



Training Series

Basic Blueprint Reading

When you get a Work Order you should CRAVE to do a good job.

- Throughout this training, we will discuss 5 things that you can do to be better at your task.
- Doing each of these 5 things only adds about 10 minutes extra time to an Operation Sequence but can help catch 90% of any issues.
- When you receive a Work Order Packet, do these 5 things:
 - CONFIRM the Part Number, Description, and Rev Letter all match on the BOM, Traveler, and Drawing.
 - REVIEW the Traveler to ensure all previous sequences have been signed.
 - AMOUNT- Count the parts to verify that you have the Amount it says you have
 - VERIFY that the Material Used matches the Material Callout on the BOM.
 - EQUATE – Take a moment to compare the part to the Isometric Drawing.

Before Starting Any Work – VERIFY!!!

Ensure that the BOM, Drawing, and Traveler match in
Part Number & **Revision**.

BOM

Gulfstream	CAGE 59734	SECTION 1 APPROVAL SHEET	PL- GPM280001013-301	Revision Letter B
Parts List Title: PANEL ASSY				CAD File: ATW_CATPRD-AAA126988

Drawing

Edwards Interiors, Inc.	
Part Number	GPM280001013-301
Description	PANEL ASSY
Dimensions Per CCS 2005 unless otherwise noted.	Program N/A
SHEET 1 OF 2	

Traveler | Work Order

EDWARDS INTERIORS AEROSPACE	Edwards Interiors Inc. P.O. Box 948 125 Entrepreneur Way Rincon, GA 31326	Traveler Work Order ID/ Lot.Split: W103519/1 Sub Assembly (Leg) ID: 0 Order Status: Released										
This Work Order is NOT linked to a sales order line and must be received into inventory upon completion												
Part ID - Description GPM280001013-301 - PANEL ASSY	<table border="1"> <thead> <tr> <th>Work Order Quantity</th> <th>Work Order Release Date</th> <th>Work Order Want Date</th> <th>Scheduled Start Date</th> <th>Scheduled Finish Date</th> </tr> </thead> <tbody> <tr> <td>8</td> <td>3/5/2019</td> <td>4/2/2019</td> <td>3/20/2019</td> <td>4/1/2019</td> </tr> </tbody> </table>	Work Order Quantity	Work Order Release Date	Work Order Want Date	Scheduled Start Date	Scheduled Finish Date	8	3/5/2019	4/2/2019	3/20/2019	4/1/2019	
Work Order Quantity	Work Order Release Date	Work Order Want Date	Scheduled Start Date	Scheduled Finish Date								
8	3/5/2019	4/2/2019	3/20/2019	4/1/2019								
Drawing: ID - Revision Page: GPM280001013-301 - B File: \\eii01\share\Catia\Gulfstream\LatestRev\GPM280001013-301_B Specifications: ***** QUALITY CODES: 131, 259, 315, 456 *****												

Definition and Purpose

A blueprint (drawing) is a guide for making something – it's a design or pattern that can be followed.

- Use of lines, notes, abbreviations and symbols to convey information.

There are 3 types of Part Numbers:

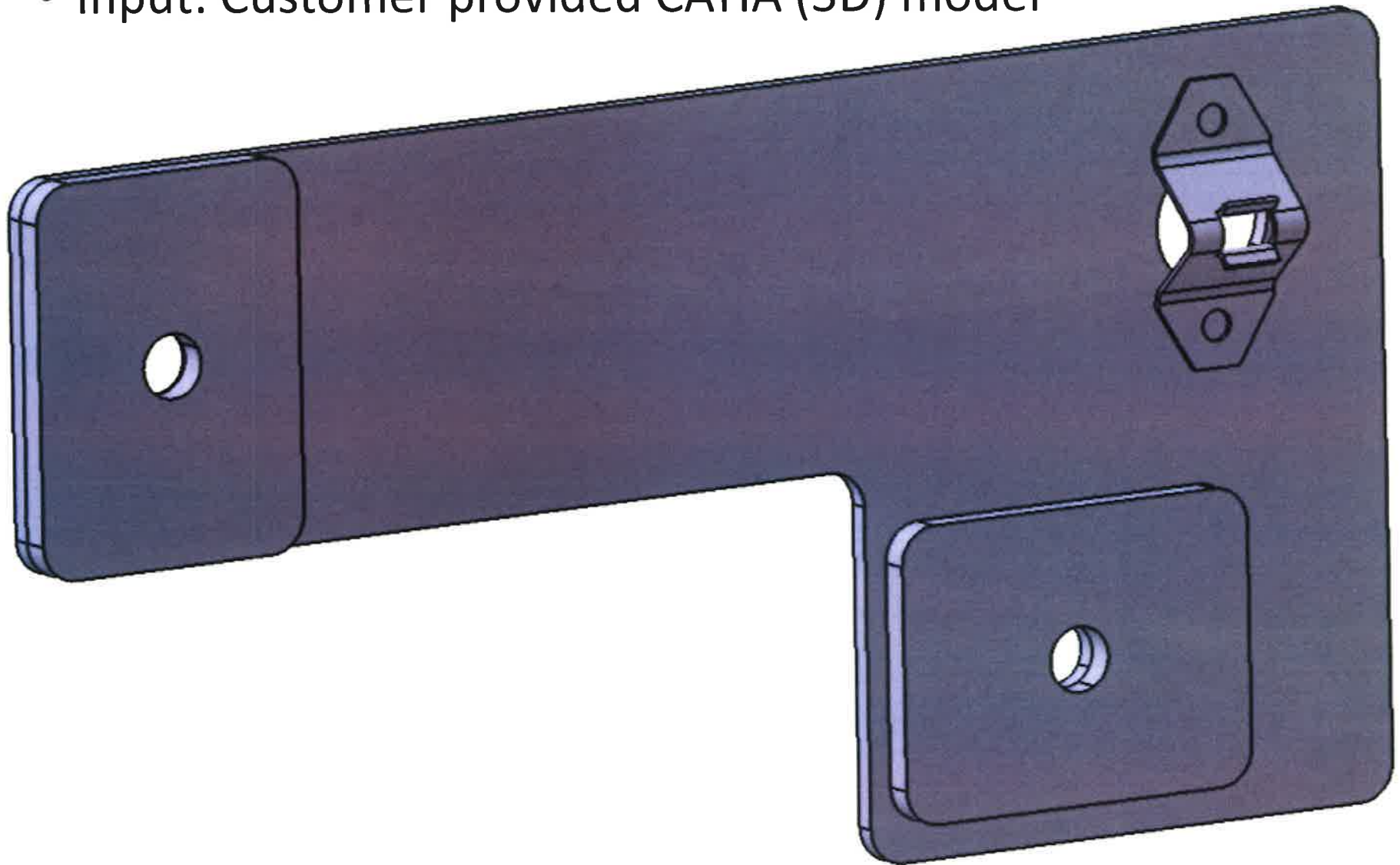
- Detail (Typically end in -101)
- Assembly (Typically end in -301)
- 60P, 62P, 70P, 72P, etc. parts
 - (Example - 62P2553001A151)
 - These do not end in -101 or -301.

Drawing Creation and Modification

- Customers Supply Edwards Engineering Department with a 3D CATIA Packet.
- Edwards Engineers use the 3D CATIA Packet to create 2-Dimensional Shop Drawings, (Blueprints).
- (CATIA): Computer-Aided Three-Dimensional Interactive Application. It is a multi-platform software suite for computer-aided design (CAD).

