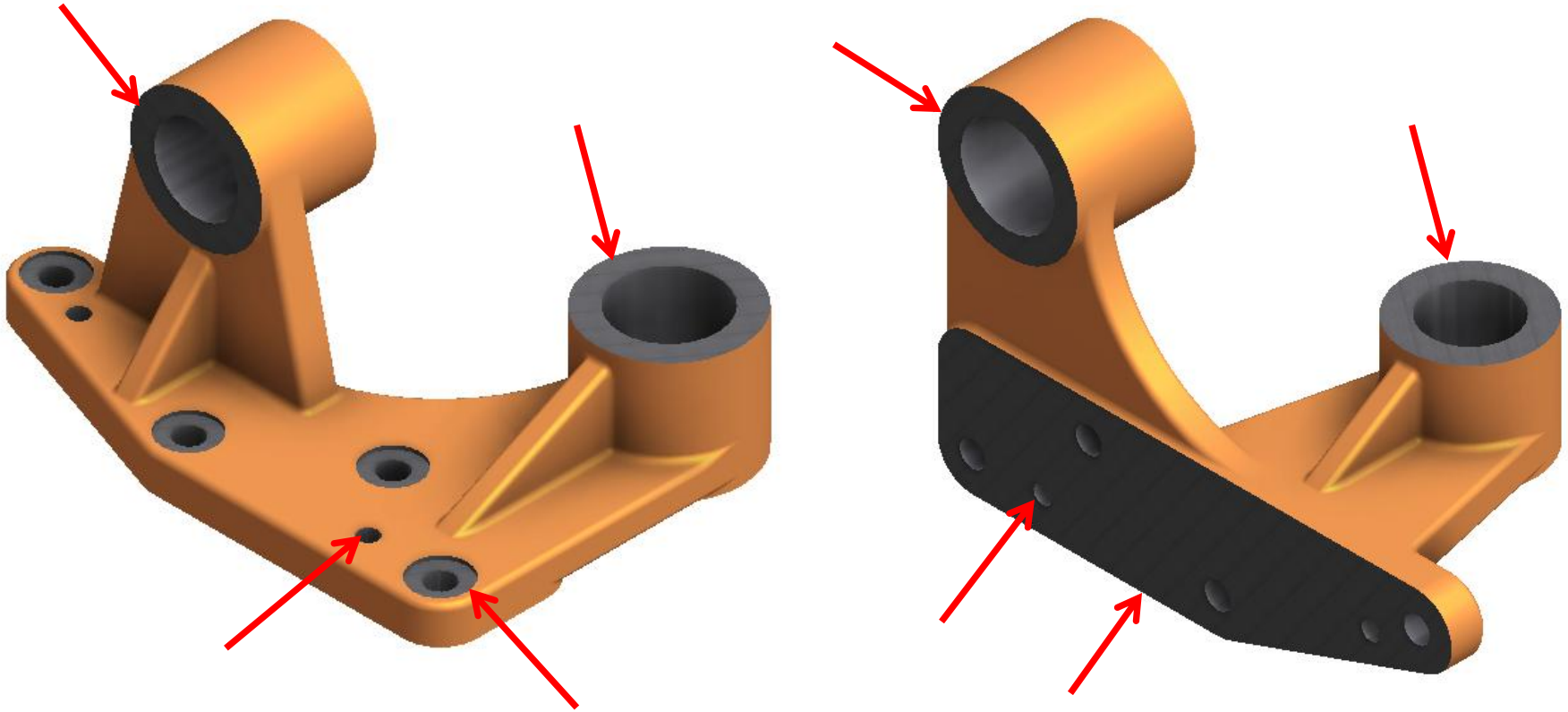
- Design documentation is also used for checking and inspecting the final manufactured components to validate design requirements.



