

# ENG 004 Lecture 4, Oct 9, 2012

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## Announcements

- Turn in HW #1 now. Place in stack corresponding to your section.
- Four wait listed students have been added.
- Read beginning of Chapter #5
- Lecture HW #2 will be posted after class.

## Topics

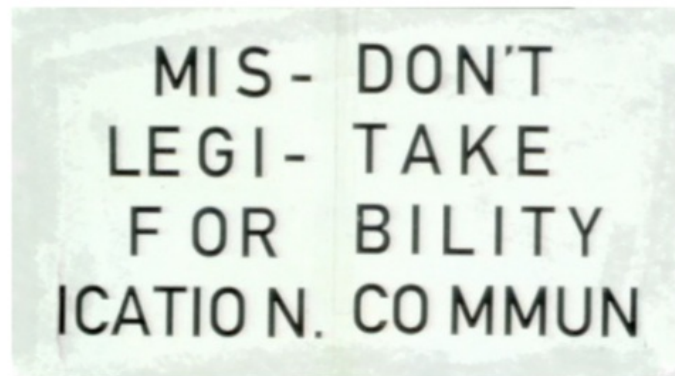
Drawing Types

3D to 2D, 2D to 3D

Diagrams

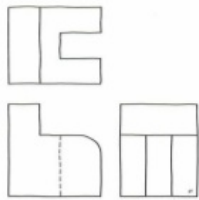
# Legibility/Communication

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## Drawing Types

Projection theory is in Chapter 5



(A) Multiview



(B) Axonometric



(C) Oblique



(D) Perspective

# Projections and Perspective

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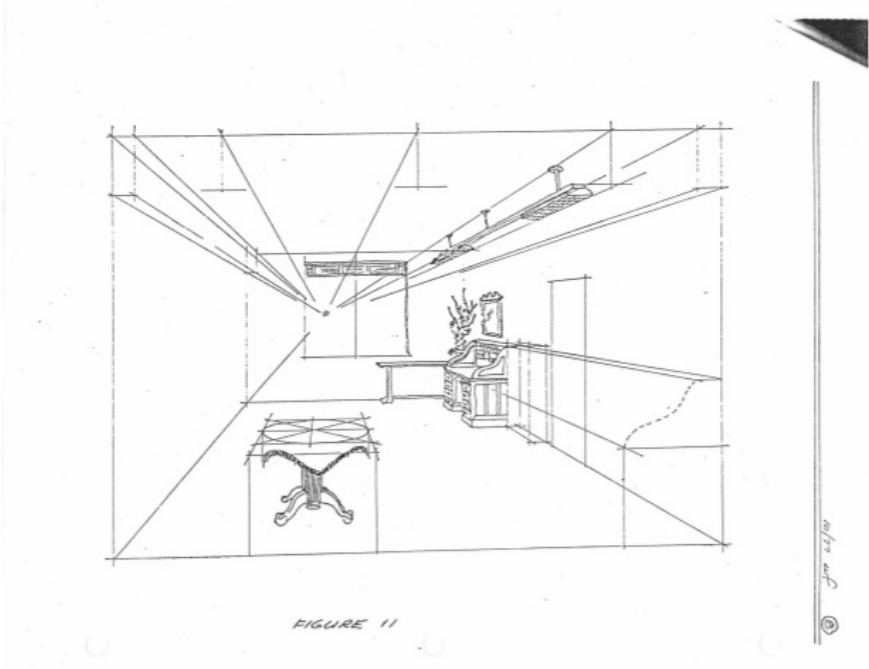
- One point perspective
- Two point perspective
- Three point perspective
- Parallel Projection (infinite focal point)

## One point perspective

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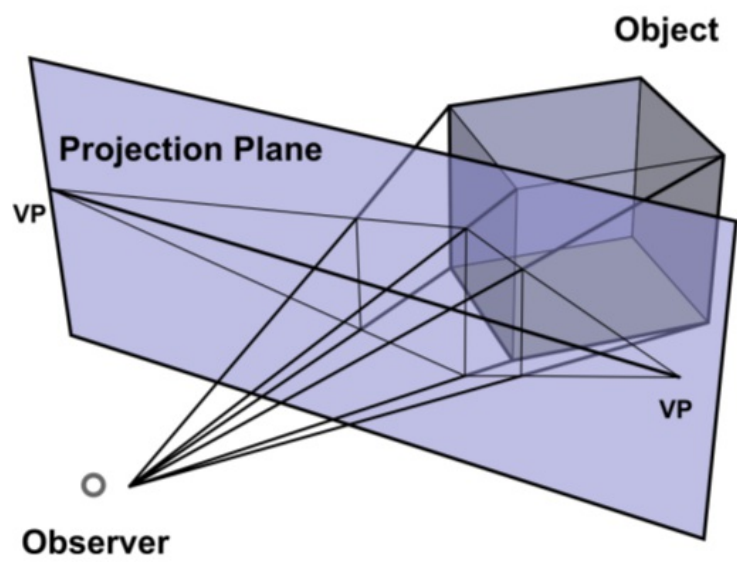
# One point perspective



## Two point perspective

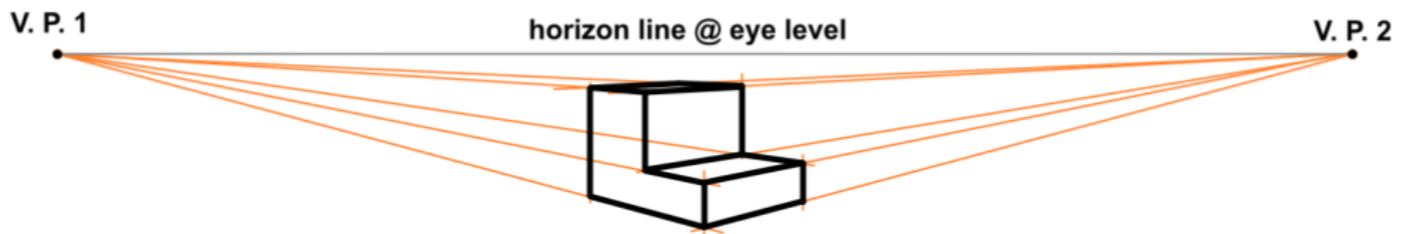
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- Most realistic
- Does not preserve scale