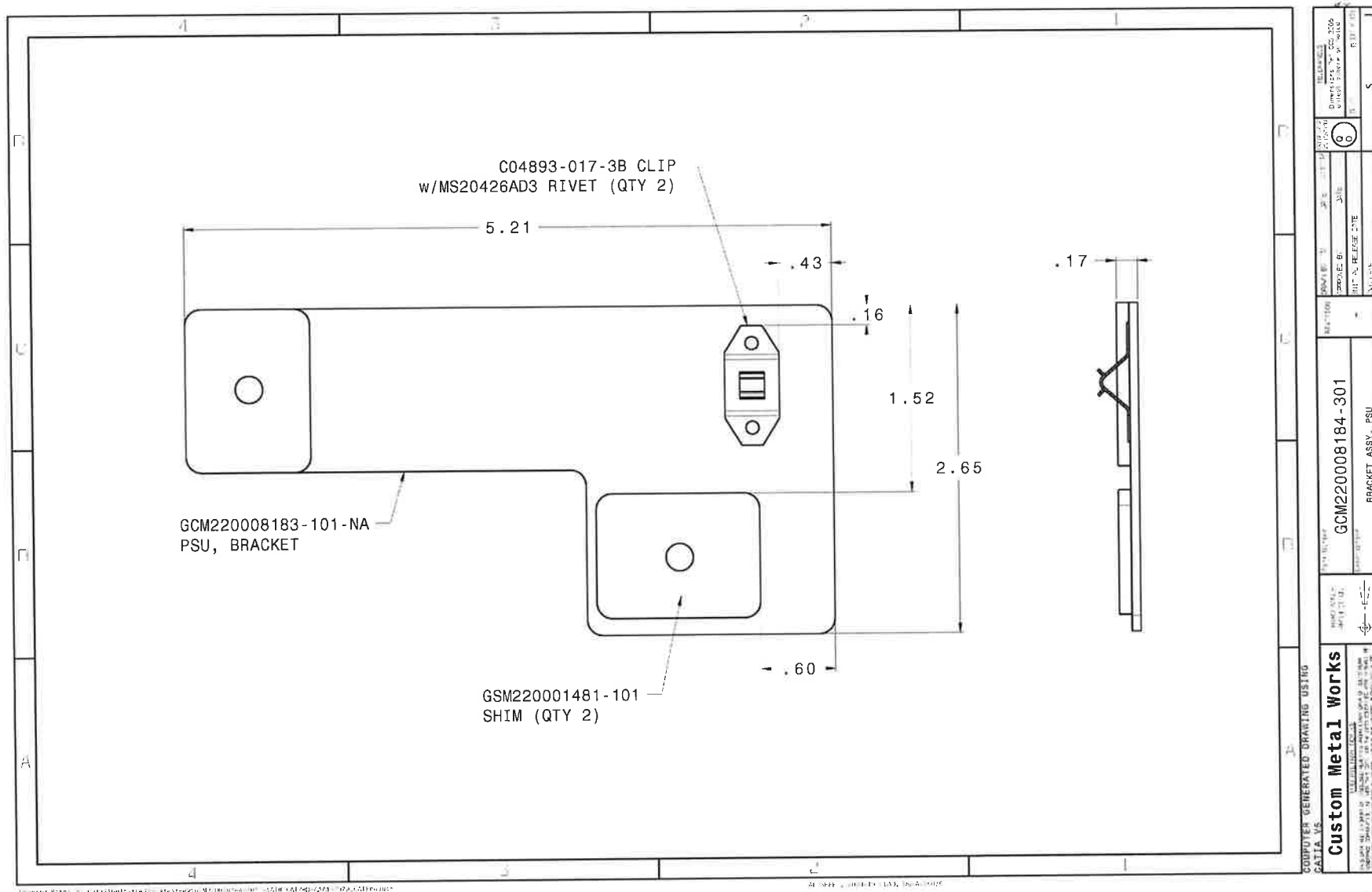
Drawing Creation and Modification

- Input: Customer provided CATIA (3D) model



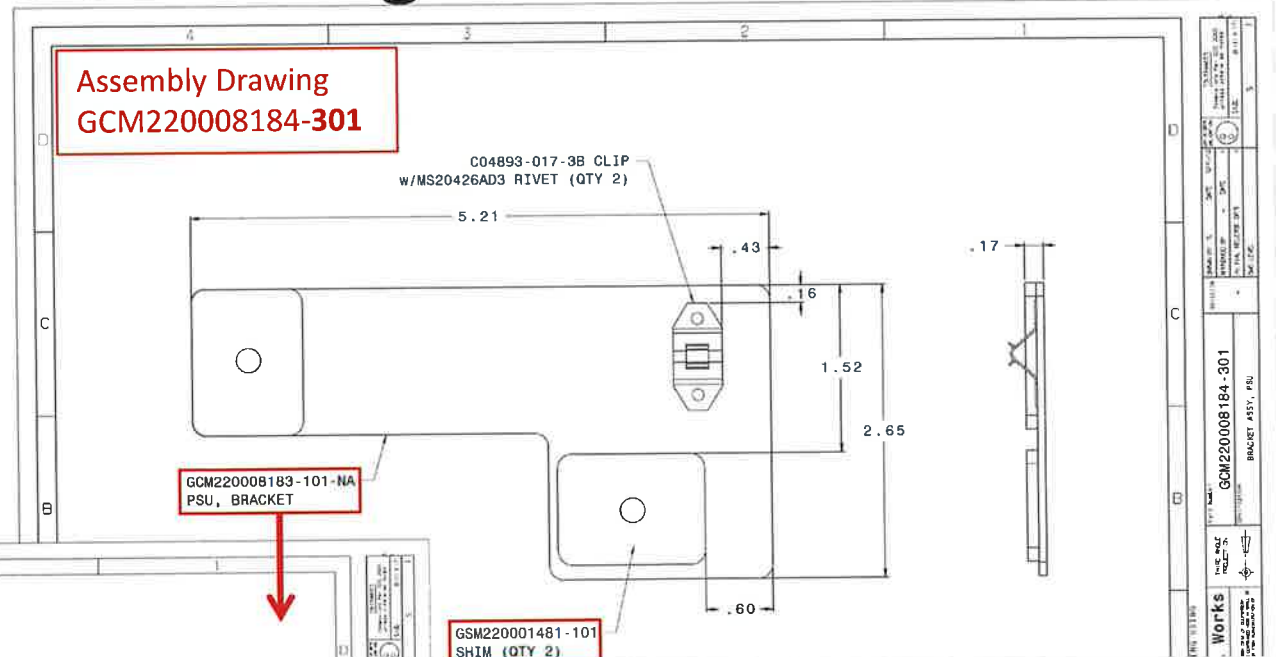
Drawing Creation and Modification

- Output: 2D drawing(s) created by EII Engineering.