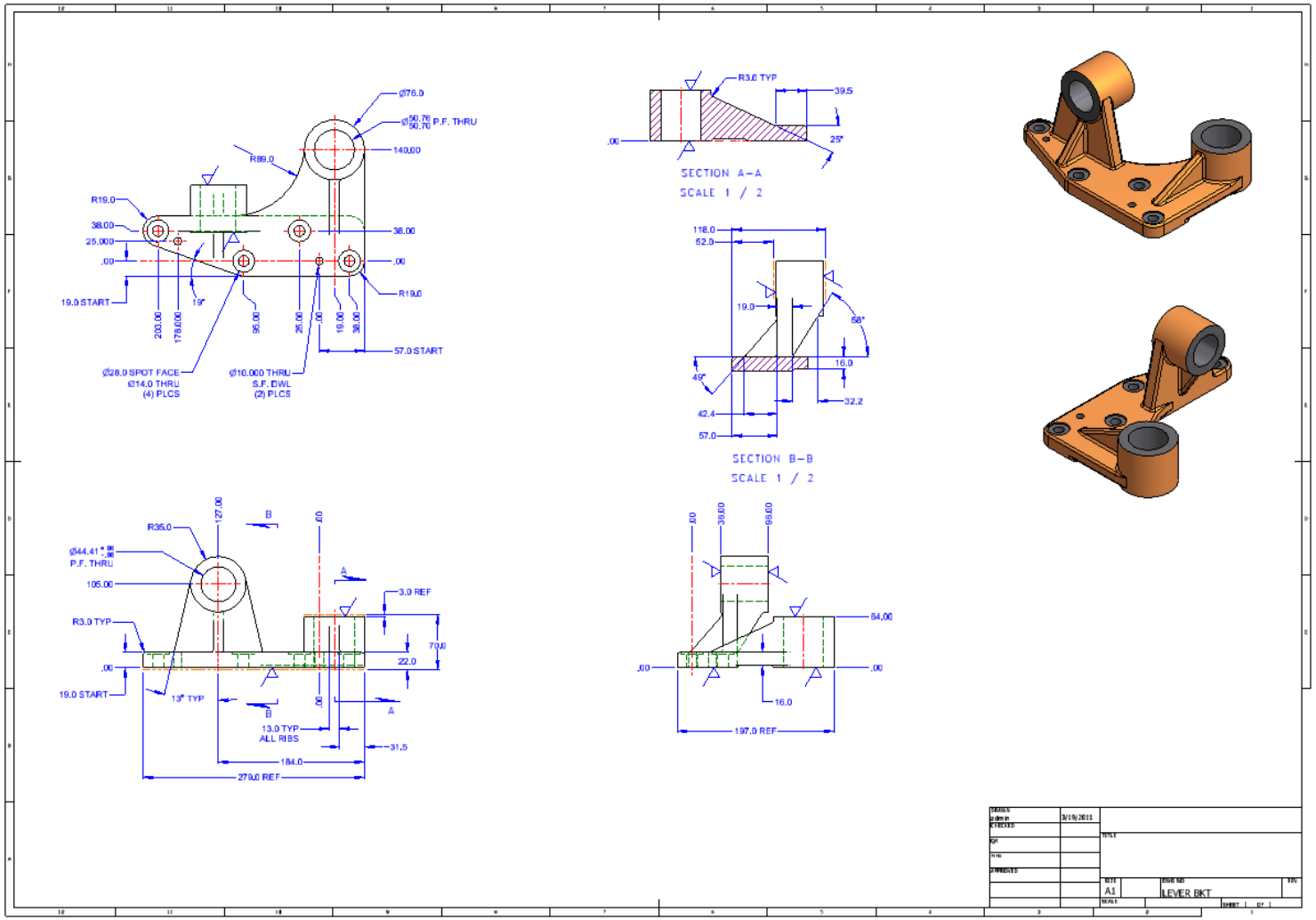
Component Example



Component Example



Detailed Drawing



Dimensional Tolerance Chart

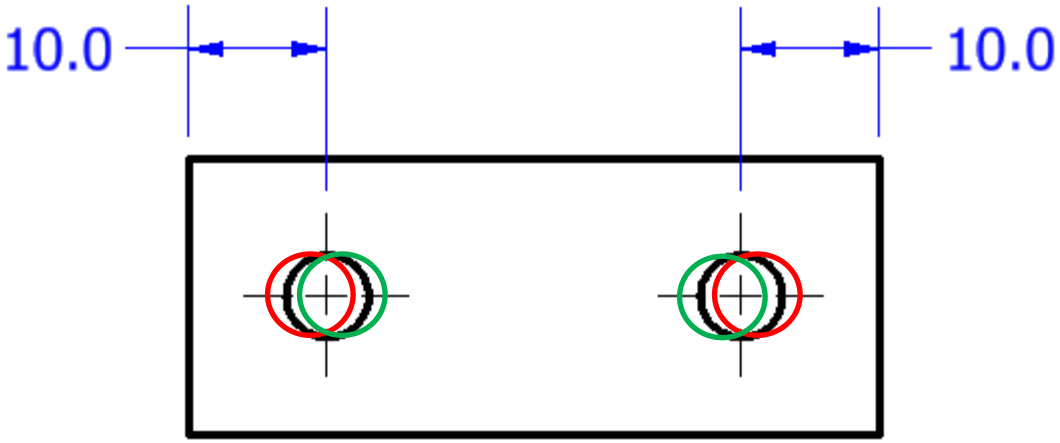
Decimal Precision	Tolerance
X	+/- 0.8 mm
X.X	+/- 0.25 mm
X.XX	+/- 0.10 mm
X.XXX	+/- 0.015 mm