# Two point perspective

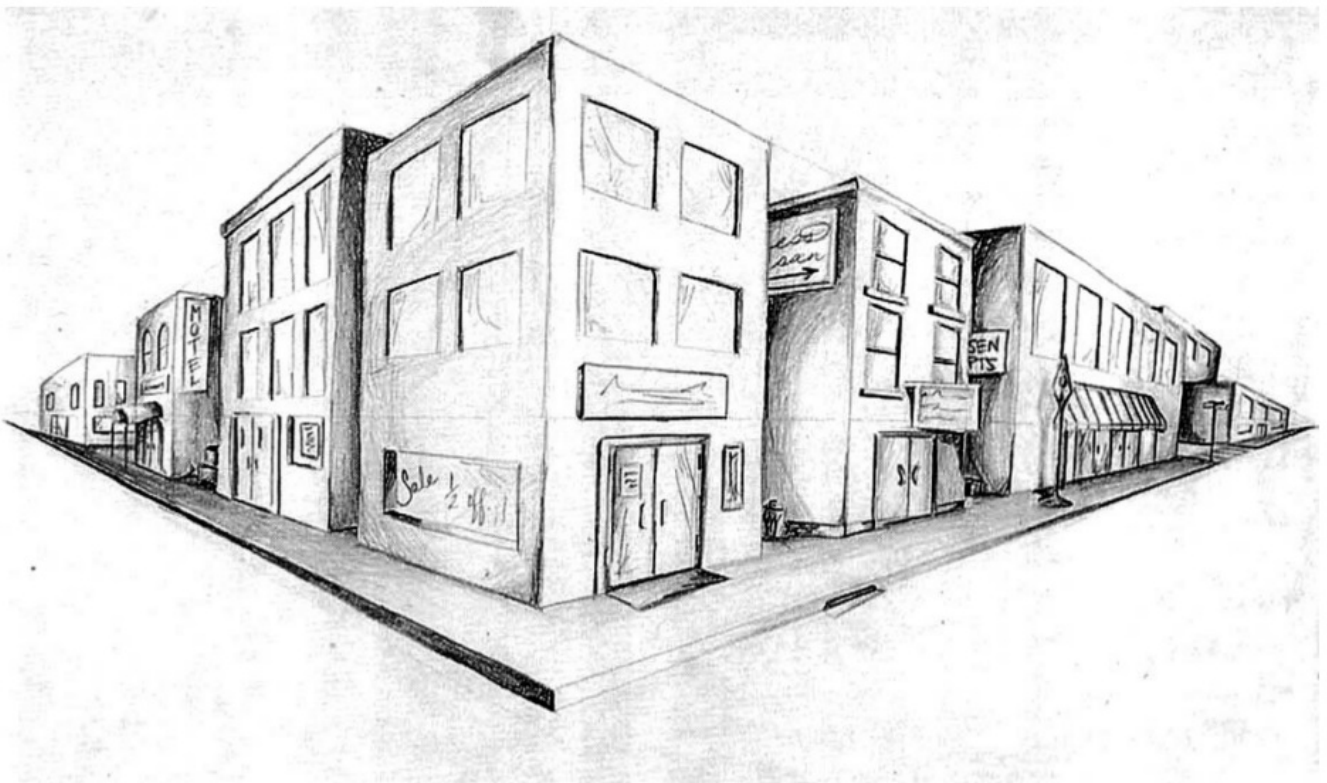
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# Two point perspective

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Whoever makes a DESIGN, without the Knowledge of PERSPECTIVE, will be liable to such Absurdities as are shown in this Frontispiece.

# Parallel Projections

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Parallel projection corresponds to a perspective projection with an infinite focal length (the distance from the image plane to the projection point)

## Orthographic projection

Parallel project representation of a three dimensional object in two dimensions

## Axonometric

To measure along axes.

## Multiview Projections

Up to 6 views of an object are projected onto planes perpendicular to the coordinate axes. The view positions follow one of two schemes: First Angle or Third Angle

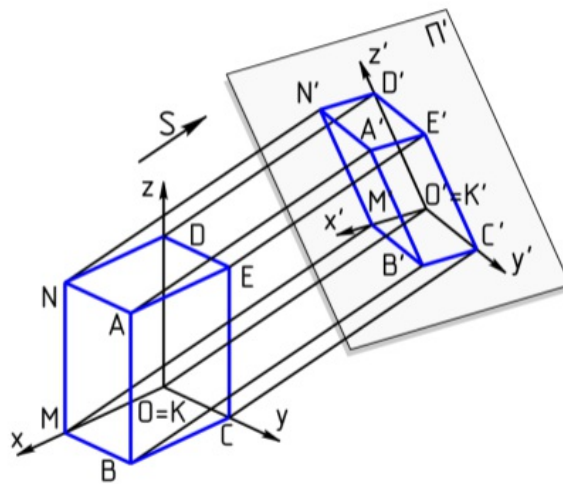
## Pictorial Projections

Image of object from skewed direction to reveal all axes

Isometric, Dimetric, Trimetric

## Axonometric Projections

Type of parallel projection, more specifically a type of orthographic projection, used to create a pictorial drawing of an object, where the object is rotated along one or more of its axes relative to the plane of projection