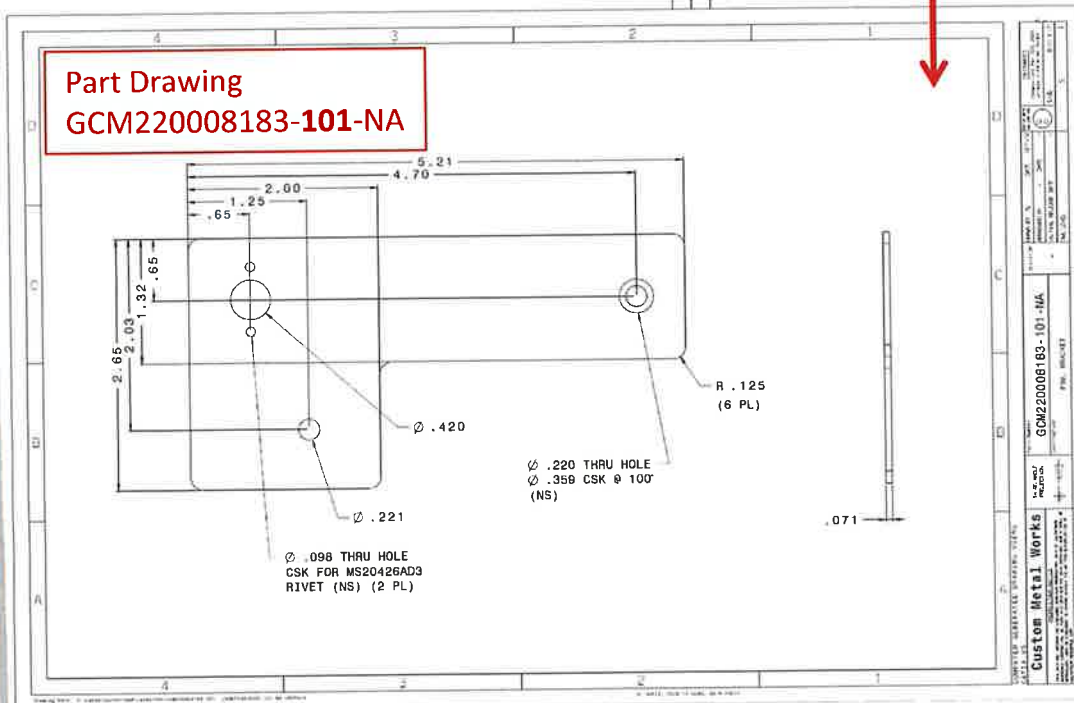


Assembly and Part Drawings

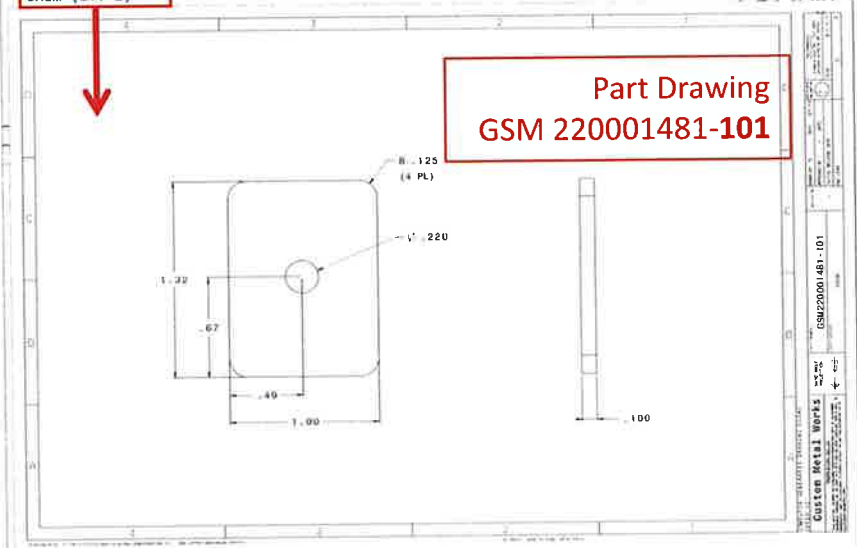
**Assembly Drawing
GCM220008184-301**



**Part Drawing
GCM220008183-101-NA**



**GSM220001481-101
SHIM (QTY 2)**

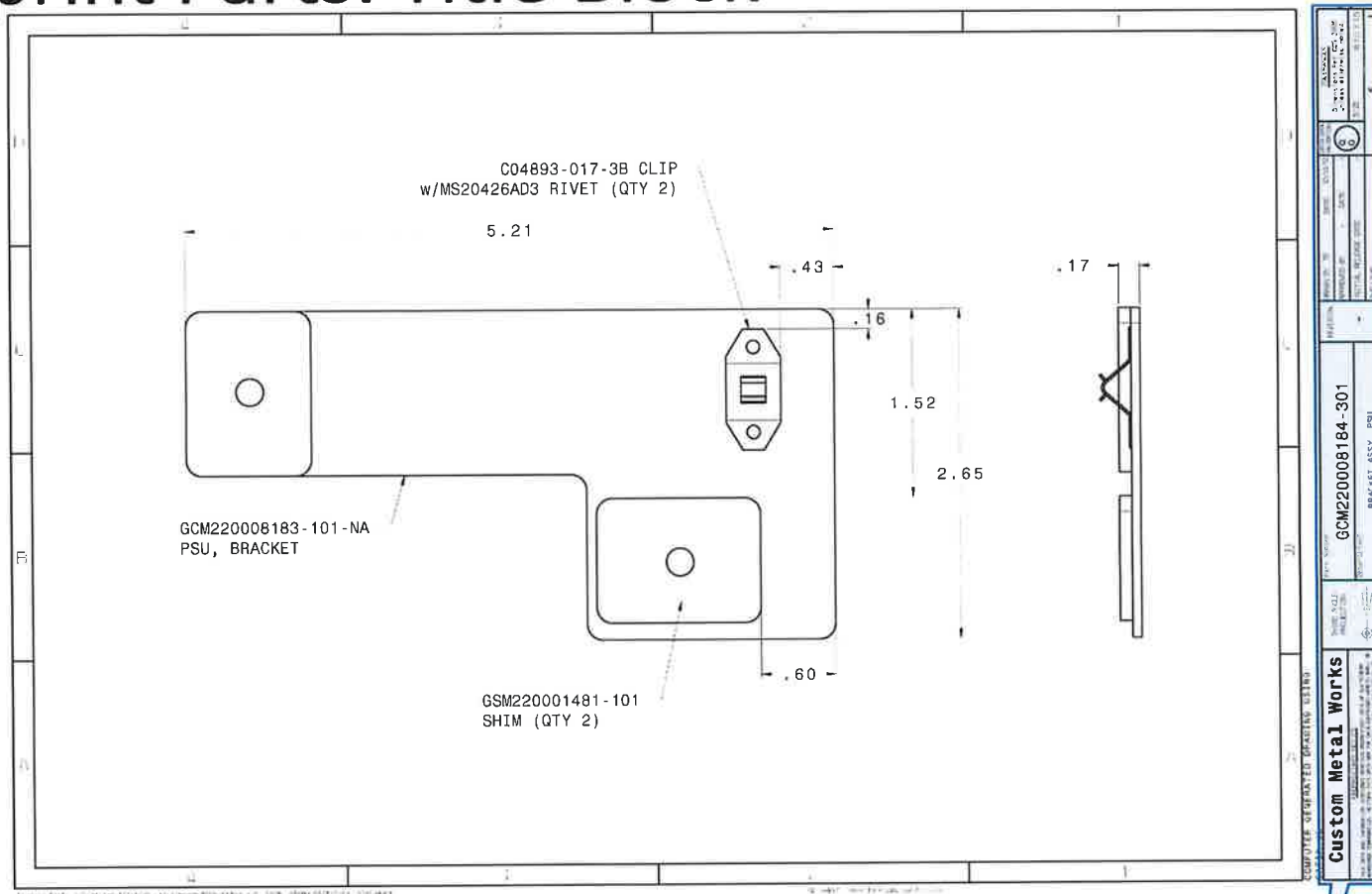


**Part Drawing
GSM 220001481-101**

Blueprints have four main parts:

- Title Block: Box on bottom of blueprint that contains all information necessary to identify the part or assembly (drawing number, name of part, etc.)
- Drawing: Graphical representation that shows the exact shape of a component.
- Dimensions: Numbers that provide the measurements of a drawing.
- Notes: Include information that cannot be easily identified on the drawing or other information needed to fabricate the component.

Blueprint Parts: Title Block



Company Identifier

Part Number
Part: 101 | Assy: 301

Tolerances

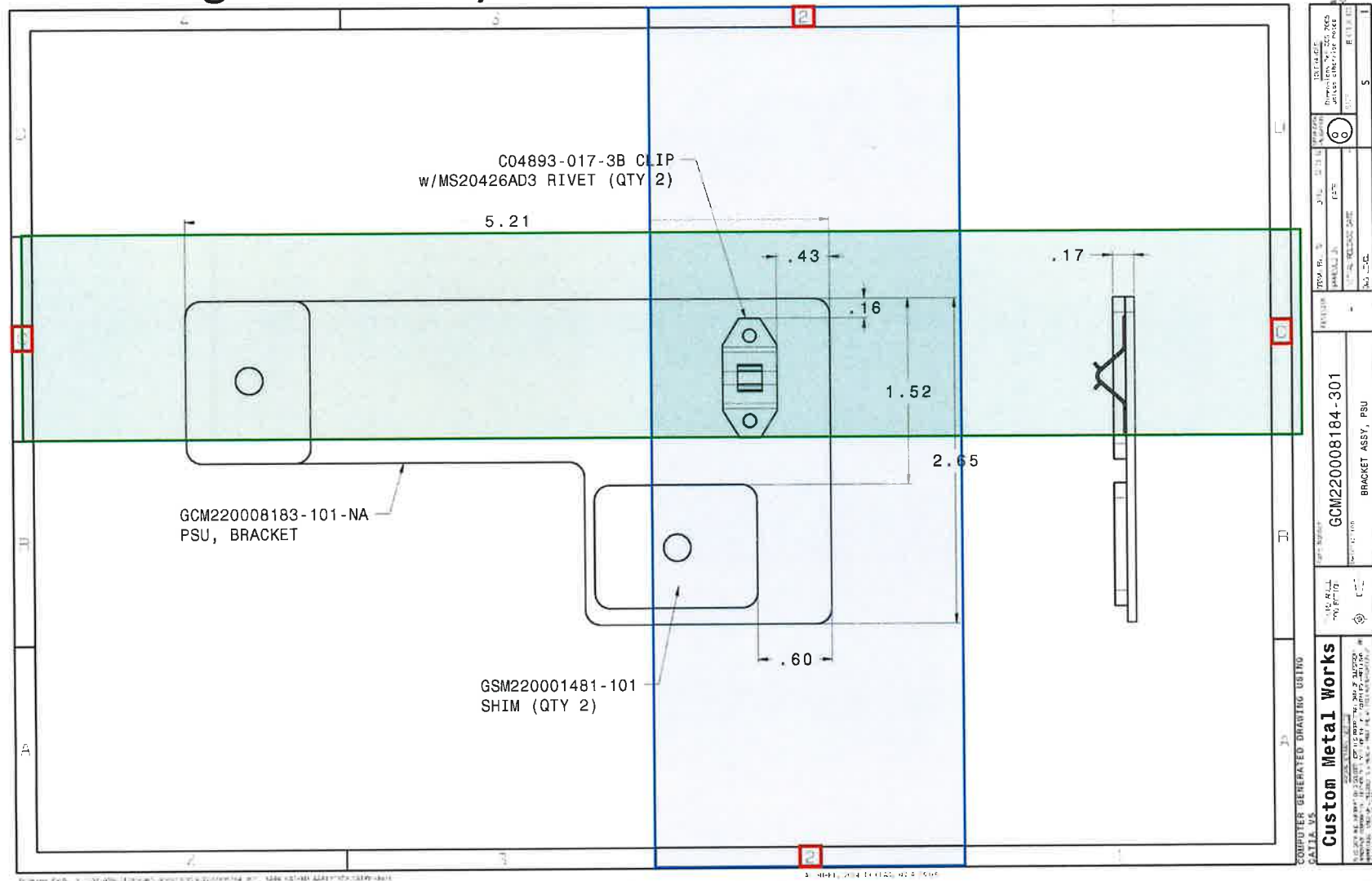
Custom Metal Works PROPRIETARY NOTICE THIS DATA AND INFORMATION DISCLOSED HEREIN IS PROPRIETARY DATA OF GULFSTREAM AEROSPACE CORPORATION. NEITHER THIS DATA NOR THE DATA CONTAINED HEREIN SHALL BE REPRODUCED, USED OR DISCLOSED TO OTHERS WITHOUT THE WRITTEN AUTHORIZATION OF GULFSTREAM AEROSPACE CORP.	THIRD ANGLE PROJECTION 	Part Number	GCM220008184-301	REVISION -	DRAWN BY: TS	DATE: 12/11/12	DATA DATA VAL IDATION 	TOLERANCES Dimensions Per GCS 2005 unless otherwise noted.	
		Description	BRACKET ASSY, PSU		APPROVED BY	DATE		SIZE	8 (11 X 17)
					INITIAL RELEASE DATE				
					DWG LEVEL			S	I

