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

- Requirements Management
- Portfolio Management
- Conceptual Design
- Product Engineering
- Manufacturing Engineering
- Simulation & Validation
- Build & Produce
- Test & Quality
- Sales & Distribution
- Maintenance & Repair
- Disposal & Recycling
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

<table>
<thead>
<tr>
<th>Process</th>
<th>Relative Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rough Machining +/- 0.030”</td>
<td>1.0</td>
</tr>
<tr>
<td>Standard Machining +/- 0.005”</td>
<td>2X</td>
</tr>
<tr>
<td>Fine Machining +/- 0.001”</td>
<td>3.5X</td>
</tr>
<tr>
<td>Grinding +/- 0.0005”</td>
<td>6X</td>
</tr>
<tr>
<td>Honing +/- 0.0002”</td>
<td>10X</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Decimal Precision</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>+/- 0.8 mm</td>
</tr>
<tr>
<td>X.X</td>
<td>+/- 0.25 mm</td>
</tr>
<tr>
<td>X.XX</td>
<td>+/- 0.10 mm</td>
</tr>
<tr>
<td>X.XXX</td>
<td>+/- 0.015 mm</td>
</tr>
</tbody>
</table>

Examples

10.0 = Min. 9.75 and Max. 10.25
10.00 = Min. 9.90 and Max. 10.10
Dimension Tolerance Example

![Diagram of dimension tolerance example]
Dimension Tolerance Example
Datum's and Relationships
Datum’s and Relationships
Tolerances

- Ø76.0
- Ø50.76 P.F. THRU
- 50.70
- 140.00
- R89.0
- 38.00
- 25.00
- .00
- 19.0 START
- 203.00
- 178.000
- 95.00
- 25.00
- 0.00
- 19.0
- 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)
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 an 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*