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ME 1110 – Engineering Practice 1

Engineering Drawing and Design - Lecture 4

Orthographic Views & Sectioning

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Objectives for today

- Prepare for DrE-3
- Additional features in multiview drawings:
 - » Cutting plane, Section, hatching, hidden feature
- Section views and Section drawings
 - » Ribs, webs, assemblies, threads

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Orthographic Projections

- Definition: Orthographic projections are parallel projections that
 - ◆ Preserve true relationship between features
 - ◆ Parallel lines are drawn parallel
 - ◆ The geometry is generally not distorted
 - ◆ Parallel projectors
 - ◆ Light from a point source at an infinite distance
 - ◆ View from a distance through a telescope

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Orthographic Projection Properties

- ◆ Projection planes
 - ◆ Horizontal, frontal, and profile
 - ◆ Each projection plane is perpendicular to adjacent projection planes
- ◆ Views
 - ◆ top, front, and right side
 - ◆ Only use the views that are needed to represent the object
 - ◆ The most descriptive view should be the front view
 - ◆ Represented with dashed lines
 - ◆ Views should be selected to minimize the use of hidden lines

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Angle projections

- ◆ Third Angle Projection
 - ◆ Associated with English units
 - ◆ If English units are used assume third angle projection unless otherwise specified
 - ◆ Include ANSI standard symbol
- ◆ First Angle Projection
 - ◆ Associated with SI units (International System of units)

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Detailed views

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Sectioned Drawing

- **Definition:**
 - » A multiview technical drawing that reveals details about internal features by displaying the part as if cut by an imaginary cutting plane
- **Objective:**
 - » To make the drawing more understandable, especially the internal details of the part
- **Principles:**
 - » Since the sectioned drawing shows internal features there is generally no need to show hidden lines
 - » Helpful for both, detailed and assembly drawings

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How to reveal hidden feature

Normal multiview drawing

Section view drawing

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Cutting plane

Line of sight

Imaginary cutting plane

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Hidden lines

Imaginary cutting plane

Optional use of a hidden line

Hidden lines (not shown in section view)

Normal orthographic view

Section view

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Surfaces and edges in section views

Change of plane behind the cutting plane represented as a line

Normal multiview drawing

(A) Correct representation

(A)

(B)

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Positioning

Hatching of thin parts

Arrows in wrong direction; arrows should show the line of sight necessary for section view

Correct cutting plane line

Incorrect cutting plane line

SECTION A-A

SECTION B-B

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Hatch features

(A) Cast or malleable iron and general use for all materials
 (B) Steel
 (C) Bronze, brass, copper and compositions
 (D) White metal, zinc, lead, babbitt, and alloys
 (E) Magnesium, aluminum, and aluminum alloys
 (F) Rubber, plastic, and electrical insulation
 (G) Cast iron, leather and fiber
 (H) Sound insulation
 (I) Thermal insulation
 (J) Titanium and refractory material
 (K) Electric windings, electromagnets, resistance, etc.
 (L) Concrete
 (M) Marble, slate, glass, porcelain, etc.
 (N) Earth
 (O) Rock
 (P) Sand
 (Q) Water and other liquids
 (R) Anisotropic grain pattern > wood

(A) Avoid! (B) Avoid! (C) Preferred
 (A) Avoid! (B) Preferred (C) Preferred

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Section types

(A) Full section (B) Standard multiview (C) Full section view
 (A) Half section (B) Multiview (C) Half section view

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Broken out section

(A) Broken-out section (B) Multiview (C) Broken-out section view

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Revolved & Removed

(A) Revolved section (B) Revolved section, broken view
 (A) Revolved section (B) Revolved section, broken view
 (A) Revolved section (B) Revolved section, broken view
 (A) Revolved section (B) Revolved section, broken view

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Multiple removed section views

SECTION A-A SECTION B-B SECTION C-C

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Offset section

Normal multiview (A) Offset section view (B) Not

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Assembly section

Adjacent parts

Different material symbol

Same part

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Convention for webs

Web sectioned (C) Correct!

SECTION A-A

Web

SECTION B-B (A) Incorrect

Web unsectioned SECTION B-B (B) Correct

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Alternate methods for webs

With webs

Without webs

WEB

(A) (B) Avoid (C) Preferred

(A) (B)

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Aligned sections

(A) True Projection (B) Preferred Spoke A omitted in the preferred True Projection Preferred

Aligned spokes

Aligned ribs

(A) True projection (B) Preferred (C) Section view

Aligned lugs

(A) (B)

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Threads

External Threads

Internal Threads

Chamfer

Minor Ø

Major Ø

Thread length

Minor Ø

Major Ø

Thread length

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Break symbols

(A) Round solid

(B) Round tubular

(C) Round tubular

(D) Rectangular

(E) Rectangular wood

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