Description

Revision

Blueprint Parts: Grid System

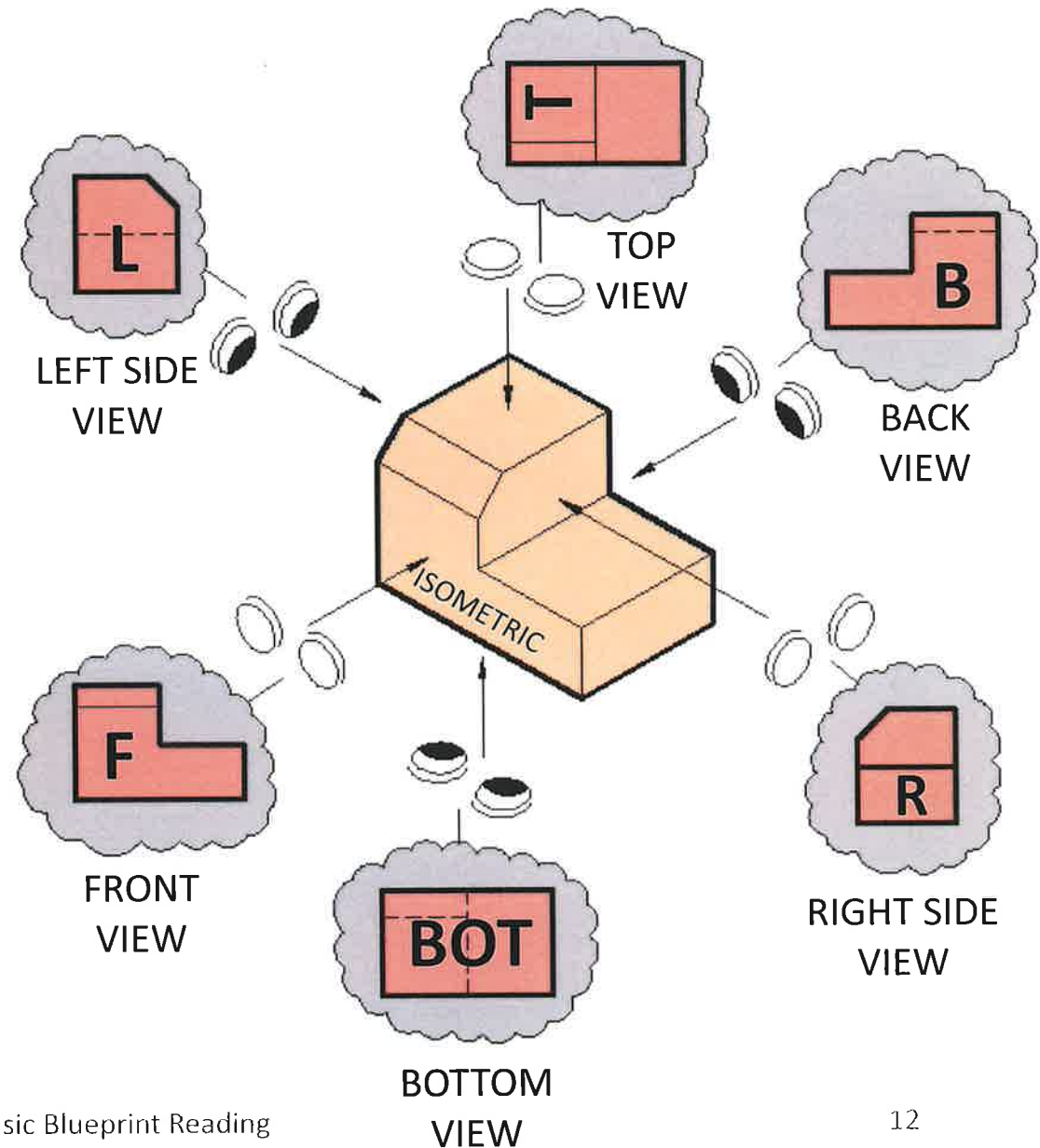
- A drawing grid system allows a specific point on a drawing to be easily referenced and found.



Understanding Projection and Views

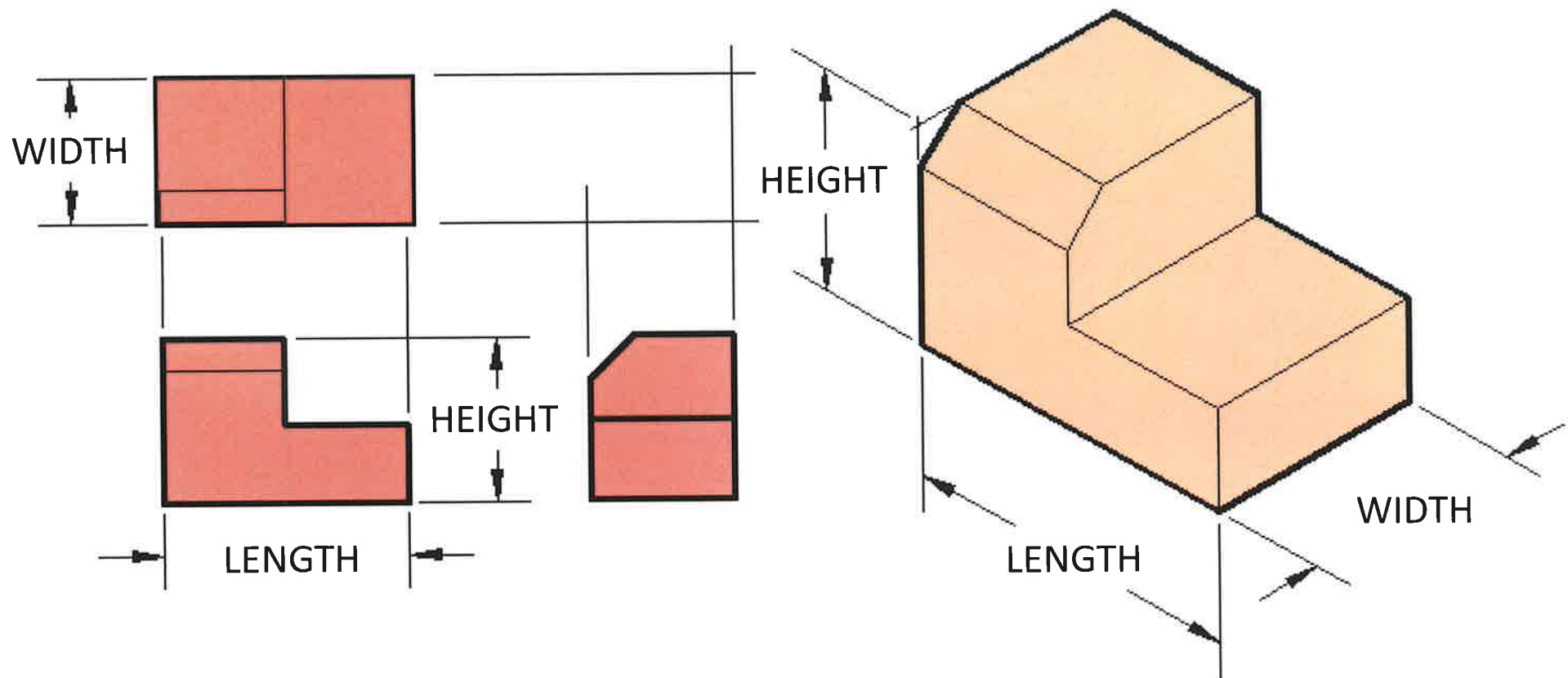
Orthographic Projection

- A collection of 2D drawings which enable you to have a complete representation of an object.
- The object is rotated so that the person viewing can see each individual side as the part is rotated.



Orthographic Projection – Common Views

- The three most common views shown on technical drawings are the front, top, and right-side views.



Basic Lines

Visible (Object) Lines

(THICK)

Hidden (Invisible) Lines

(THIN)

Center Lines

(THIN)

Extension & Dimension Lines

(THIN)

Leader Lines

(THIN)

Break Lines

(THIN)

Cutting or Viewing Plane Lines

Are thick broken intermittent lines with small 90-degree arrowheads. These type of lines indicates when a section is mentally cut in half to better perceive the internal detail.

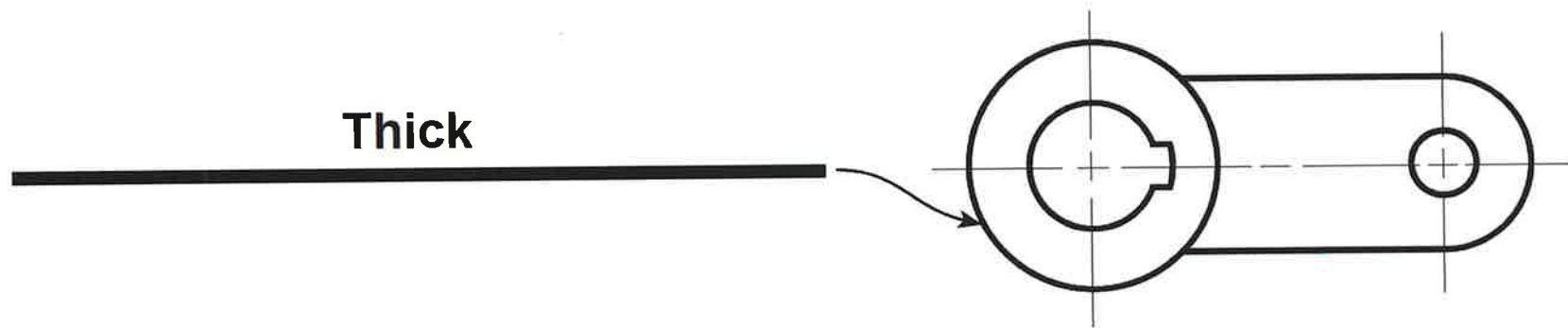
(THICK)

Section Lines

(THIN)

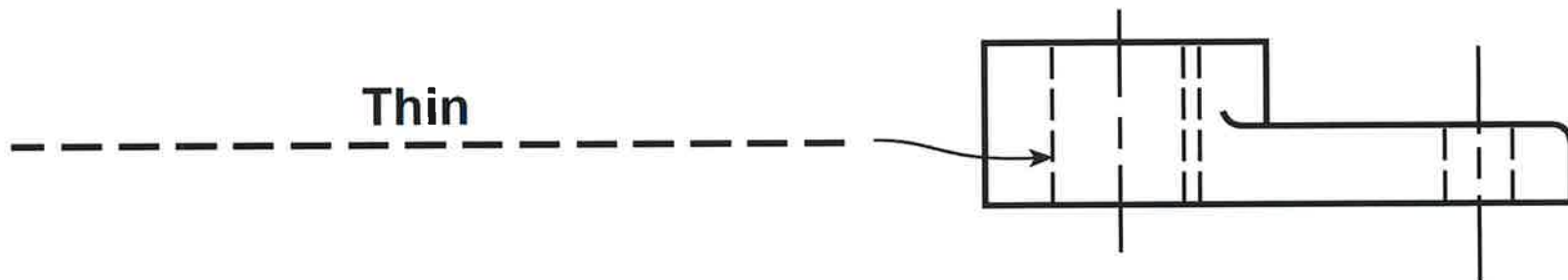
Basic Lines: Visible (Object) Lines

- Thick solid lines that outline all surfaces that are visible to the eye.
- These are the most important lines because they are thick and solid and thus become the basis for comparing the weights and composition of all other lines used in a drawing.