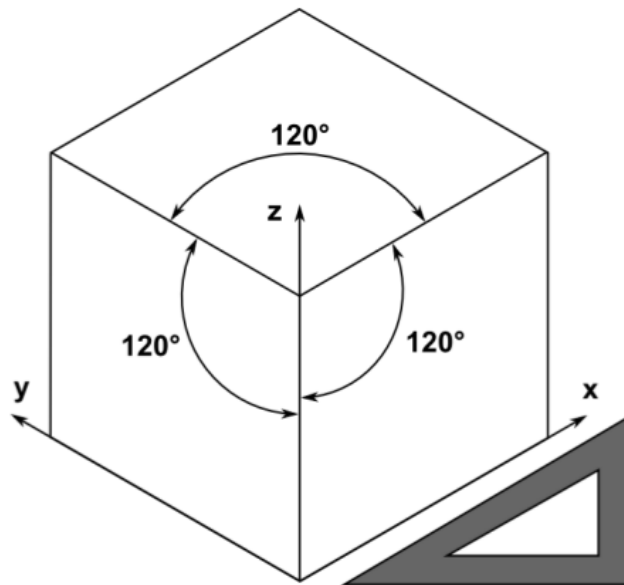


# Isometric Projections

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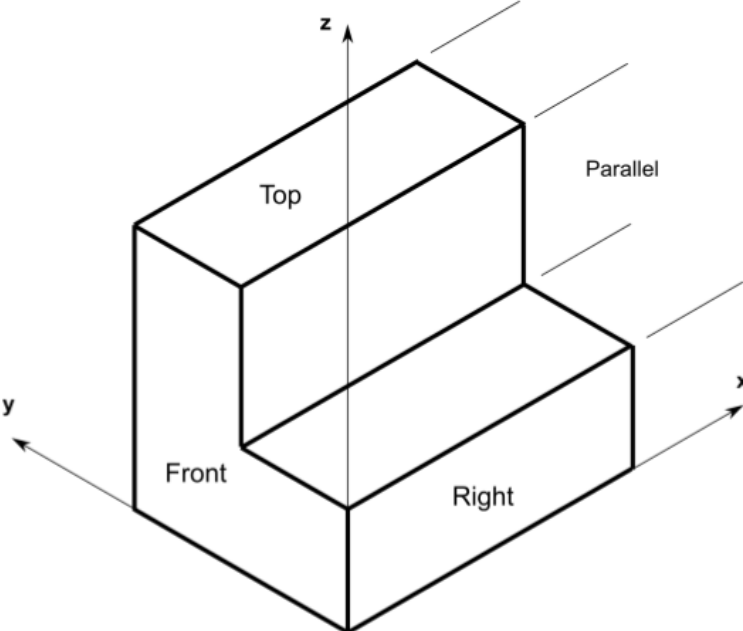
All three axes are equally foreshortened and angled 120 degrees apart.

Lines are parallel.



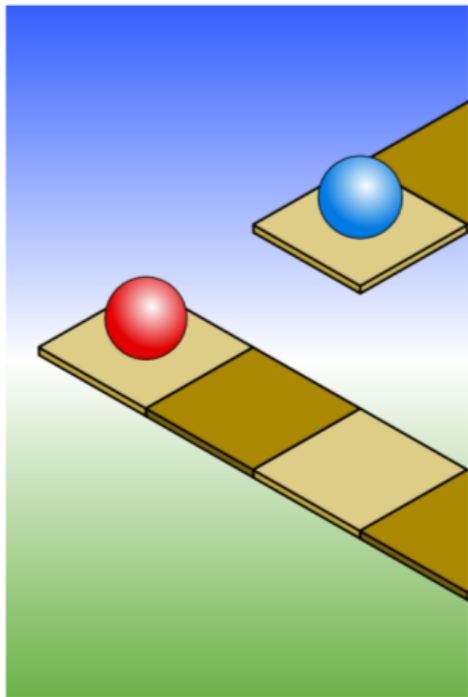
# Isometric Projections

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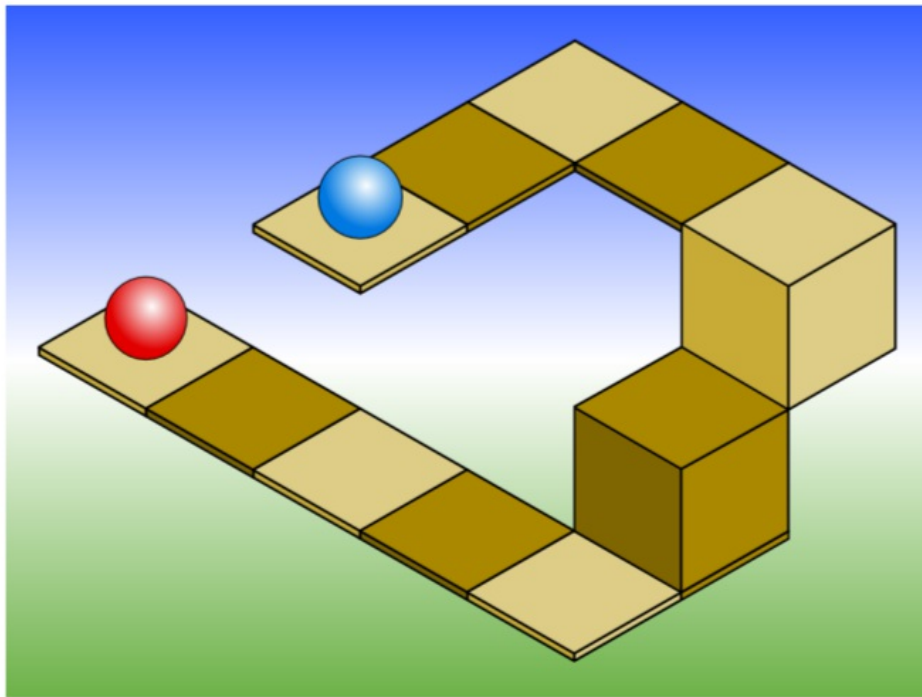
## Isometric Limitations

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## Isometric Limitations

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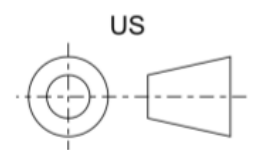
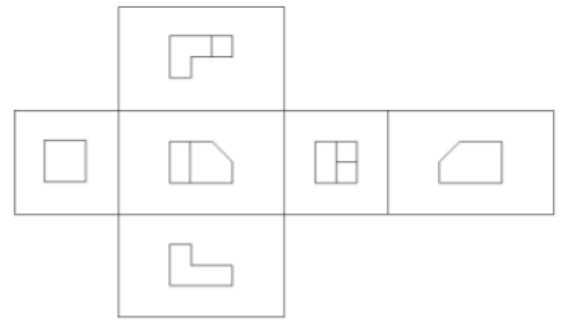
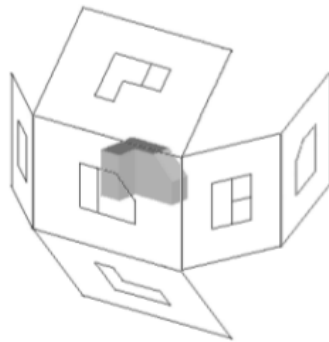
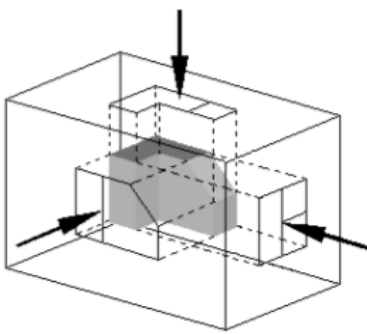




