

# ENGINEERING DRAWINGS

Deborah Munro, Ph.D.

# Overview: What is an Engr Dwg?



- ❑ Controlled document, “the engineering report”
- ❑ Contains all necessary information
- ❑ Provides a visual reference of the part or assembly
- ❑ Tracks revisions
- ❑ Provides a bill of materials

# Necessary content



- ❑ 3 orthographic projections
- ❑ Title Block
- ❑ Revision history
- ❑ Bill of Materials
- ❑ Fully dimensioned, toleranced, and bulleted drawing
- ❑ Isometric view

**Revision history.** Refers to an Engineering Change Order (ECO), a controlled document.

**Isometric View really helps with visualization, but not required.**

**Dimensions (once per part) with proper tolerances. Outside of geometry. Filled arrowheads.**


### Front View

### Right View

This is for your Bill of Materials. Indicates what material(s) and/or standard parts should be used. Each ITEM, if more than one, has a balloon to the appropriate part with a matching number.

ITEM	PART #	DESCRIPTION	FILE #	MATERIAL	QTY

**Add all your specific notes for how to manufacture or treat part/assembly**

1 UNLESS OTHERWISE NOTED: BREAK SHARP EDGES R.010 MAX	
#	NOTES
	
1115 WINDFIELD WAY, SUITE 100, EL DORADO HILLS, CA 95762 PH: (916) 355-7100, FX: (916) 355-7180	
DATE	FINISH
1/21/09	
SPECIFIED FINISHES: ANGLES $\pm 1^\circ$	<b>Specific Part Name and Size</b> <b>Name of Assembly or Subassembly</b> <b>Name of Product Line</b>
THIS DRAWING IS NOT TO BE REPRODUCED OR PROHIBITED WITHOUT THE WRITTEN PERMISSION OF THE COMPANY	SIZE: <b>C</b> DIM: NUMBER <b>Specific Part Number</b> REV.
<b>Scale:</b>	SHEET <b>OF</b>

NOTE: DRAWING CONTAINS  
PRO/E CAD FILES

DRAWING FILENAME:  
DRW0001.DRW  
MODEL FILENAME:  
MODEL NAME.PRT

CONFIDENTIAL  
&  
PROPRIETARY

APPROVAL	DATE												
DRAWN	1/21/09												
<p><b>Name</b></p> <p>UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES</p> <p>TOLERANCES ARE:</p> <table> <tr> <td>FRACTIONS</td> <td>DECIMALS</td> <td>ANGLES</td> </tr> <tr> <td><math>\pm 1/64</math></td> <td><math>\pm .005</math></td> <td><math>\pm 1'</math></td> </tr> <tr> <td></td> <td><math>\pm .010</math></td> <td></td> </tr> <tr> <td></td> <td><math>\pm .015</math></td> <td></td> </tr> </table>		FRACTIONS	DECIMALS	ANGLES	$\pm 1/64$	$\pm .005$	$\pm 1'$		$\pm .010$			$\pm .015$	
FRACTIONS	DECIMALS	ANGLES											
$\pm 1/64$	$\pm .005$	$\pm 1'$											
	$\pm .010$												
	$\pm .015$												
<p>ANY REPRODUCTION OF THIS DRAWING WITHOUT WRITTEN PERMISSION FROM CONSENSUS ORTHOPEDICS IS PROHIBITED</p> <p>ALL PRINTS ARE FOR REFERENCE ONLY UNLESS STAMPED "CONTROLLED" IN RED</p>													

# Title Block



- ❑ Specific Part Name and Size, Name of Subassembly, Name of Product Line
- ❑ Specific Part Number (Contains only numbers)
- ❑ Scale (1, 2, 5, 10 only)
- ❑ Revision (1, 2, 3 prerelease, A, B, C after release)
- ❑ Drawn by with date & signatures (EGR, QA, MFG)
- ❑ Default tolerances (.XX = .01, .XXX = .005 for inch)
- ❑ Confidentiality statements

