Surfaces in Orthographic

ENGR 1182
Graphics 04
Today’s Objectives

- Drawing Complex Surfaces in Orthographic
  - Inclined
  - Curved

- Points, Edges, and Surfaces in Multiple Views
  - Tracking

- GP04 In-Class Activity

- GP04 Out-of-Class Homework Assignment
Inclines in Orthographic

- In orthographic projection, inclined surfaces are defined by the view in which they appear as an edge.

- They are shown as an edge in one view, and as a surface (characteristic shape) in the other two views.

- The true length is given by the line, the shape is given by the two other views.
Inclined Surfaces: Example

* Note that the edges of the inclined surface project orthographically into the other two views.

* Note that the size of the inclined surface changes in two views, but the shape does not.
**Recognizing Principal or Normal Surfaces, Inclined Surfaces and Oblique Surfaces**

- **A PRINCIPAL SURFACE APPEARS IN ITS TRUE SHAPE IN ONE VIEW AND AS A LINE IN THE OTHER TWO VIEWS WHERE IT IS PERPENDICULAR TO THE OTHER TWO PRINCIPAL PLANES.**

- **AN INCLINE SURFACE APPEARS AS A LINE IN ONE VIEW AND IN ITS CHARACTERISTIC SHAPE IN THE OTHER TWO VIEWS WHERE IT IS ANGLED WITH RESPECT TO THE OTHER TWO PRINCIPAL PLANES.**

- **AN OBLIQUE SURFACE APPEARS IN IT'S CHARACTERISTIC SHAPE IN ALL THREE VIEWS WHERE IT IS ANGLED TO THE OTHER THREE PRINCIPAL PLANES.**

Principal Planes: TOP, FRONT & RIGHT
Curved Features in Orthographic

- Curved surfaces are similarly described in orthographic.
- Curved features appear as a curved edge in one view, as a surface in the other two views.
Centerlines and Centermarks

- Centerlines and centermarks are used to show the center of a circular or cylindrical feature.

Note that some SYMMETRICAL objects only require 2 views, in this case either the **front & right side** or the **front & top views** are required!
Centerlines and Centermarks

- Centerlines and centermarks are used where the arc of a surface is $\geq 180^\circ$
- Centerlines are drawn through the length of the center of a cylinder or circular hole
- Centerlines are shown as alternating long and short dashes
- Both centerlines and centermarks extend past the edges of the circular feature
Line Precedence

- **Visible lines** takes precedence over all other lines

- **Hidden lines** take precedence over center lines

- **Center lines** have lowest precedence

In this drawing, a visible line overlies a centerline.

Notice that the extension lines from the centerline are still visible.

Notice also the small gap between the centerline extension and the object.
In-Class Activity (GP04)
Points in Orthographic Projection

- In orthographic views, the projected points of an object will be aligned between views.

* A SolidWorks implementation of this object is available on the EEIC website.
Edges in Orthographic Projection

- Edges are defined by two or more points, and also project orthographically between views.

- Sometimes an edge may appear to be a point, when you are looking directly down the line.
Point and Edge Tracking

<table>
<thead>
<tr>
<th>No.</th>
<th>Front</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Edge</td>
<td>1-2</td>
</tr>
<tr>
<td>2</td>
<td>Point</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Edge</td>
<td>2-4</td>
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<td>Point</td>
<td>12</td>
</tr>
<tr>
<td>5</td>
<td>Point</td>
<td>17</td>
</tr>
<tr>
<td>6</td>
<td>Edge</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>Edge</td>
<td>9-16</td>
</tr>
</tbody>
</table>
Surfaces in Orthographic Projection

- Surfaces are defined by 3 or more points, also project orthographically between views.

- Sometimes surfaces may appear as a line when you look directly down the edge of that surface.
### Surface Tracking

<table>
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<th>Surface No.</th>
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<tbody>
<tr>
<td>1</td>
<td>Surface 1</td>
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<tr>
<td>2</td>
<td>Surface 2</td>
<td>12-13</td>
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<tr>
<td>3</td>
<td>Surface 3</td>
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<td>Surface 4</td>
<td>14-15</td>
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<tr>
<td>5</td>
<td>Surface 5</td>
<td>3-4-5-6</td>
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<tr>
<td>6</td>
<td>Surface 6</td>
<td>1-2-4-5-7</td>
</tr>
<tr>
<td>7</td>
<td>Surface 7</td>
<td>8-17</td>
</tr>
</tbody>
</table>

Note that the surface(s) is defined by the numbers. The cross hatched color is only a visualization aid!
In-Class Activity (GP04)

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**GP04-IN CLASS (2 OF 2)**

<table>
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<tr>
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<td>8</td>
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<td>E-A</td>
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</tbody>
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**Notes:**
- Fill in the letters or numbers of the corresponding point, edge, or surface.
Important Takeaways

- Inclined and curved features are shown as an edge in one view, and as planes in the other two views.
- Centerlines and centermarks are used to show the center of circular or cylindrical features.
- Points, edges, and surfaces project orthographically between views.
What’s Next?

- Due Next Class: GP04 Out-of-Class

- Missing Lines
  - Using multiple views to identify and add in missing lines, centerlines, and centermarks

- Missing Views
  - Using information from two views to create the missing third view
  - Using all three views to create the missing isometric view

- Take Graphics 5 Quiz on readings