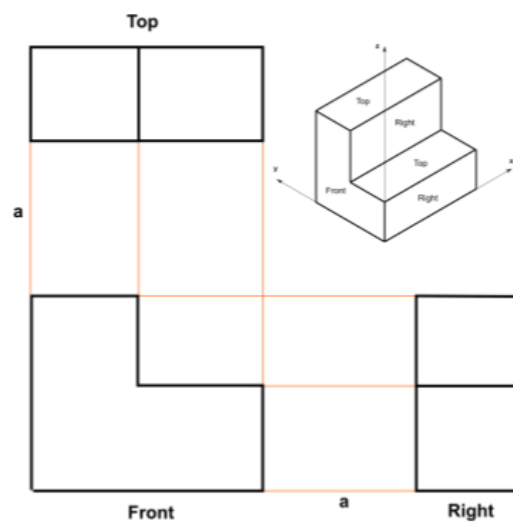
# Orthographic Axonometric Multiview Projections

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## Third Angle Projection



## Orthographic Multiview Projections



# Orthographic Multiview Projections

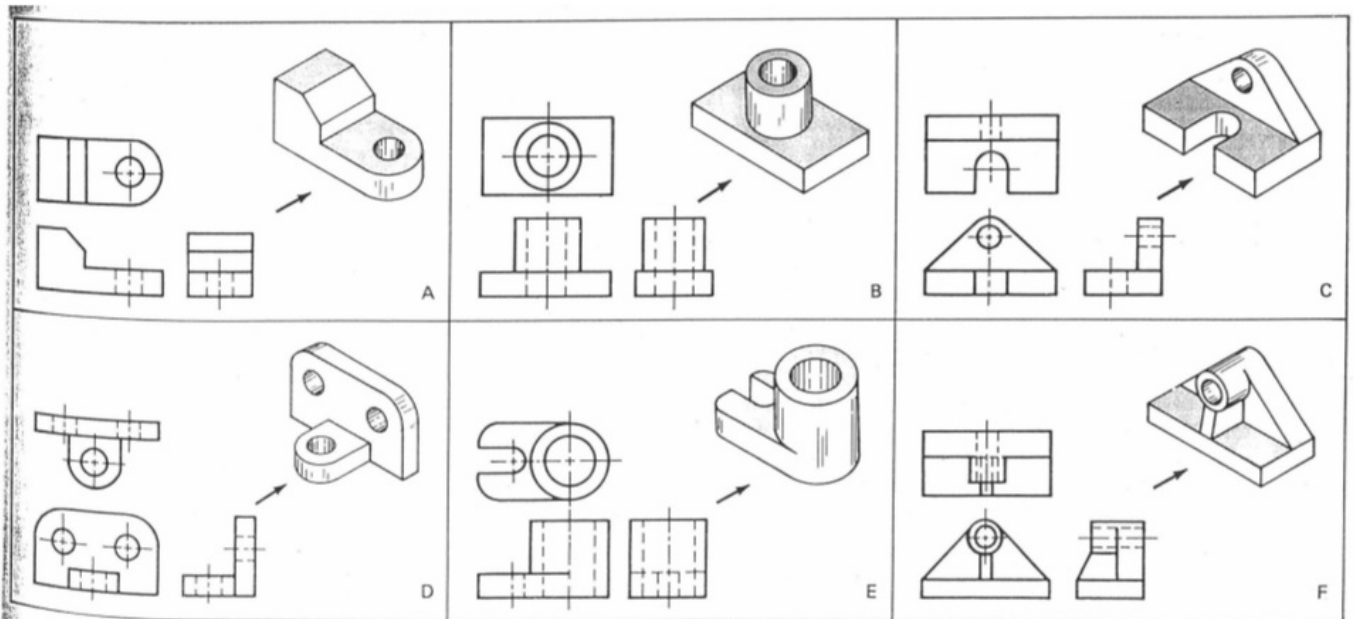


Fig. 5-6-1 Illustrations of objects having circular features.

NOTE: ARROWS INDICATE DIRECTION OF FRONT VIEW

# Oblique

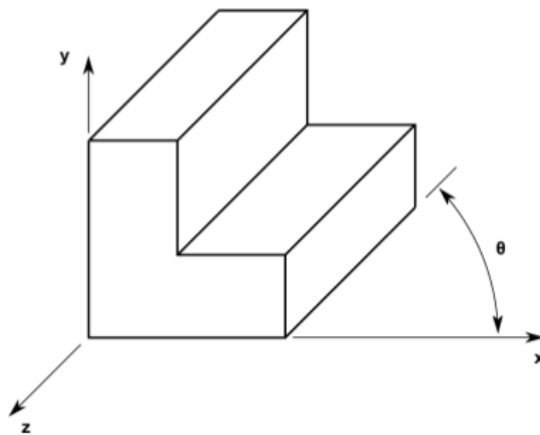
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Projects an image by intersecting parallel rays (projectors) from the three-dimensional source object with the drawing surface (projection plane).

$\theta$  is typically 45 degrees

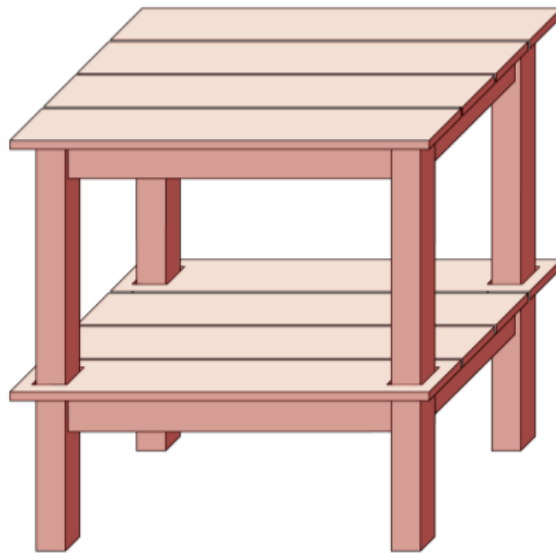
x-y scales are the same

z scale is between 0 and 1, usually 1/2



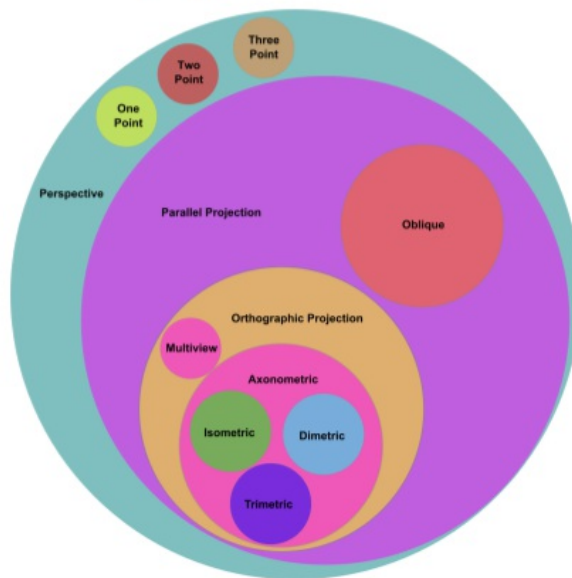
## Oblique

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## Drawing Types

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# Diagrams

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Ideas are captured in a visual format using symbols, words, lines, etc.