# Bill of Materials



- ❑ Raw material
- ❑ Purchased components
- ❑ Modified from stock components
- ❑ Other subassemblies or components
- ❑ All placed in a bulleted, numbered list, with quantities
- ❑ Corresponding bullets on assembly, usually cross-section or exploded view

# Revision History



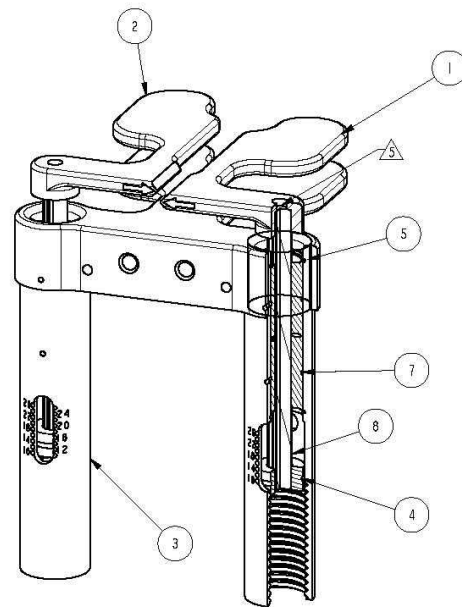
- Prior revisions
- Engineering Change Order (ECO) numbers
- Dates
- Checked by?
- Approved by?
- ECO is a separate document with written commentary and all the redlined drawings in the change order
- Any other documentation that prompted revisions

# Dimensioning and Tolerancing

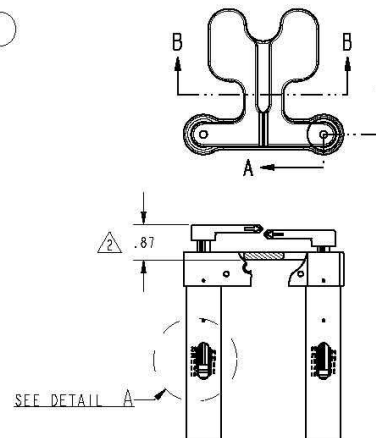
- Overall size dimensions, even if as (reference)
- Only one dimension per feature!!
- Think about how it will be measured by inspector
- Decimal places control default tolerancing
- Special tolerancing only if critical
- Notes with numbers and description at bottom of drawing if needed for special processes
- Geometric dimensioning & tolerancing if needed (ANSI Y14.5)



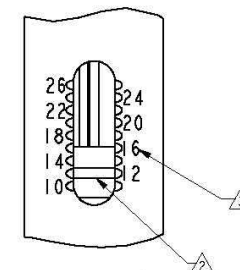
REV. NUMBER 20186-01				
REV.	DCR NUMBER	DATE	CHECKED	APPROVED
1	?	?	?	?



SECTION A-A



SECTION B-B  
SCALE 0.500



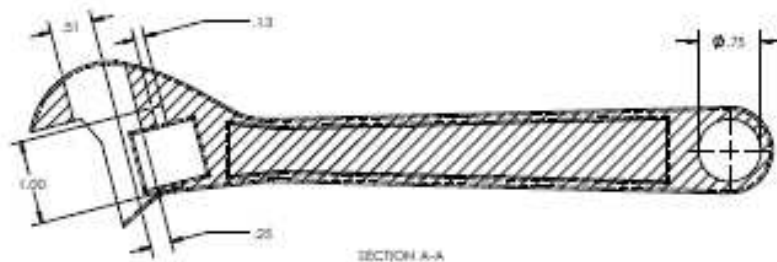
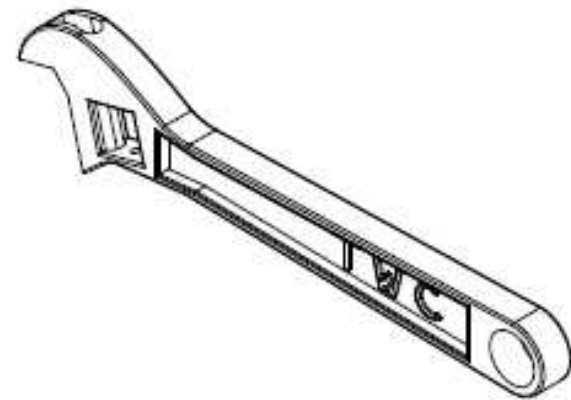
DETAIL A  
SCALE 2.000