Examples

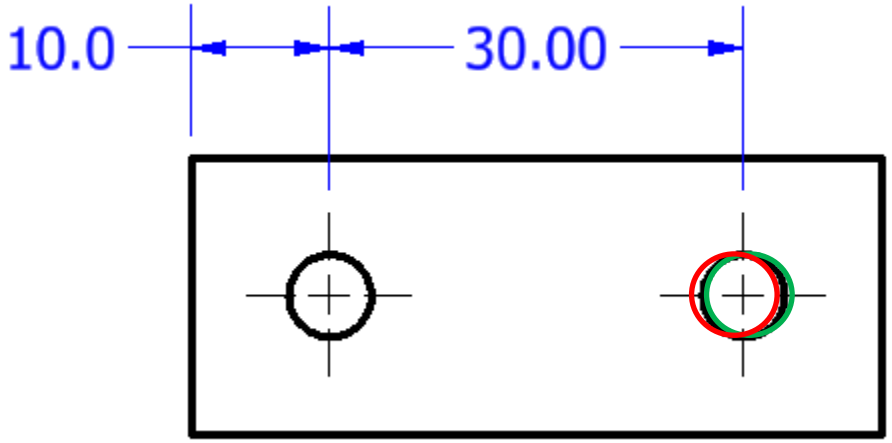
10.0 = Min. 9.75 and Max. 10.25

10.00 = Min. 9.90 and Max. 10.10

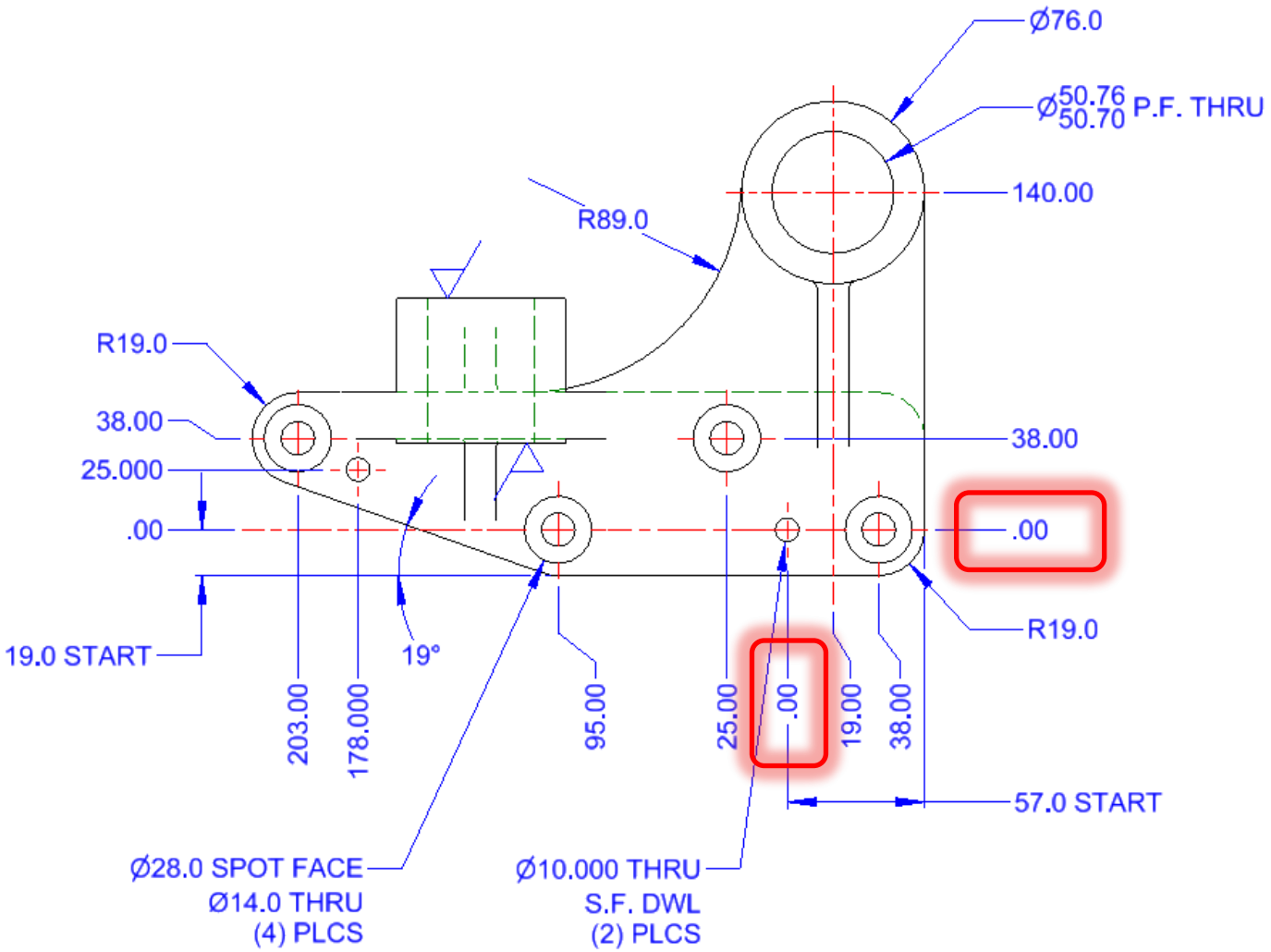
Dimension Tolerance Example



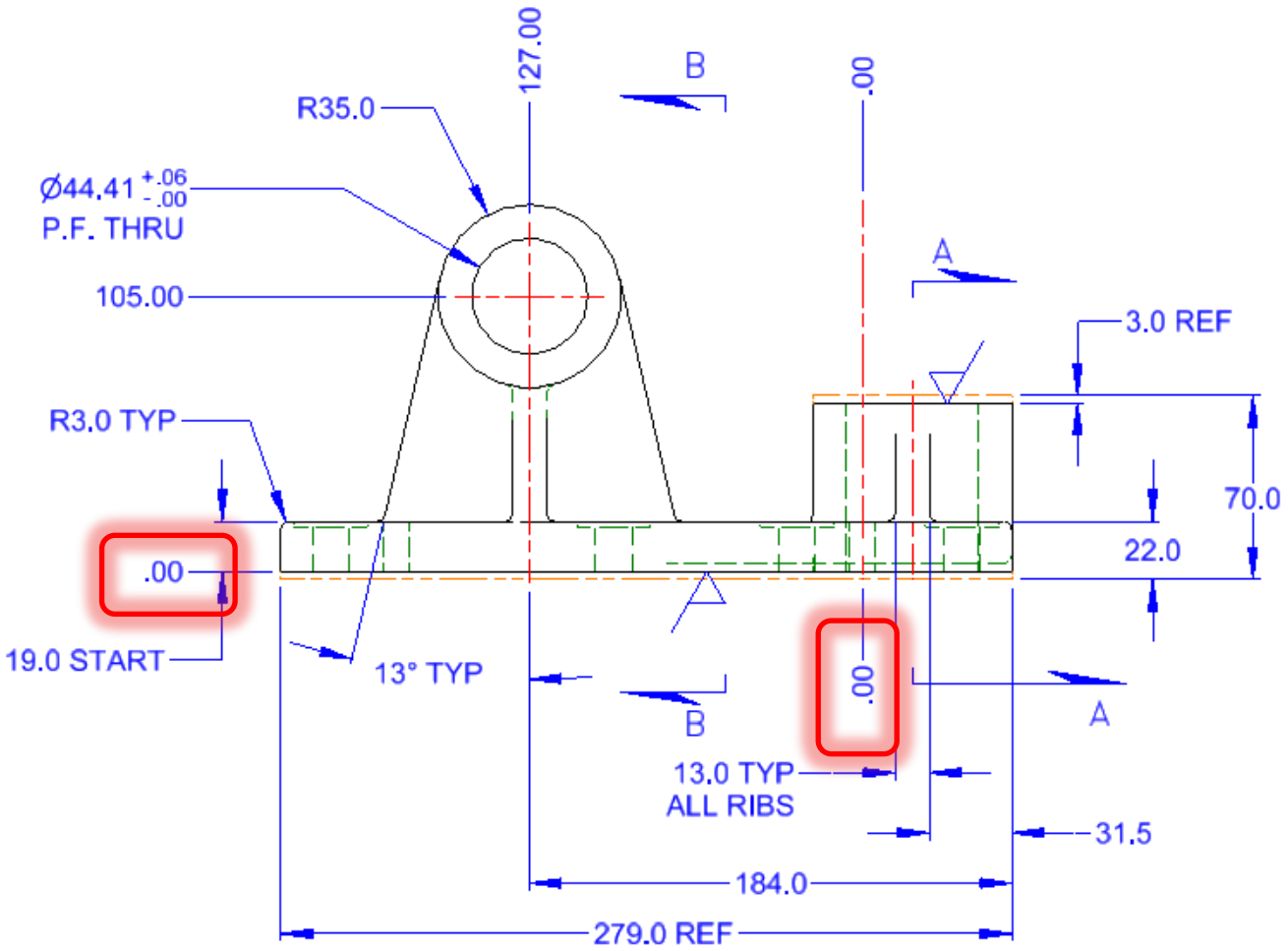
Dimension Tolerance Example



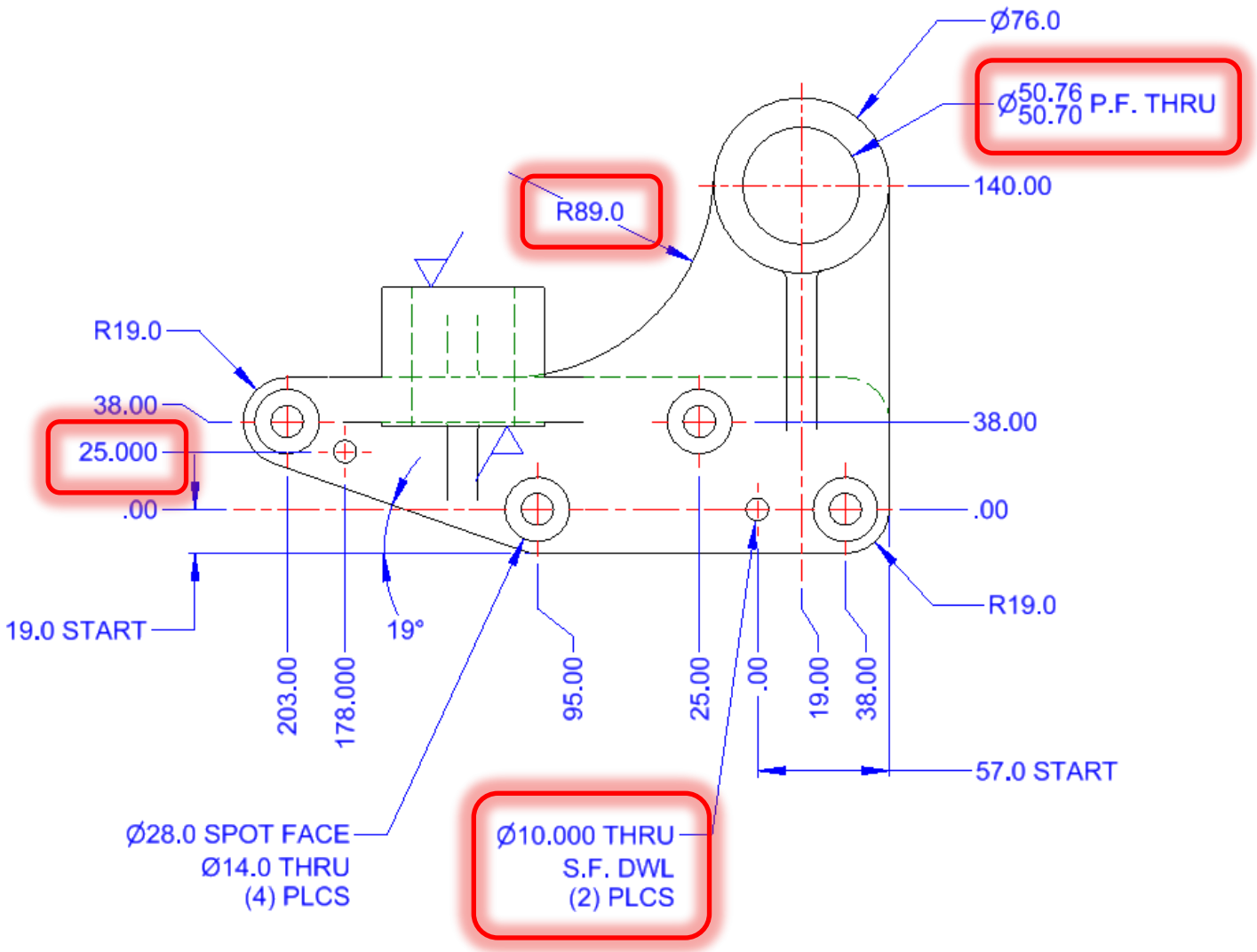
Datum's and Relationships



Datum's and Relationships



Tolerances


Ø76.0
Ø50.76 / 50.70 P.F. THRU
140.00
R89.0
R19.0
38.00
25.000
.00
38.00
.00
R19.0
19.0 START
19°
203.00
178.000
95.00
25.00
.00
19.00
38.00
57.0 START
Ø28.0 SPOT FACE
Ø14.0 THRU
(4) PLCS
Ø10.000 THRU
S.F. DWL
(2) PLCS

GD&T

- Introduction to GD&T
  - Feature Control Frame Symbols
  - ASME Y14.5M-1994 Geometric Dimension and Tolerancing (GD&T)

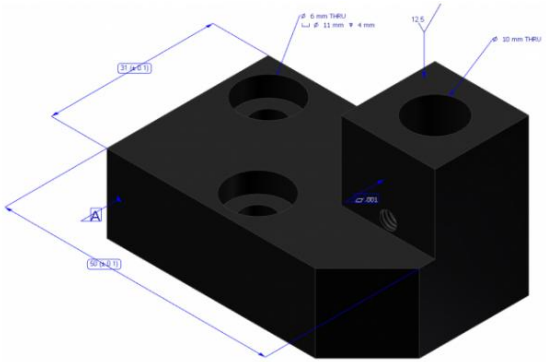
SYMBOL	GEOMETRIC CHARACTERISTIC	TYPE OF TOLERANCE	PRIMARY CONTROL
▱	FLATNESS	Form No relation between features	Controls form (shape) of size and non-size features. Datum reference is not allowed
—	STRAIGHTNESS		
⌭	CYLINDRICITY		Controls form (shape) of size features Datum reference is not allowed
○	CIRCULARITY (ROUNDNESS)		