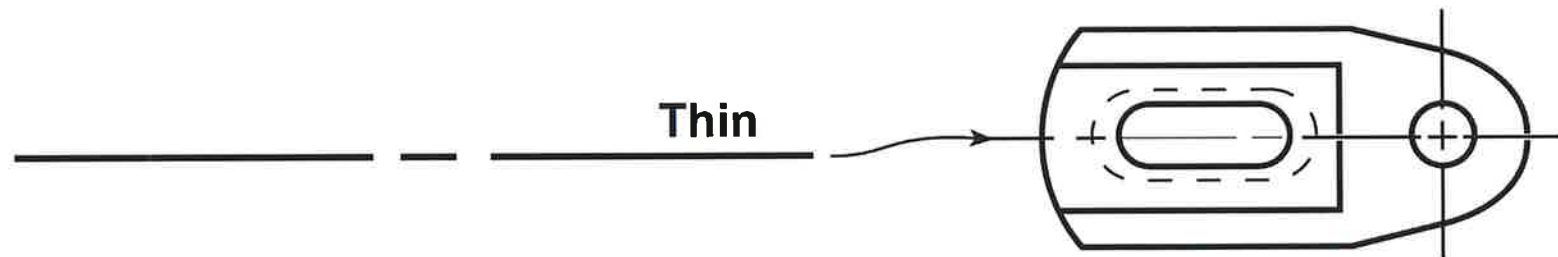
Basic Lines: Hidden (Invisible) Lines

- Consist of short, evenly-spaced dashes, they outline invisible or hidden surfaces that are not directly visible from the viewpoint.
- They are thin lines, about half as heavy as visible lines.
- They always begin with a dash in contact with the line from which they start, except when a dash would form a continuation of a solid line.



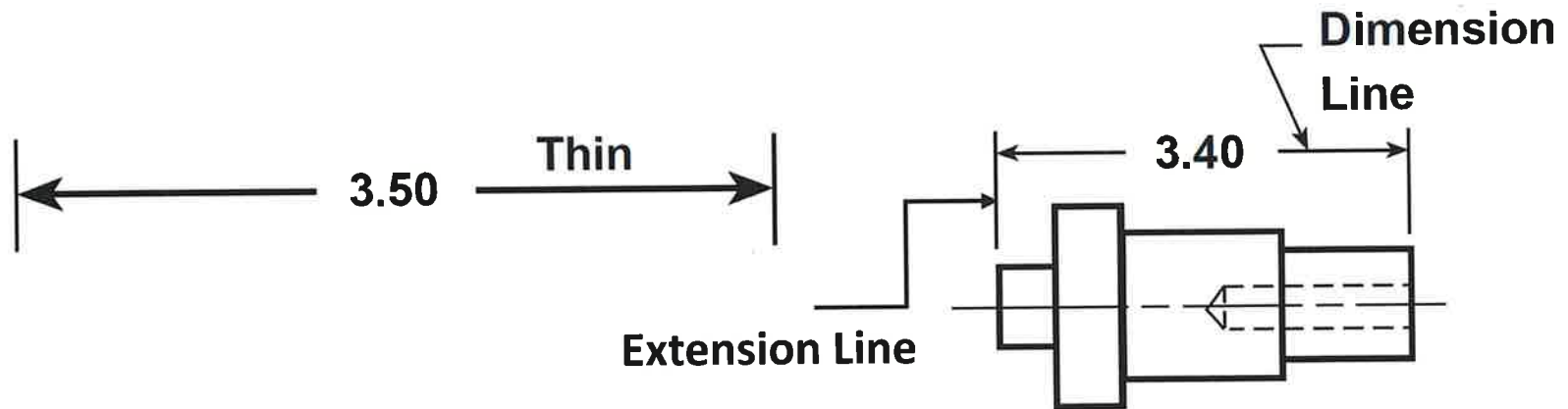
Basic Lines: Center Lines

- Consist of alternating long and short, evenly-spaced dashes, with a long dash at each end and short dashes at points of intersection. The lines are the same weight as invisible lines.
- Center lines indicate the central axis of an object or part, particularly circular objects or objects made up of circular or curved parts.
- They are also used to indicate the travel of a center.
- Whenever a complete circle or hole is shown on a drawing, both horizontal and vertical center lines are used to indicate the center point of the circle or hole.



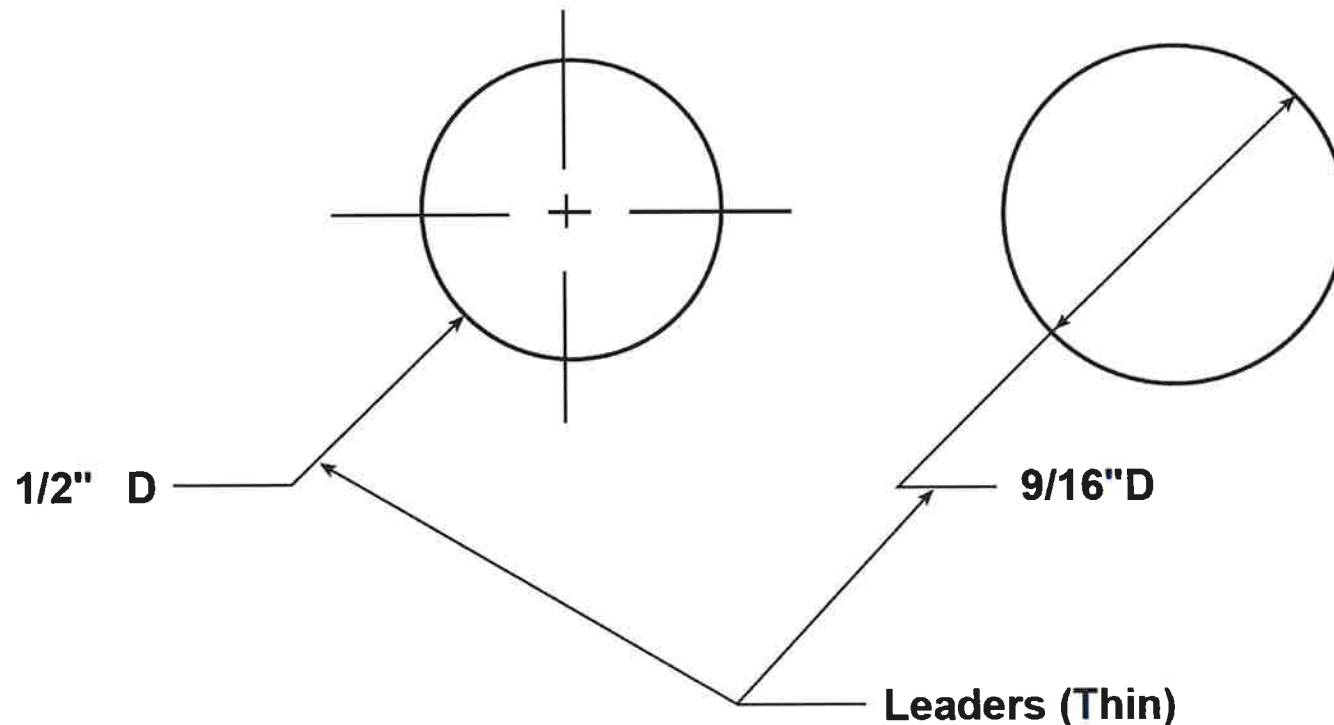
Basic Lines: Dimension and Extension Lines

- Short, solid lines that indicate the distance between two points on a drawing.
- They terminate or end in arrowheads at each end and are broken to insert the dimension.
- They extend from an outline or surface, but do not touch it.



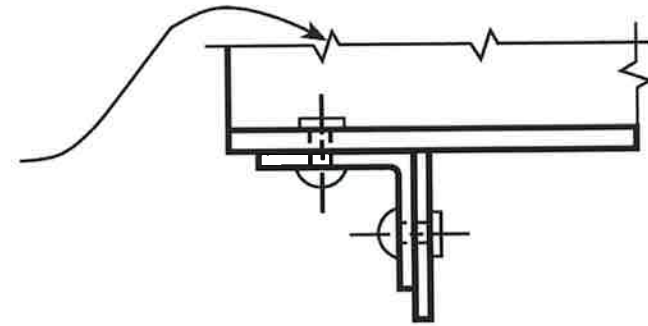
Basic Lines: Leader Lines (Leaders)

- Indicate the part or area of a drawing to which a number, note or other reference applies.
- Solid lines usually terminate in a single arrowhead.