5	SPOT WELD FOOT TO SLIDE TWO PLACES.
4	ITEM 6 PRESS UP TO BEARING KEYWAY, SPOT WELD AND GRIND SMOOTH FOUR PLACES.
3	LASER MARK IN .05 CHARACTERS 10 - 26 IN APPROXIMATE LOCATION SHOWN FOUR PLACES
2	SECURE ITEM 4 SO THAT THE INDICATOR ALIGNS WITH 12 AND THE MEASURE VALUE IS .870
1	UNLESS OTHERWISE NOTED: BREAK SHARP EDGES R.010 MAX
#	NOTES

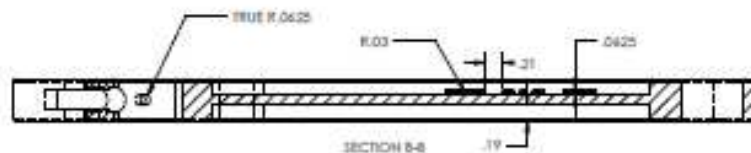
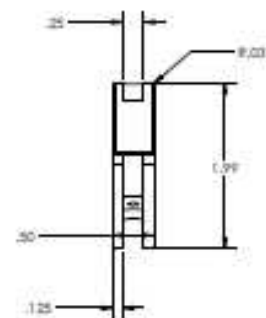
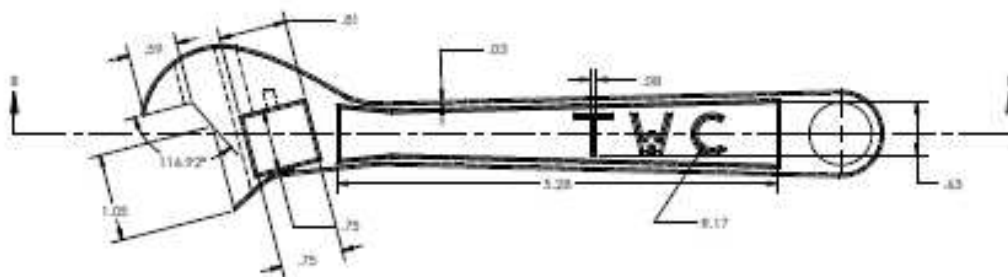
**Consensus<sup>®</sup> Orthopedics**  
1115 WINDFIELD WAY, SUITE 100, EL DORADO HILLS, CA 95702  
PH: (916) 355-7100, FX: (916) 355-7190

ITEM	PART #	DESCRIPTION	FILE #	MATERIAL	QTY
1	10770-01	FOOT RIGHT	10770_1	17-4 PH SS	1
2	10771-01	FOOT LEFT	10771_1	17-4 PH SS	1
3	20191-01	TIBIA PLATE ASSEMBLY	20191_1	17-4 PH SS	1
4	57485K240-01	COLLAR, SHAFT, 8MM	57485K240	303 SS	2
5	91580A171-01	RING, RETAINING 5/8" DIA.	91580A171	420 SS	4
6	91585A030-01	DOWEL PIN 2.5mm	91585A030	18-8 SS	4
7	SSPS8-01	BEARING, SLIDE	SSPS8	STAINLESS	4
8	SSPS8-01	SLIDE	SSPS8_SLIDE	STAINLESS	2

NOTE: DRAWING CONTAINS PROF CAD FILES		APPROVAL	DATE	MATERIAL	FINISH
DRAWING FILENAME: 20186_1.DWG MODEL FILENAME: 20186_1.INST.PRT		C. SCHENBERGER	11/6/08	SEE TABLE	SEE TABLE
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES ±1/64 .005 ±.010 ±1°		KNEE BALANCER ASSEMBLY			
CONFIDENTIAL & PROPRIETARY		ANY REPRODUCTION OF THIS DRAWING WITHOUT WRITTEN PERMISSION FROM CONSENSUS ORTHOPEDICS IS PROHIBITED ALL PRINTS ARE FOR REFERENCE ONLY UNLESS STAMPED "CONTROLLED" IN RED			
SIZE		DWG. NUMBER		REV.	
C		20186-01		1	
SCALE		.000		SHEET	
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SECTION A-A