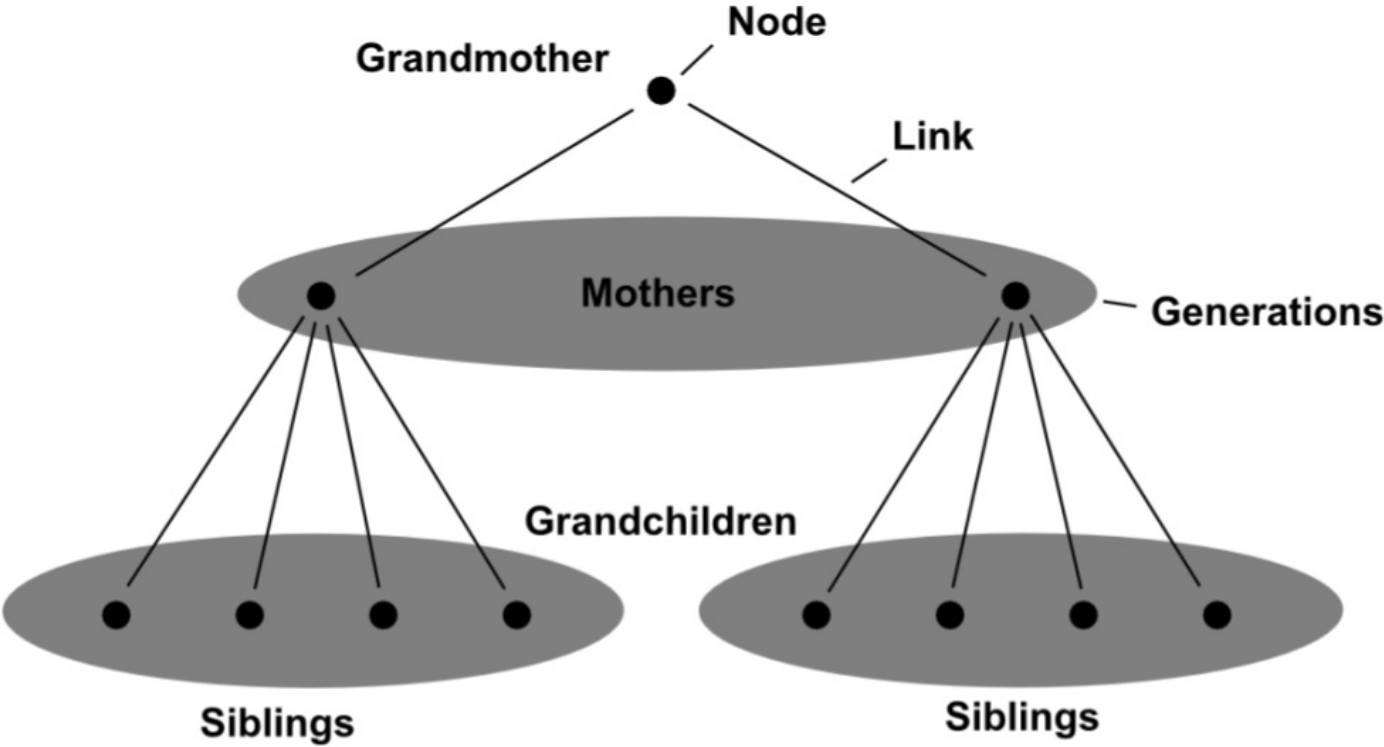
- shows relationships
- show critical issues or functions
- organize concepts
- visual note taking
- free form

## Types

- Graph based: tree, network, flow chart, Venn
- Chart based: histogram, bar char, pie char, function graph, scatter plot
- Infographics

# Tree diagrams

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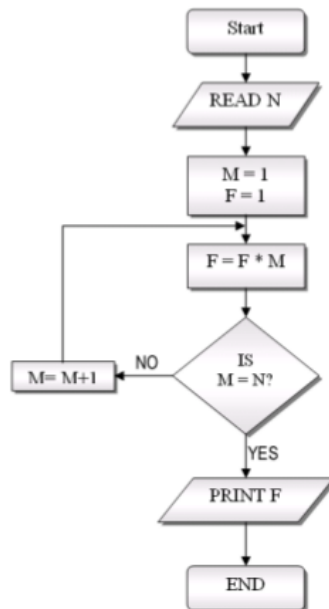




# Flow chart

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Represents an algorithm or process



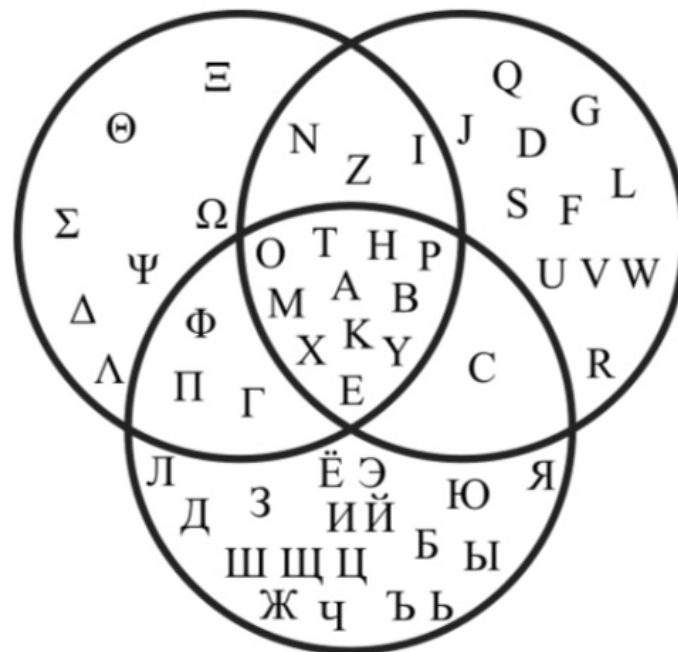
### Flow chart: Freehand



# Venn diagrams

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Show all possible logical relations between a finite collection of sets