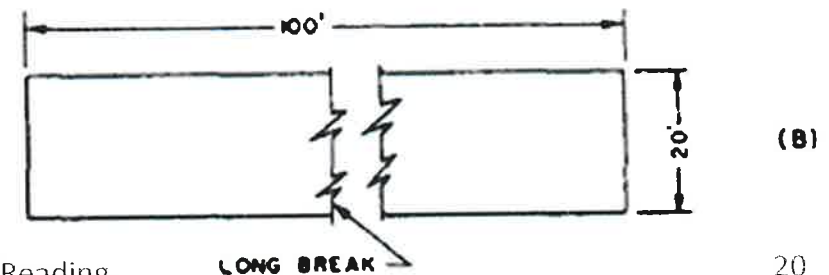
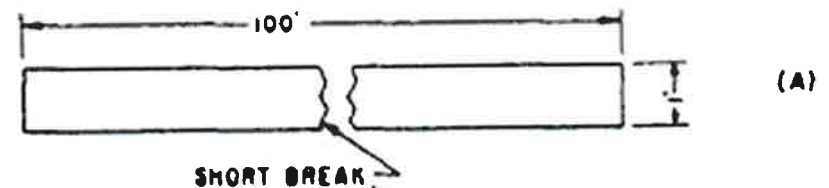


Basic Lines: Break Lines (1 of 2)

- Indicate that a part is broken out or removed to more clearly show the part (or parts) that lie directly below the broken-out part.

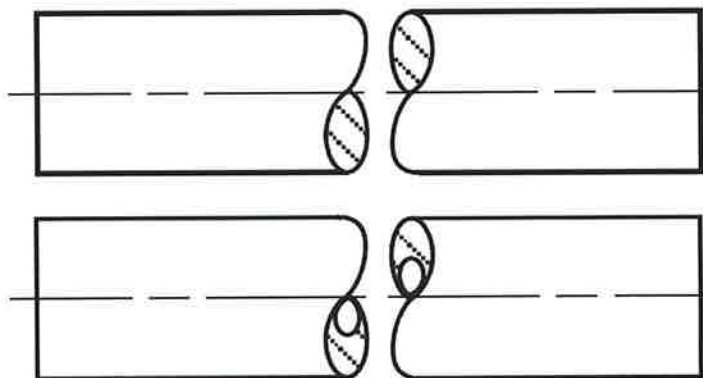
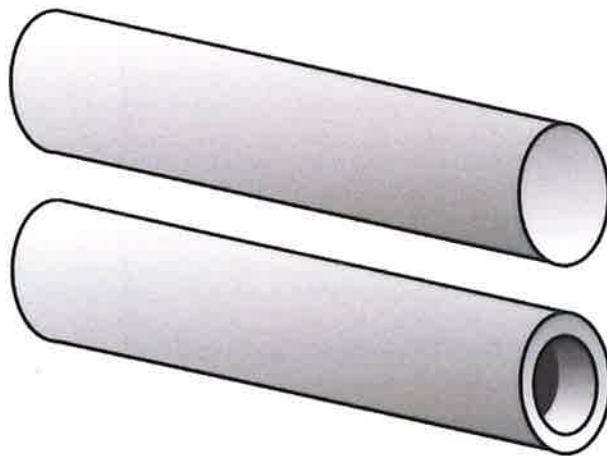


- Also used to reduce the size of the drawing of a long part having a uniform cross section so that it can be shown on a smaller sheet of paper.



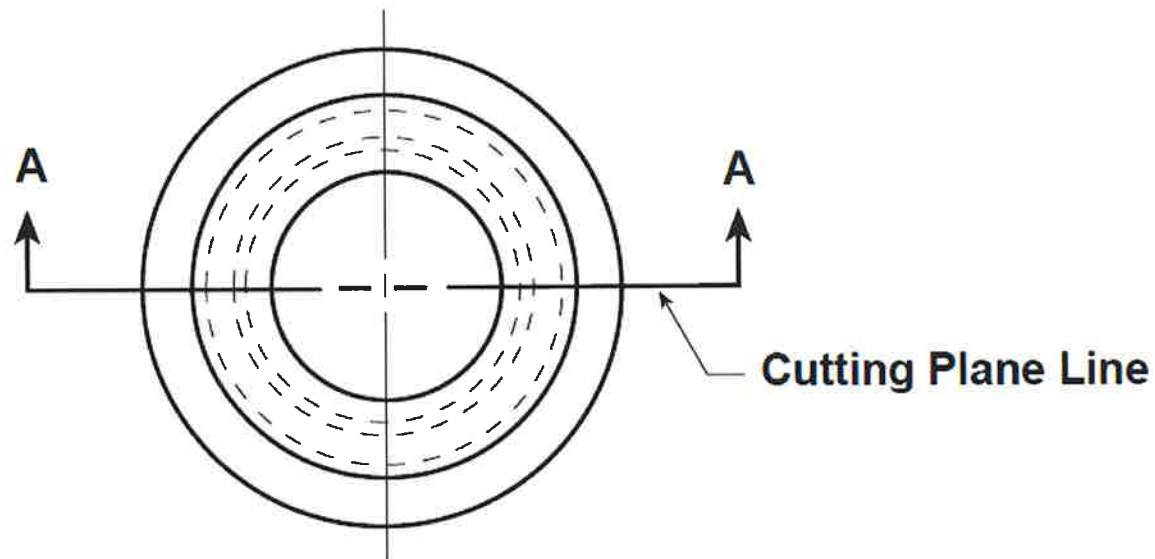
Basic Lines: Break Lines (2 of 2)

- Cylindrical Parts
- Breaks on shafts, rods, tubes, and pipes are curved.

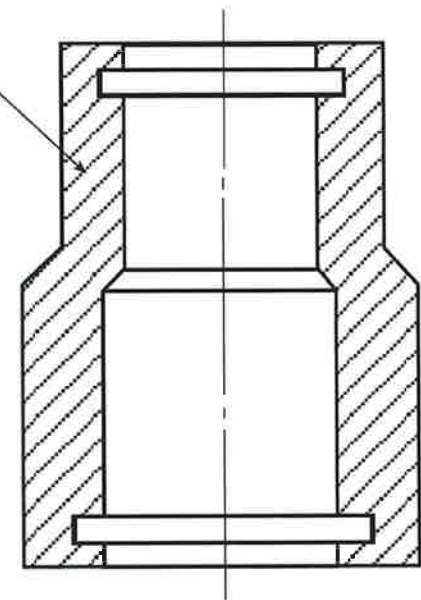


Basic Lines: Cutting Plane Lines

- Used to indicate where an imaginary cut is made through an object.
- The cut surface drawing is called a section.
- Usually labeled on each arrow and indicated section is redrawn in detail in another part of the drawing.



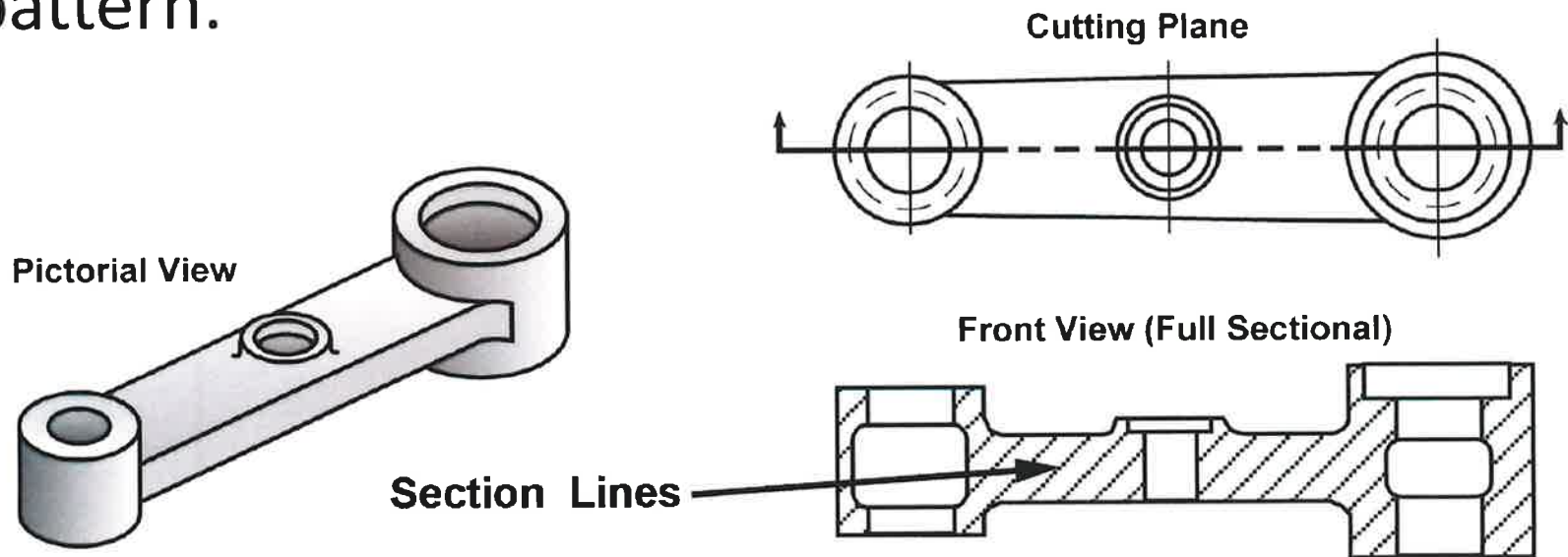
Section Lines



Sectional View A-A

Basic Lines: Section Lines

- Section lines, or crosshatch lines, distinguish between two separate parts that meet at a given point.
- Each part is lined or hatched in opposite directions with thin parallel lines placed approximately 1/16 inch apart at 30 degrees, 45 degrees, or 60 degrees across the exposed cut surface. Most section lines follow this pattern.