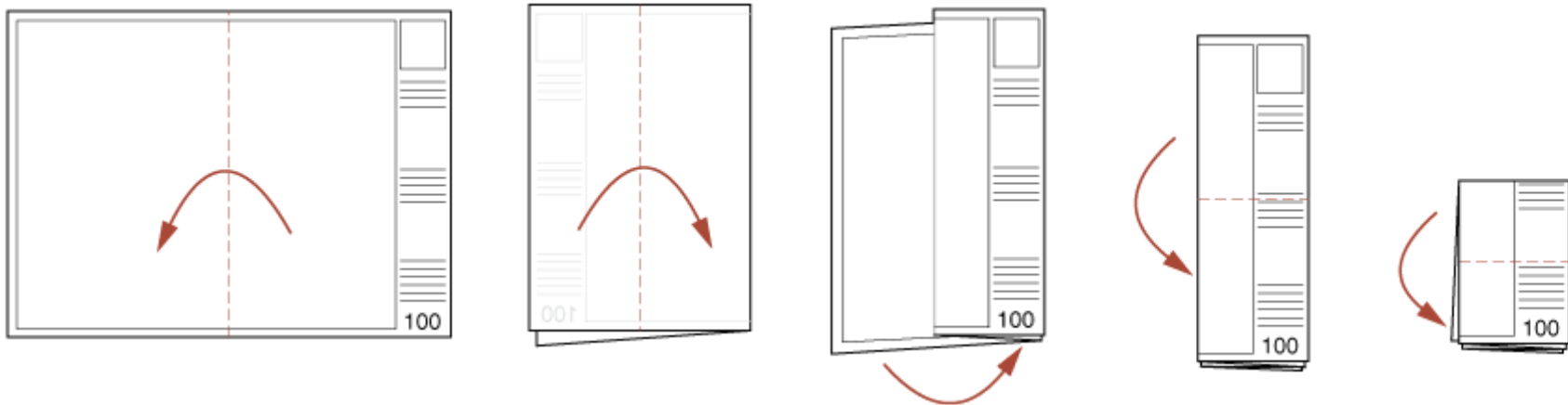
SECTION 8-8

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		DISTRICT OF COLUMBIA		NEW YORK	10/1/80	
		ADDRESS: 400 ANDREWS AVENUE WASHINGTON, D.C. 20535		SEARCHED	INDEXED	FIXED WRENCH JAW
		FEDERAL BUREAU OF INVESTIGATION		SERIALIZED	FILED	
		400 ANDREWS AVENUE WASHINGTON, D.C. 20535		FILED		
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# How to Fold an Engineering Drawing

- <http://archtoolbox.com/representation/graphic-symbols/84-foldlargedrawing.html>
- Want the title block to show
- Want finished work to measure 8.5 x 11



# Miscellaneous Drawing Etiquette

- ❑ All dimensions must be shown.
- ❑ Tangent lines should not be shown.
- ❑ All hidden lines must be shown, except on ISO view
- ❑ Threading should not be shown
- ❑ Do not dimension to hidden lines. Make section views as needed.
- ❑ Do not put dimensions on an assembly drawing.
- ❑ Give overall reference dimensions as needed.
- ❑ Show centerlines in all views.

# I have totally forgotten SolidWorks!

- SolidWorks is based off part components:
  - ▣ Drawings and assemblies have small file sizes, because all the dimensional content is in the part file.
- You can “make assembly/drawing from part”
- If you make “smart dimensions” in your part file, you can simply show those in your drawing.
- SolidWorks has built-in drawing formats that you can edit, using “edit sheet”
- Let’s open SolidWorks and refresh our memories!

# Summary



- ❑ 3 orthographic views, plus isometric view
- ❑ Fully dimensioned with tolerances
- ❑ Title Block
- ❑ Bill of Materials
- ❑ Revision history
- ❑ Notes, if desired