⊥	PERPENDICULARITY	Orientation No relation between features	Controls orientation (tilt) of surfaces, axes, or median planes for size and non-size features Datum reference required *Optional: Angularity symbol may be used for all orientation controls*
//	PARALLELISM		
∠	ANGULARITY		

SYMBOL	GEOMETRIC CHARACTERISTIC	TYPE OF TOLERANCE	PRIMARY CONTROL
⌖	POSITION	Location	Locates center points, axes and median planes for size features. Can also control orientation.
⌓	PROFILE OF A SURFACE		Locates surfaces Can also be used to control size, form, and orientation of surfaces based on datum reference
⌒	PROFILE OF A LINE		
⌰	TOTAL RUNOUT	Runout	Controls surface coaxiality Can also control form and orientation of surfaces.
↗	CIRCULAR RUNOUT		
◎	CONCENTRICITY	Location of derived median points.	Locates derived median points of a feature *Not common, consider position, runout, or profile.*
⌯	SYMMETRY		

Modern Design Documentation

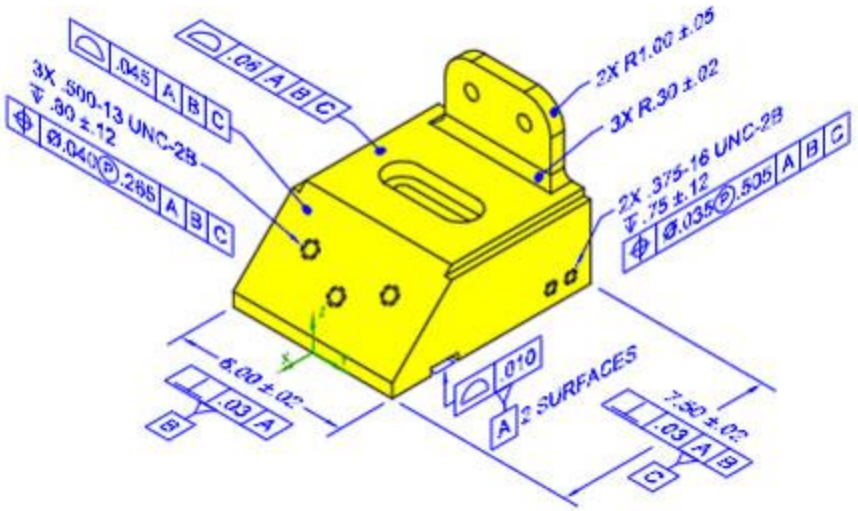
Several new technologies like the items listed below are being adopted today.

- 3D Annotation (3DA)
- 3D Assembly Instructions
- Viewing and Markup (Mobile Access)



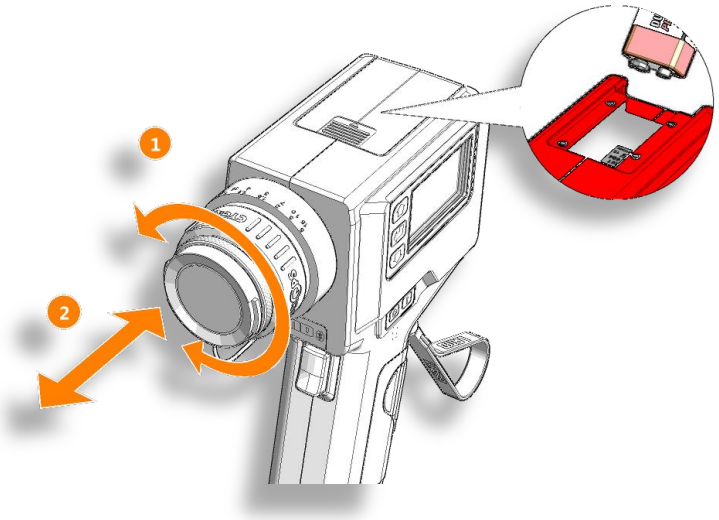
3D Annotation (3DA)