# Paul Bennett IDEO

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Click me

# Engineering Diagrams

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- Free body diagrams
- Block diagrams
- Circuit diagrams
- Exploded views
- Hydraulic diagrams
- Sankey diagrams

## Statics: Free Body Diagrams

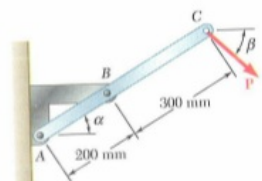


Fig. P3.154

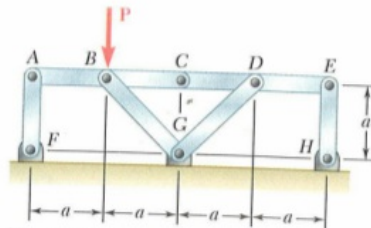


Fig. P6.111

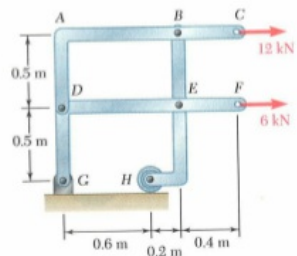


Fig. P6.103

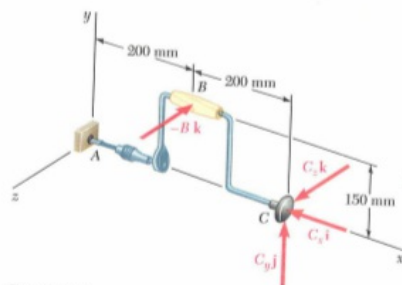
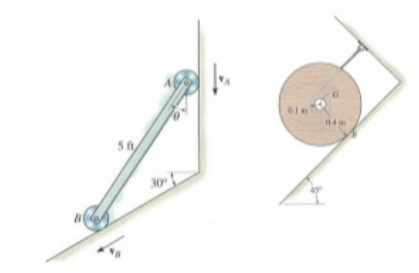
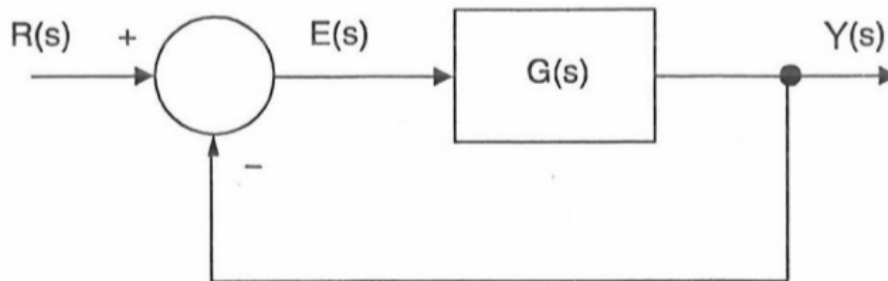
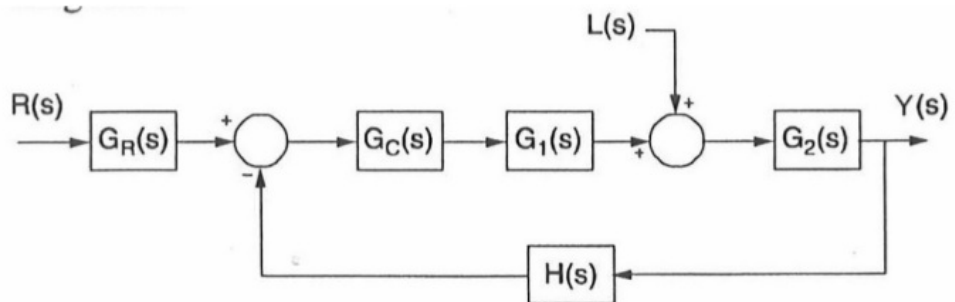


Fig. P3.157

## Dynamics



## Controls: Block Diagrams

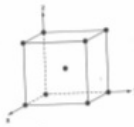




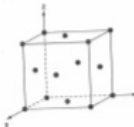
**Materials: Lattice Diagrams**

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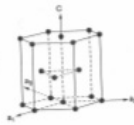
Body-Centered Cubic (BCC)



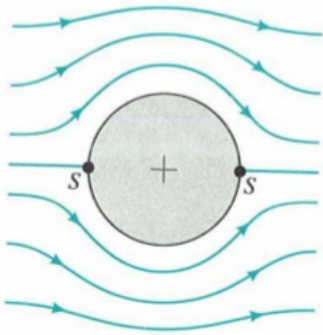
Face-Centered Cubic (FCC)



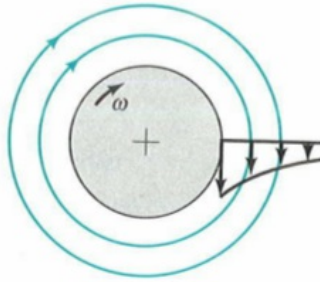
Hexagonal Close-Packed (HCP)



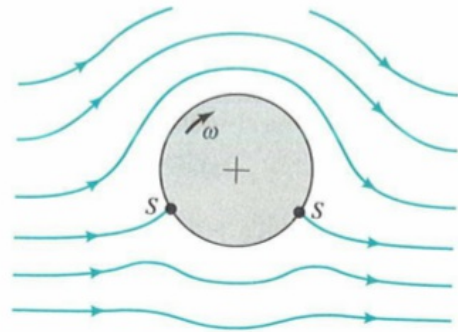
# Fluids: Flow Diagrams



(a)