Common Symbols & Abbreviations

R Radius

Ø Diameter (2 x Radius)

° Degree

✓ Countersink

CSK

C / S

□ Counterbore

CBORE

⇓ Depth

FS Far Side

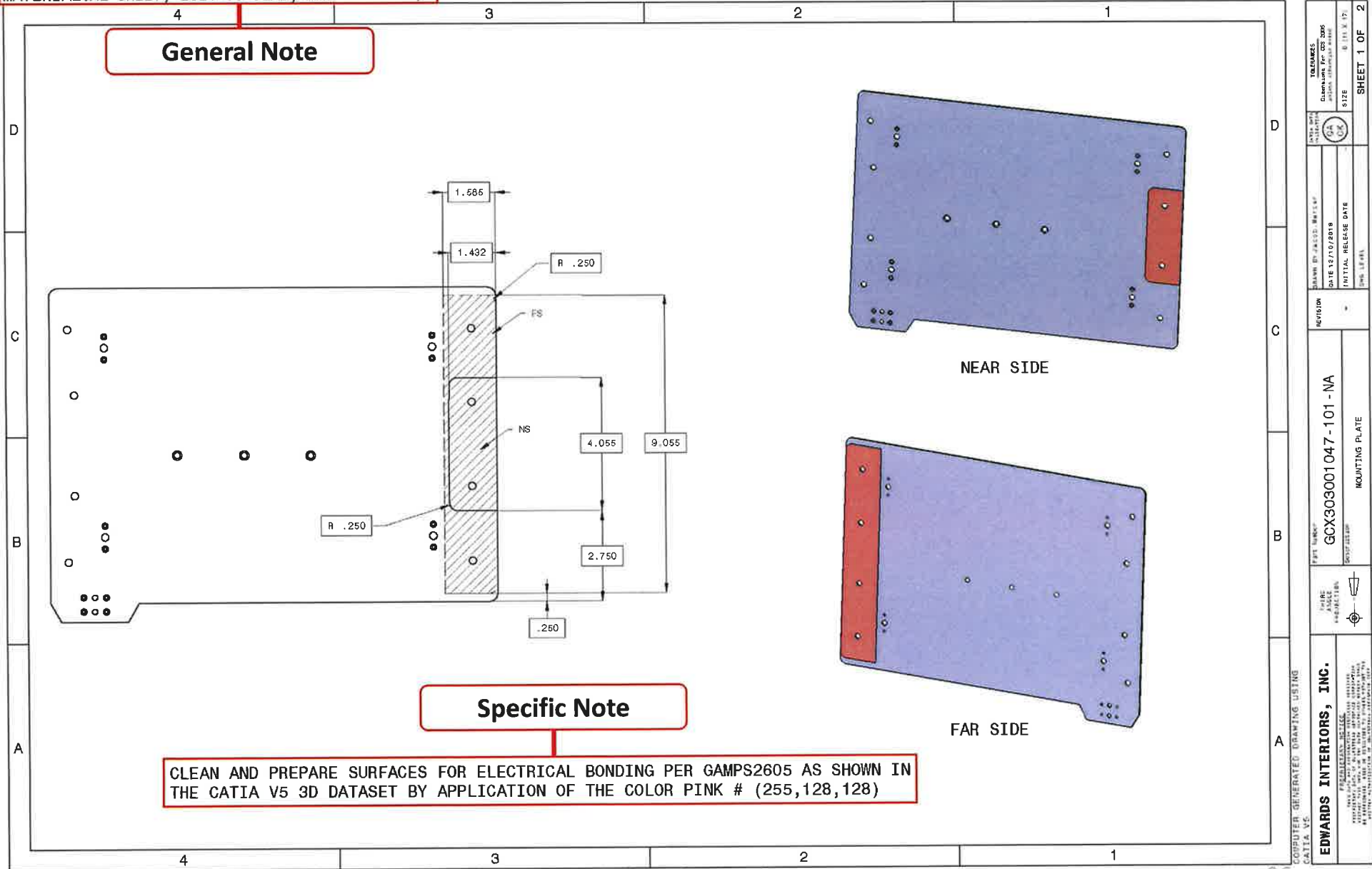
NS Near Side

Blueprint Parts: Shop Notes

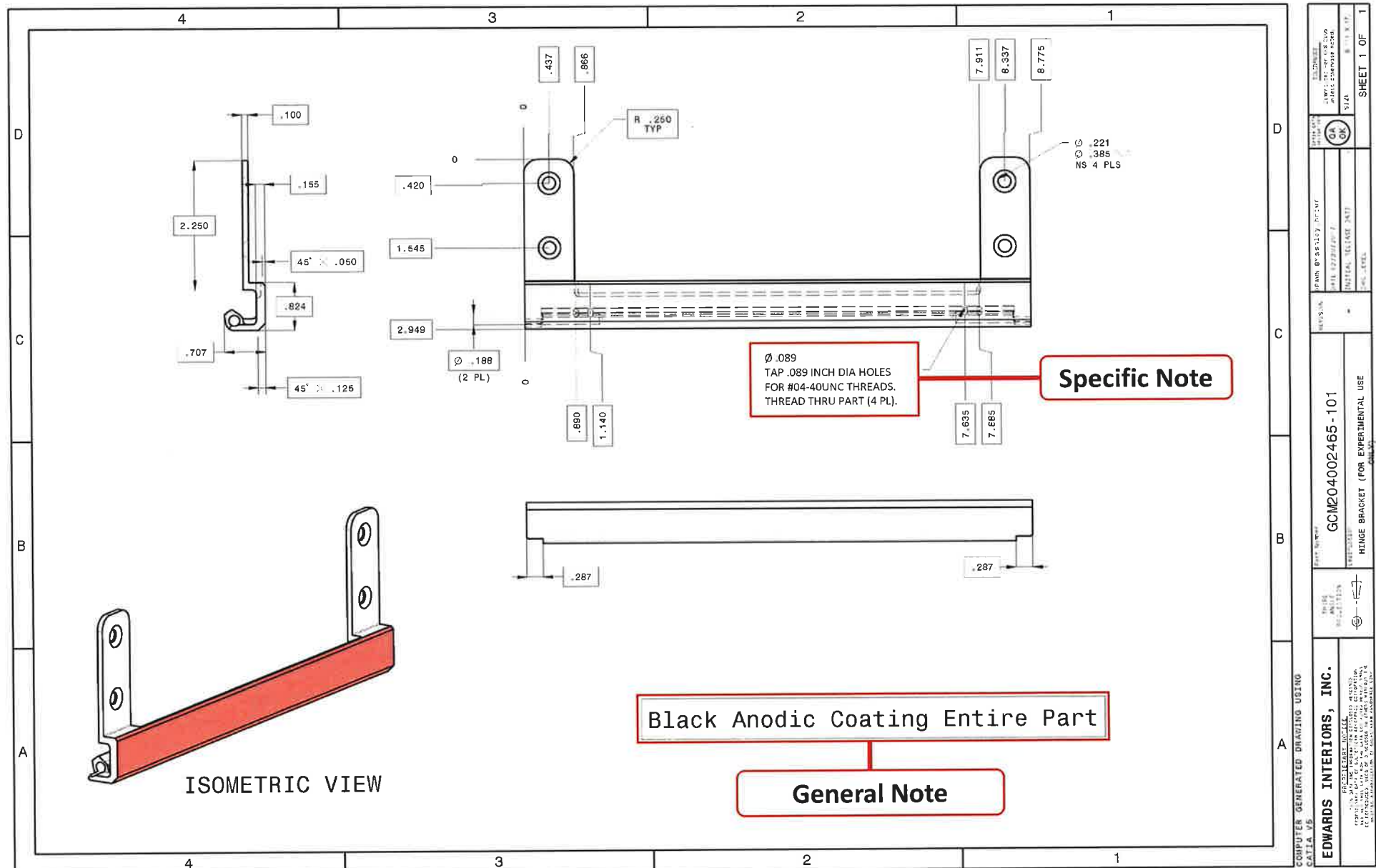
- Shop Notes normally provide information and instruction that cannot be given conveniently by any other means.
- There are two different types of shop notes:
 - General Notes apply to the drawing as a whole.
 - Specific Notes apply to particular parts of the drawing and are located near the area of the drawing to which they pertain.

Blueprint Parts: Shop Notes – Example 1

MATERIAL:AL SHEET, 2024-T3 CLAD, AMS-QQ-A-250/5



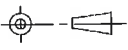
Blueprint Parts: Shop Notes – Example 2



Special Note: Revision Level

EII drawing number and revision level are the same as GAC.

- When GAC revises a drawing our drawing revises as well.
- When we make internal changes to a drawing it does not get a new revision level.
 - Adding another view.
 - Additional clarification of feature.
 - Etc.

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		GCM220008184 - 301		APPROVED BY	DATE		Dimensions Per CCS 2005 unless otherwise noted.
		Description		INITIAL RELEASE DATE			SIZE B (11 X 17)
		BRACKET ASSY, PSU		DWG LEVEL			S 1

Special Note: NA Drawings
NA: Next Assembly

- Ell internal part number.
- Created when original engineering (GAC) drawing is changed to add holes, normally for rivets.