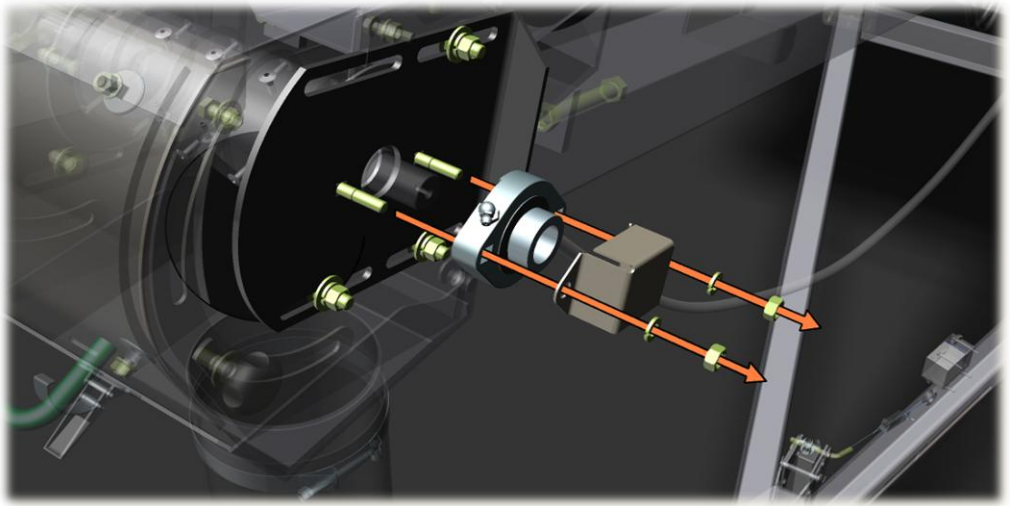
- 3D Annotation is the method of adding all required manufacturing annotations directly to the 3D model.



3D Assembly Instructions

- Creating visual and interactive 3D technical documentation directly from 3D models.





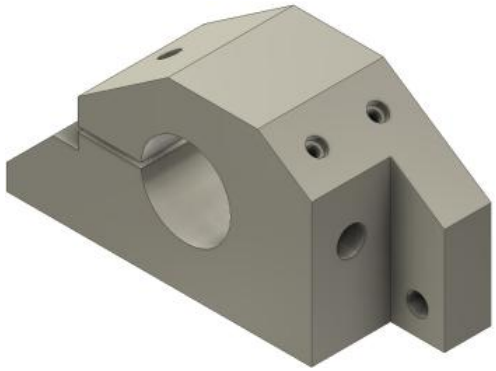
Mobile Viewing and Markup

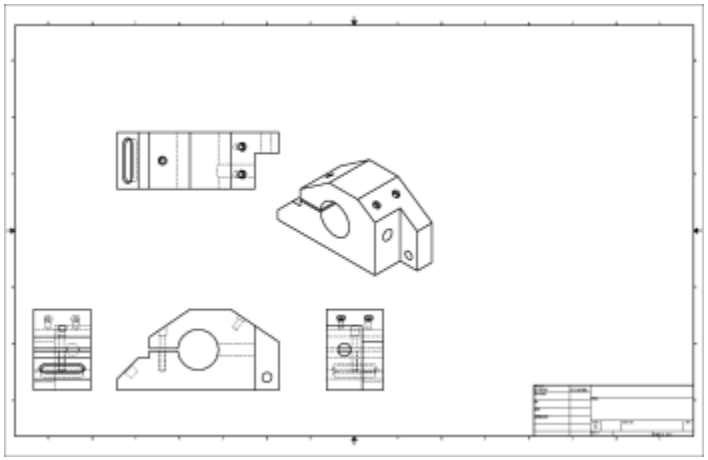
- Access, view, and markup your product documentation on common mobile devices.

Computer-Cluster Projects (CP6)

Guided Lab Project 1

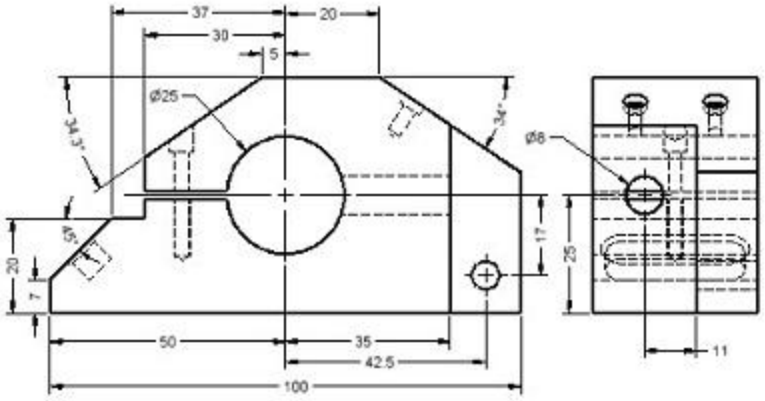
- Guides instructions for creating drawing views.





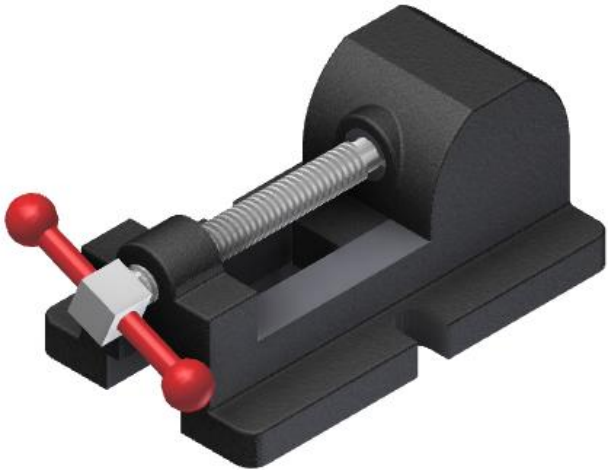
Guided Lab Project 2

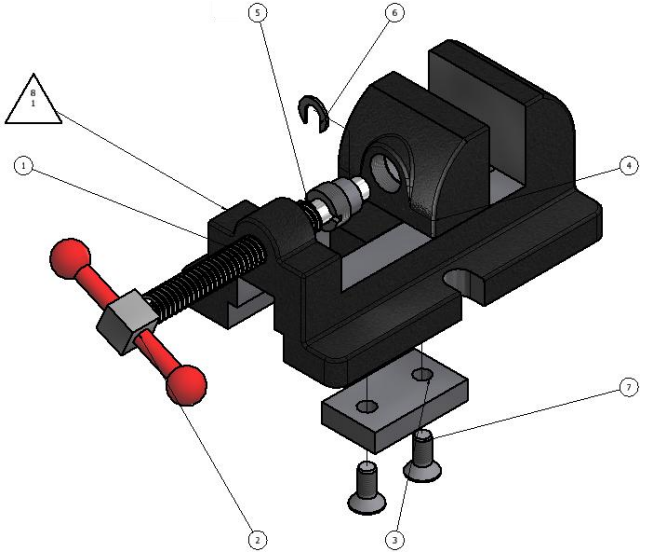
- Guided instructions for creating drawing dimensions and annotations.