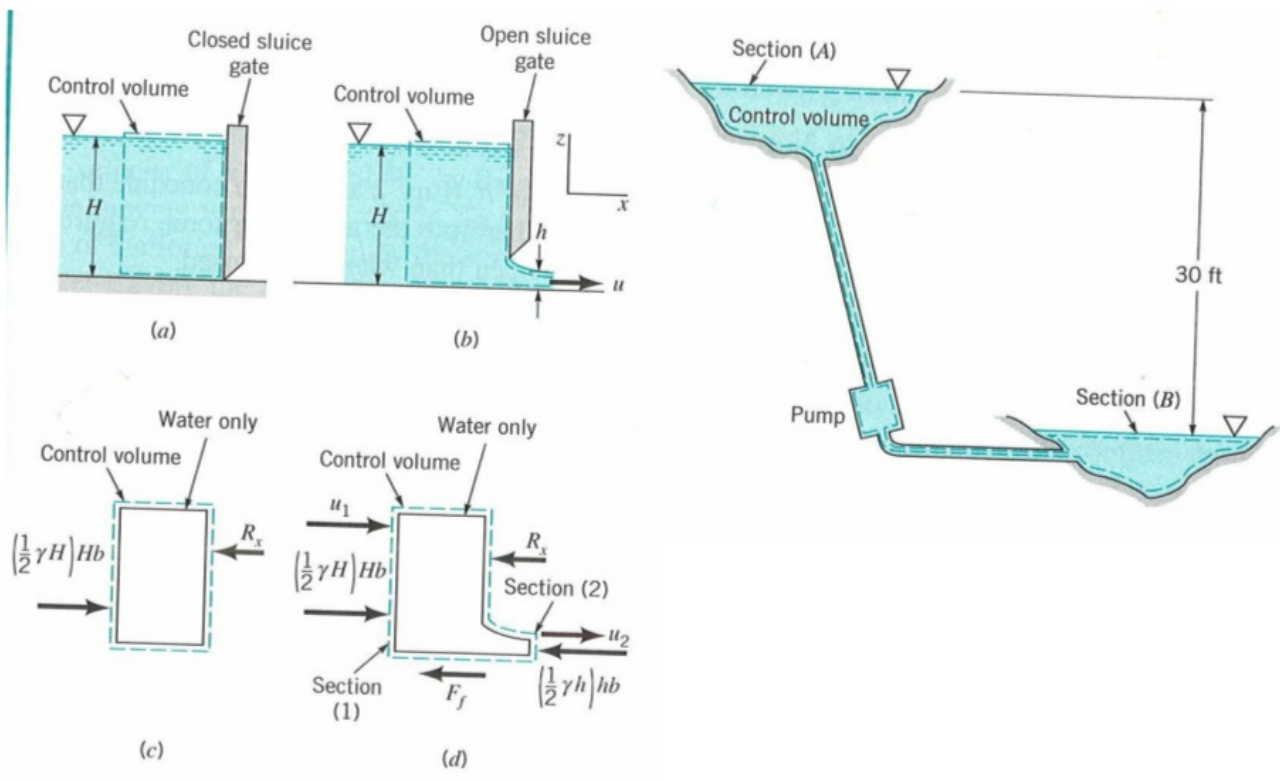


(b)



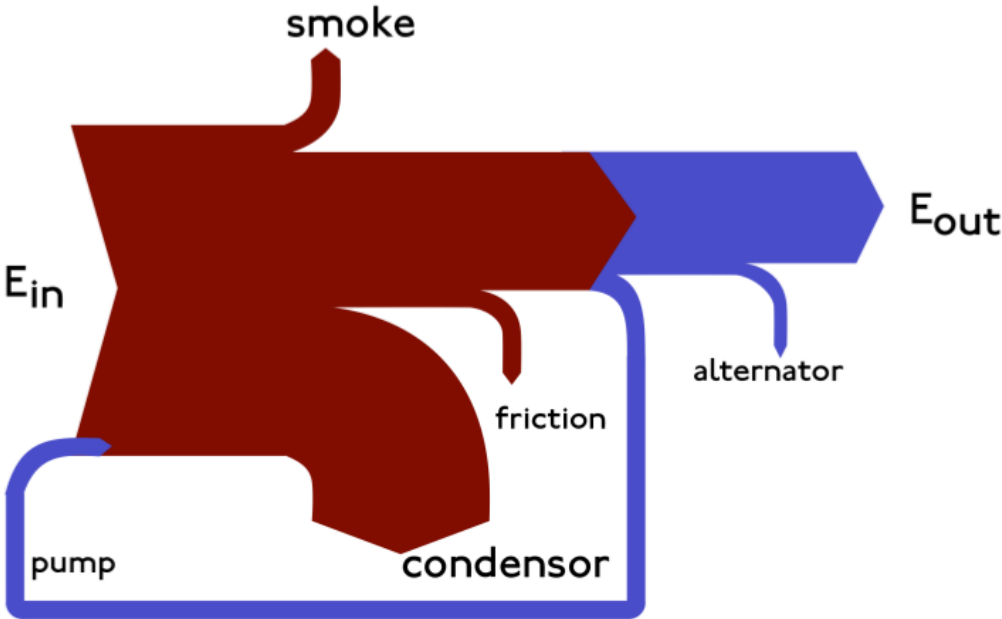
S = stagnation point (highest pressure)  
“(a) + (b) = (c)”