Guided Lab Project 3

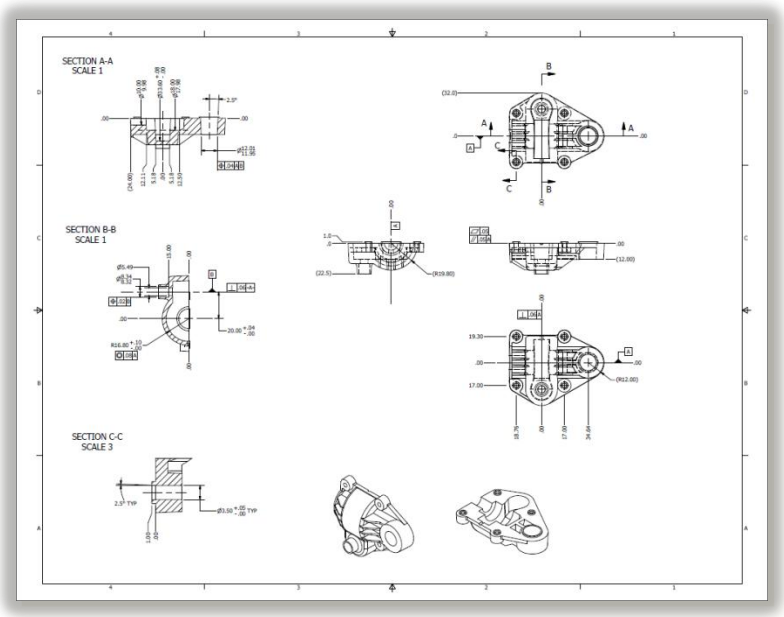
- Guided instructions for creating assembly drawing with BOM and balloons.





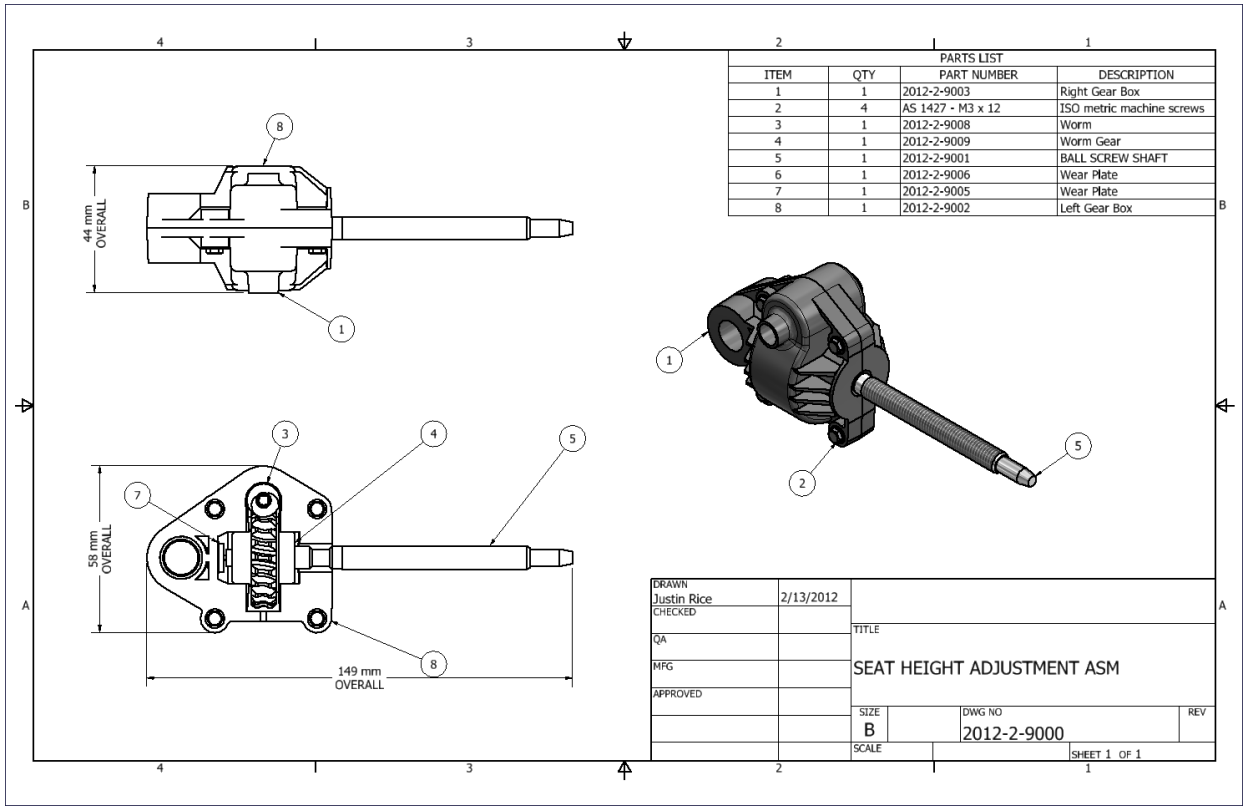
Project Set Assignment

- Create part drawing for manufacturing molded plastic gear case.



Project Set Assignment

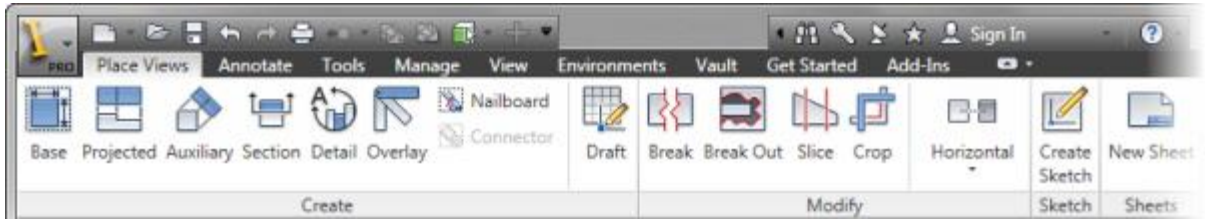
- Create and exact replica of the Assembly drawing.



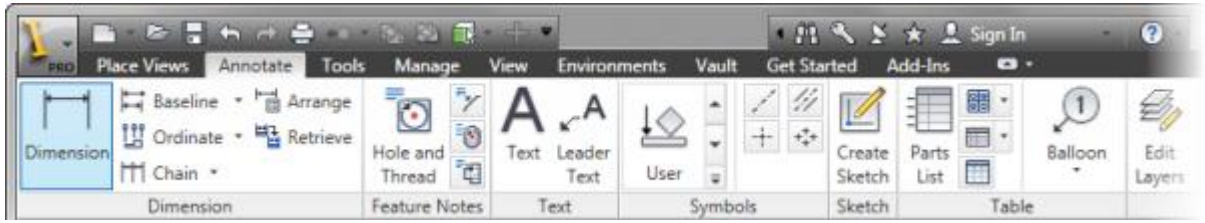
Demo Topics

Bevel Gear Design Accelerator

- **Drawing Tab**



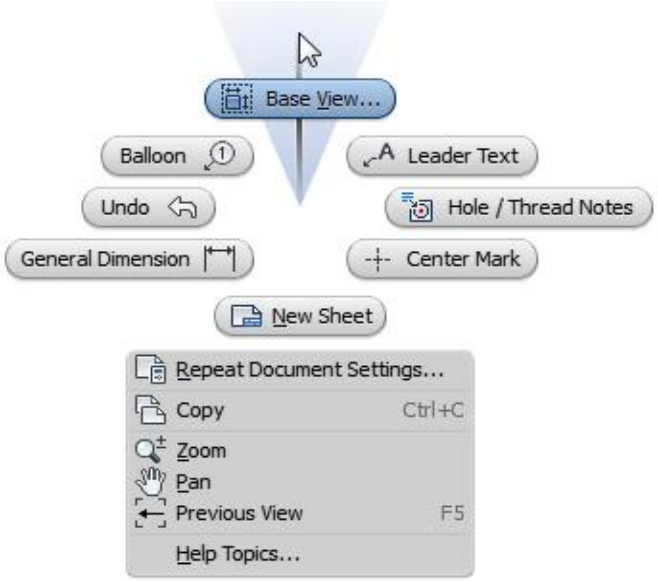
- **Annotate Tab**



Creating Base Views

- **Access**
  - Ribbon: **Place Views tab > Create panel > Base**

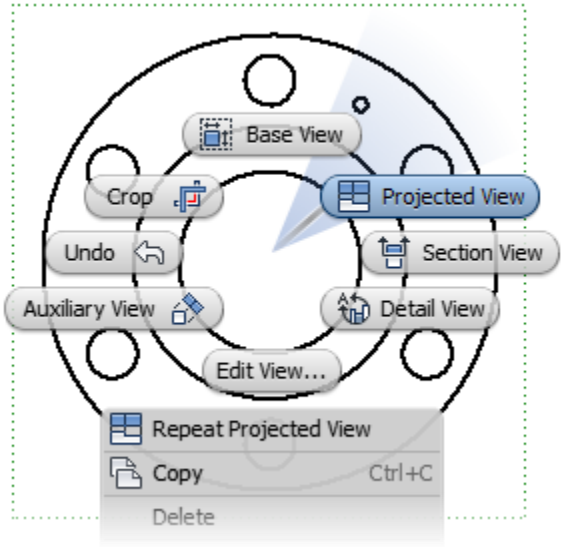
  - Marking Menu: **Base View**



Creating Projected Views

- **Access**
  - Ribbon: **Place Views tab > Create panel > Projected**

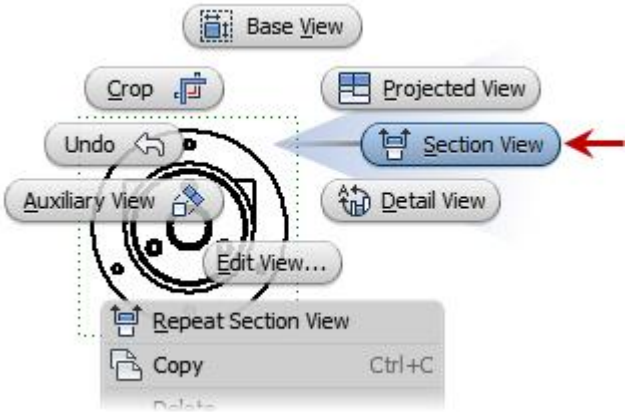
  - Marking Menu: **Projected View**



Creating Section Views

- **Access**
  - Ribbon: **Place Views tab > Create panel > Section**

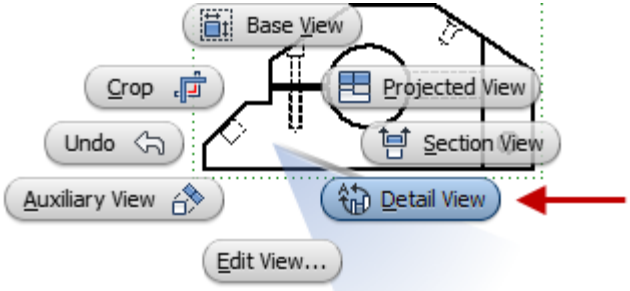
  - Marking Menu: **Section View**



Creating Detail Views

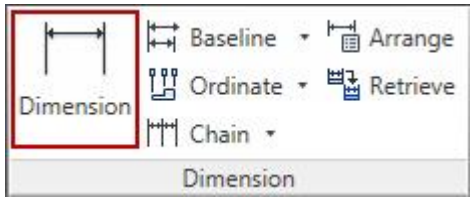
- **Access**
  - Ribbon: **Place Views tab > Create panel > Detail**