# Fluids: Hydraulic Diagrams

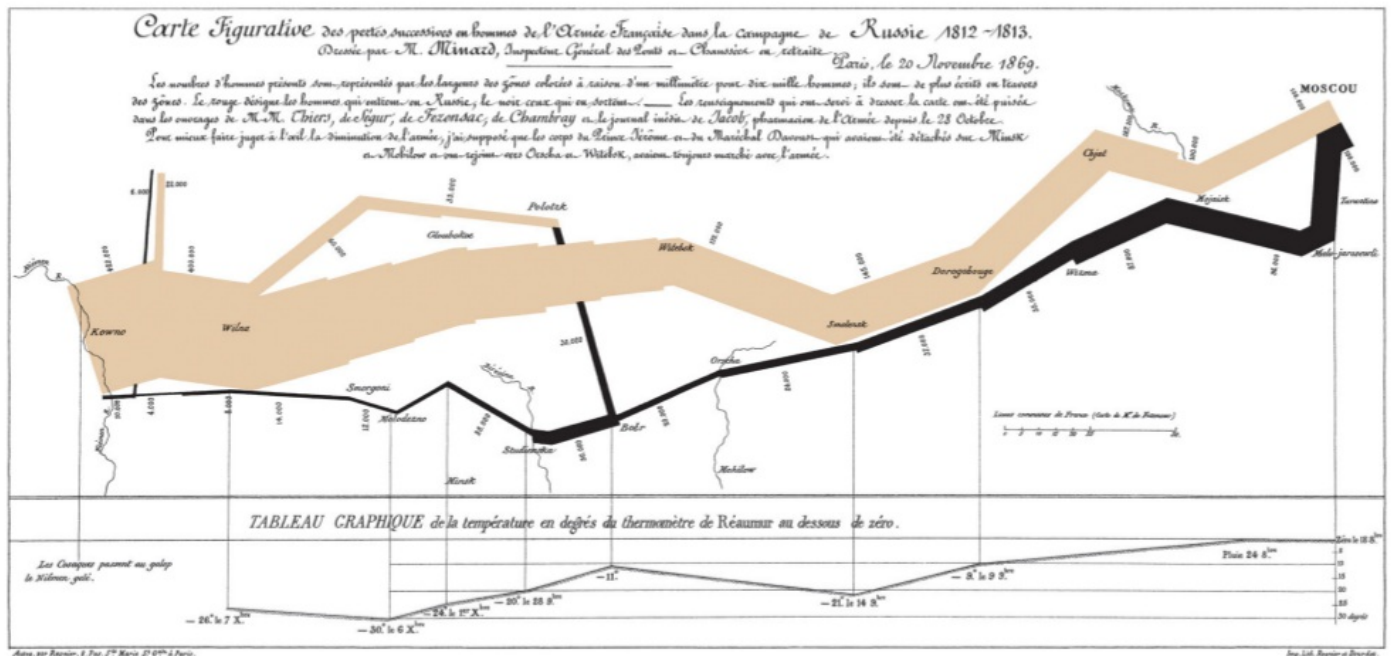


# Thermodynamics: Sankey Diagrams

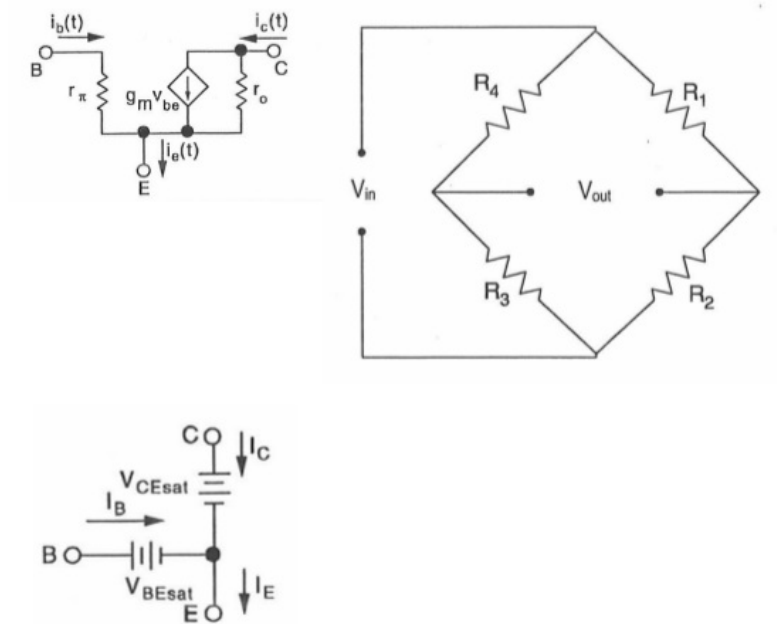
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# Famous Sankey Diagram



## Circuits



# Exploded View

Parts List			
ITEM	QTY	PART NUMBER	DESCRIPTION
6	2	2MM9313WICRDUL	ANGULAR CONTACT BEARING
7	2	36680205	2.75 X 3.623 X 0.375 SHAFT SEAL
19	1	92158A127	#4-40 x 1/4" SET SCREW
20	2	92185A147	#6-32 X 3/8" SOCKET CAP SCREW
23	4	92185A197	#8-32 X 3/4" SOCKET CAP SCREW
34	2	92313A144	#6-32 X 1/4" SET SCREW
35	6	92313A190	#8-32 x 1/4" SET SCREW
41	1	CS-003	CONE
42	1	CS-004	OIL CATCH
43	1	CS-005	INNER RACE LOCK RING
44	1	CS-006	BEARING HOUSING
45	1	CS-007	OUTER RACE LOCK RING
47	1	CS-009	HOUSING MOUNT
48	1	CS-010	CONE PULLEY
60	1	CS-022	PLUG
61	1	CS-023	PLUG KNOB

NOTE: QUANTITIES SPECIFIED ARE FOR THE ENTIRE MACHINE

**ASSEMBLY PROCEDURE**

- CLEAN ALL PARTS THOROUGHLY
- INSTALL THE BEARING SET (6) ONTO THE CONE (41) BACK TO BACK (REFER TO BEARING DOCUMENTATION)
- TIGHTEN THE INNER RACE LOCKRING (43) WITH A SPANNER TO PRELOAD THE BEARINGS AT 130LBS
- TIGHTEN THE SETSCREWS (35) TO PREVENT THE INNER LOCKRING FROM LOOSENING
- PRESS THE OIL SEAL (7) INTO THE BOTTOM OF THE HOUSING (44)
- ATTACH THE HOUSING MOUNT (47) WITH FOUR SCREWS (23)
- PRESS THE CONE AND BEARING ASSEMBLY INTO THE HOUSING (44)
- FILL THE HOUSING (44) WITH ENOUGH OIL TO COVER THE BEARINGS
- TIGHTEN THE OUTER RACE LOCKRING (45) INTO THE HOUSING (44) SNUGGLY WITH A SPANNER
- TIGHTEN THE SETSCREWS (35) TO LOCK THE LOCK RING (45)
- ATTACH THE CONE PULLEY (48) TO THE CONE (41) WITH TWO SCREWS (20)
- SLIDE THE OIL CATCH (42) ONTO THE CONE AND SECURE THE SETSCREW (19)

DRAWN JASON MOORE	10/24/2008	UNIVERSITY OF CALIFORNIA, DAVIS	
CHECKED		TITLE	
		<b>CONE ASSEMBLY</b>	
DIMENSIONS ARE IN INCHES AND DEGREES TOLERANCES UNLESS OTHERWISE SPECIFIED:			
X.X	= ±0.1	X/X	= ±1/32
X.XX	= ±0.03	X°	= ±1°
X.XXX	= ±0.005	X.X°	= ±5°
X.XXXX	= ±0.0005	X.XX°	= ±.05°
SIZE B		DWG NO	CS-A-001
SCALE 3:8		REV	
		SHEET 1 OF 5	