  - Marking Menu: **Section View**



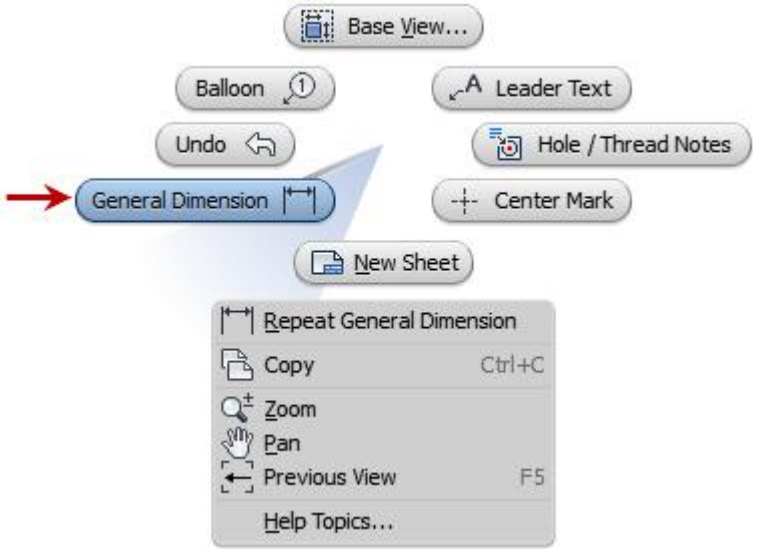
Creating General Dimensions

- **Access**
  - Ribbon: **Annotate tab > Dimension panel > Dimension**



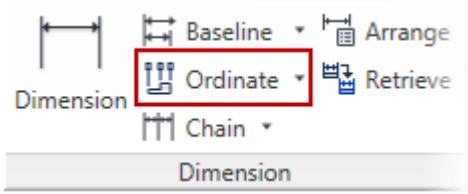
  - Keyboard: **D**

    Marking Menu: **General Dimension**



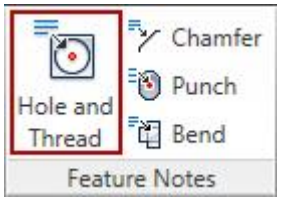
Creating Ordinate Dimensions

- **Access**
  - Ribbon: **Annotate tab > Dimension panel > Ordinate**

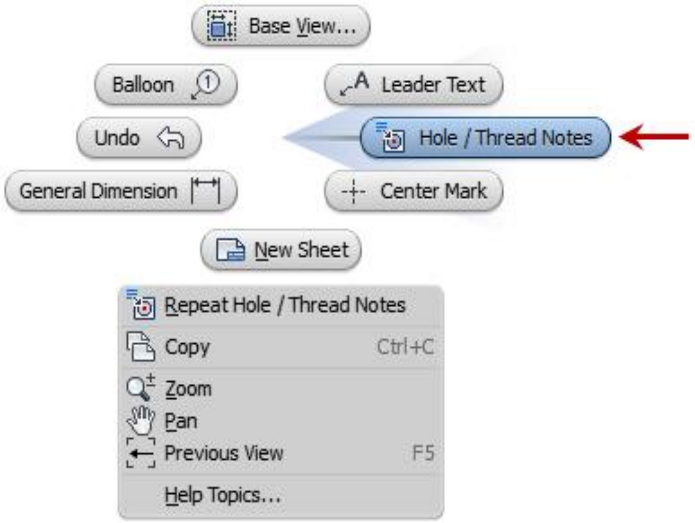


Creating Hole and Thread Notes

- **Access**
  - Ribbon: **Annotate tab > Features panel > Hole and Thread**

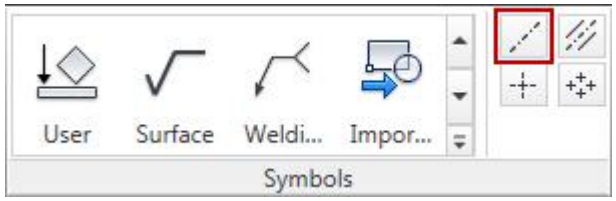


  - Marking Menu: **Hole / Thread Notes**

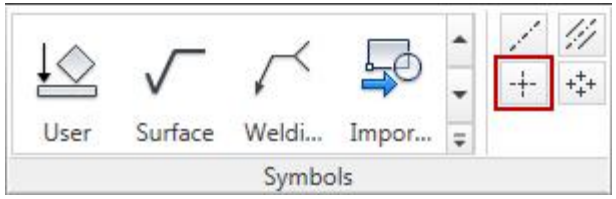


Creating Centerlines

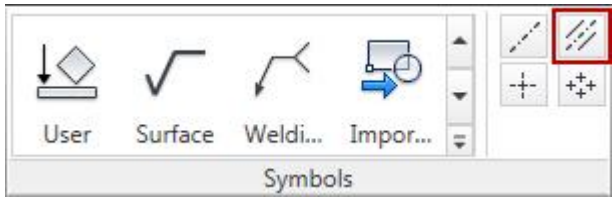
- **Access**
  - Ribbon: **Annotate tab > Symbols panel > Centerline**



  - Ribbon: **Annotate tab > Symbols panel > Center Mark**



  - Ribbon: **Annotate tab > Symbols panel > Centerline Bisector**

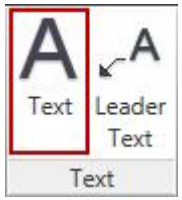


Documenting Views with Symbols

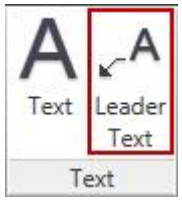
- **Access**
  - Ribbon: **Annotate tab > Symbols panel**

Adding Leaders and Text

- **Access**
  - Ribbon: **Annotate tab > Text panel > Text**

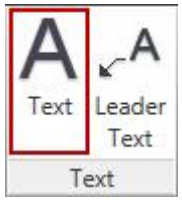


  - Ribbon: **Annotate tab > Text panel > Leader Text**

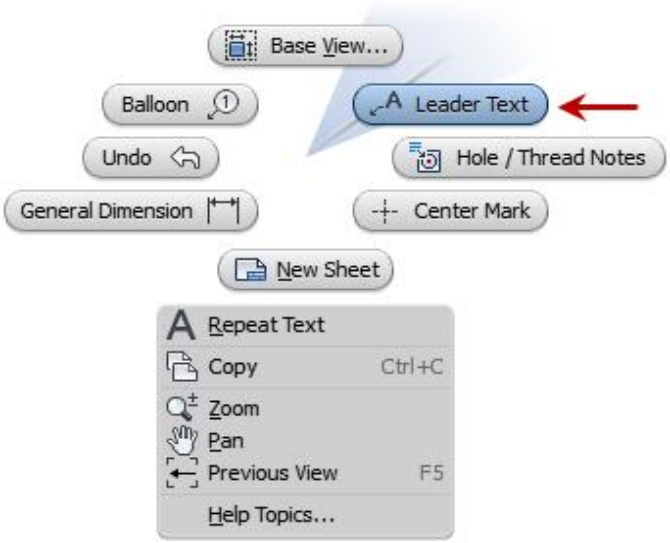


Adding Leaders and Text

- **Access**
  - Ribbon: **Annotate tab > Text panel > Text**

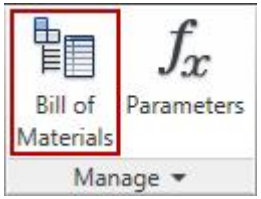


  - Ribbon: **Annotate tab > Text panel > Leader Text**



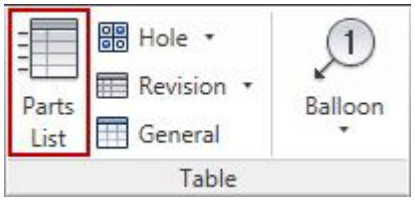
Bill of Materials

- **Access**
  - Ribbon: **Assemble tab > Manage panel > Bill of Materials**



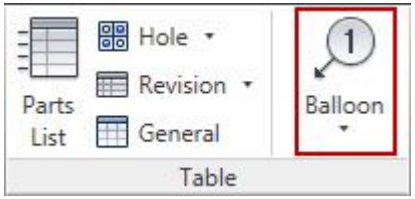
Parts List

- **Access**
  - Ribbon: **Annotate tab > Table panel > Parts List**

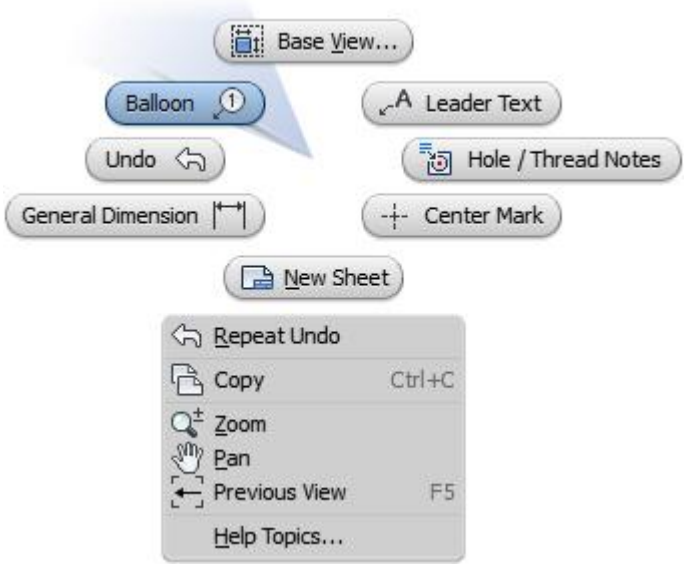


Balloons

- **Access**
  - Ribbon**: Annotate tab > Table panel > Balloon**



  - Marking Menu: **Balloon**
  - Keyboard: **B**



Auto Balloons

- **Access**
  - Ribbon: **Annotate tab > Table panel > Auto Balloon**