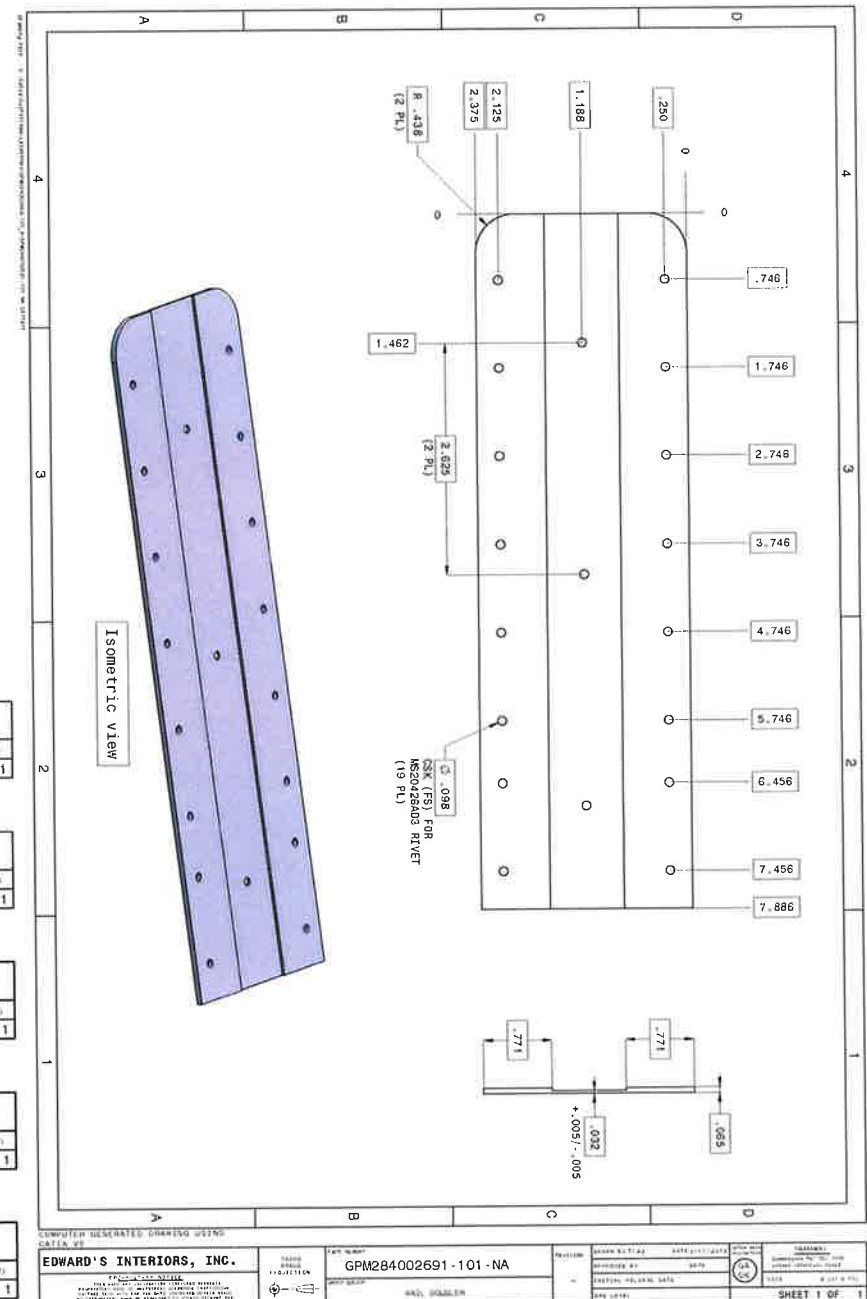
DATA V5		PART NUMBER		REVISION		DRAWN BY TTYW		DATE 2/27/2016		DATE AND INITIALS		TOLERANCES	
EDWARD'S INTERIORS, INC.		GPM28400269-101-NA				APPROVED BY		DATE					

DATA VS		INJED ANGLE PROJECTION		Part Number GPM284002691-101-NA1	REVISION =	DRAWN BY: RYAN APPROVED BY: DATE: DATE: 07/27/2016	10/24/2016 10/24/2016 10/24/2016	TO: EDWARDS FROM: RYAN 10/24/2016
EDWARDS INTERIORS, INC. PROPRIETARY NOTICE THE INFORMATION CONTAINED HEREIN IS THE PROPERTY OF EDWARDS INTERIORS, INC. AND IS NOT TO BE REPRODUCED OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF EDWARDS INTERIORS, INC.				Description RAIL DOUBLER	INTERNAL RELEASE DATE N/A LEVEL	0A 0A 0A	1/12 1/12 1/12	SHEET 1 OF 1

CATIA V5 EDWARDS INTERIORS, INC.		PART NUMBER GPM284002691-101-NA2	REVISION DRAWN BY JACOB-WP DATE 10/22/2018 APPROVED BY _____ DATE _____ (INITIALS, PLEASED, DATE) DWS, 8/26/18	TITLE BLOCK PART NAME RAIL DOUBLER	CUSTOMER HUNTER DOUGLAS 1914 WOODBRIDGE DRIVE WILMINGTON, DE 19381	SHEET 1 OF 1
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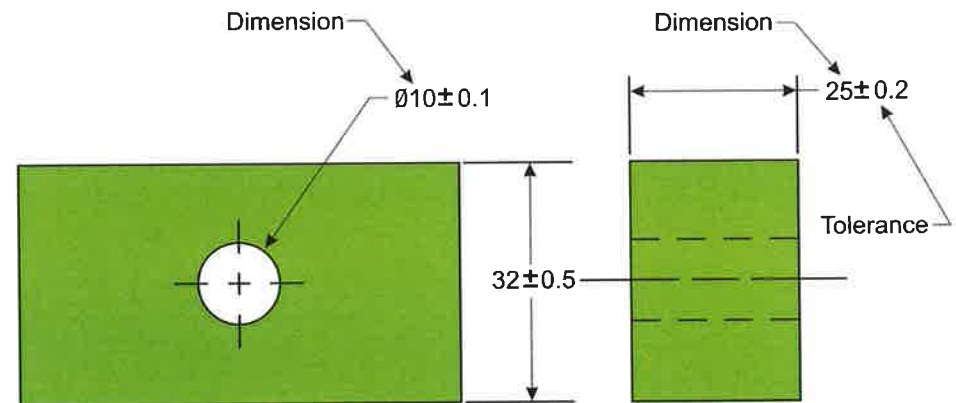
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EDWARD'S INTERIORS, INC.		GPM284002691-101-NA3				APPROVED BY _____ DATE _____		QA OK		SHEET 1 OF 1	
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CATIA V5		Part Number		Revision		Date and By		Quantity	
EDWARDS INTERIORS, INC.		GPM284002691-101-NA4		000001		DATE 02/20/2010		Quantity for QW 2000	
PROJECT: 284002691-101-NA4		DRAWING: 284002691-101-NA4		= INITIAL: 000001		DATE 02/20/2010		Quantity for QW 2000	
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								SHEET 1 OF 1	

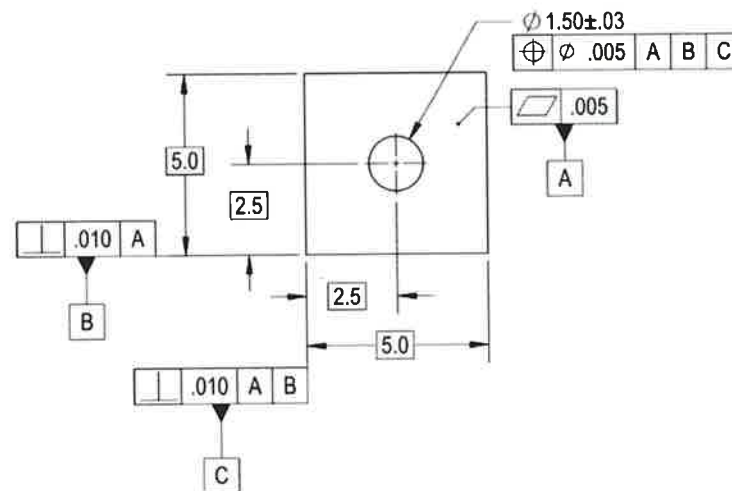


Two Types of Tolerances are Used on our Drawings

- Linear Dimensions with limit Tolerances



- Geometric Dimensioning and Tolerancing, (GD&T)



Linear Dimensions with limit Tolerances

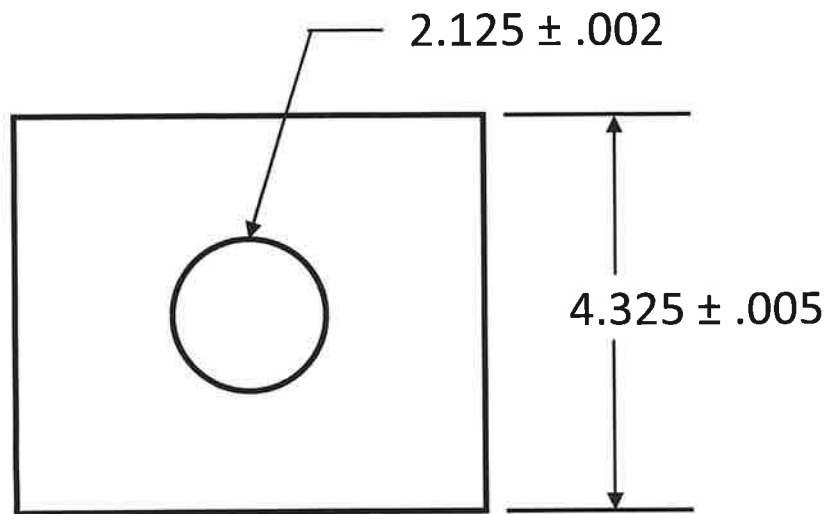
- A measurement is given, and then the tolerance is shown in acceptable Plus + (Over limit), and Minus – (Under Limit).

$\pm$ Means that the Tolerance is the same above limit and below limit.

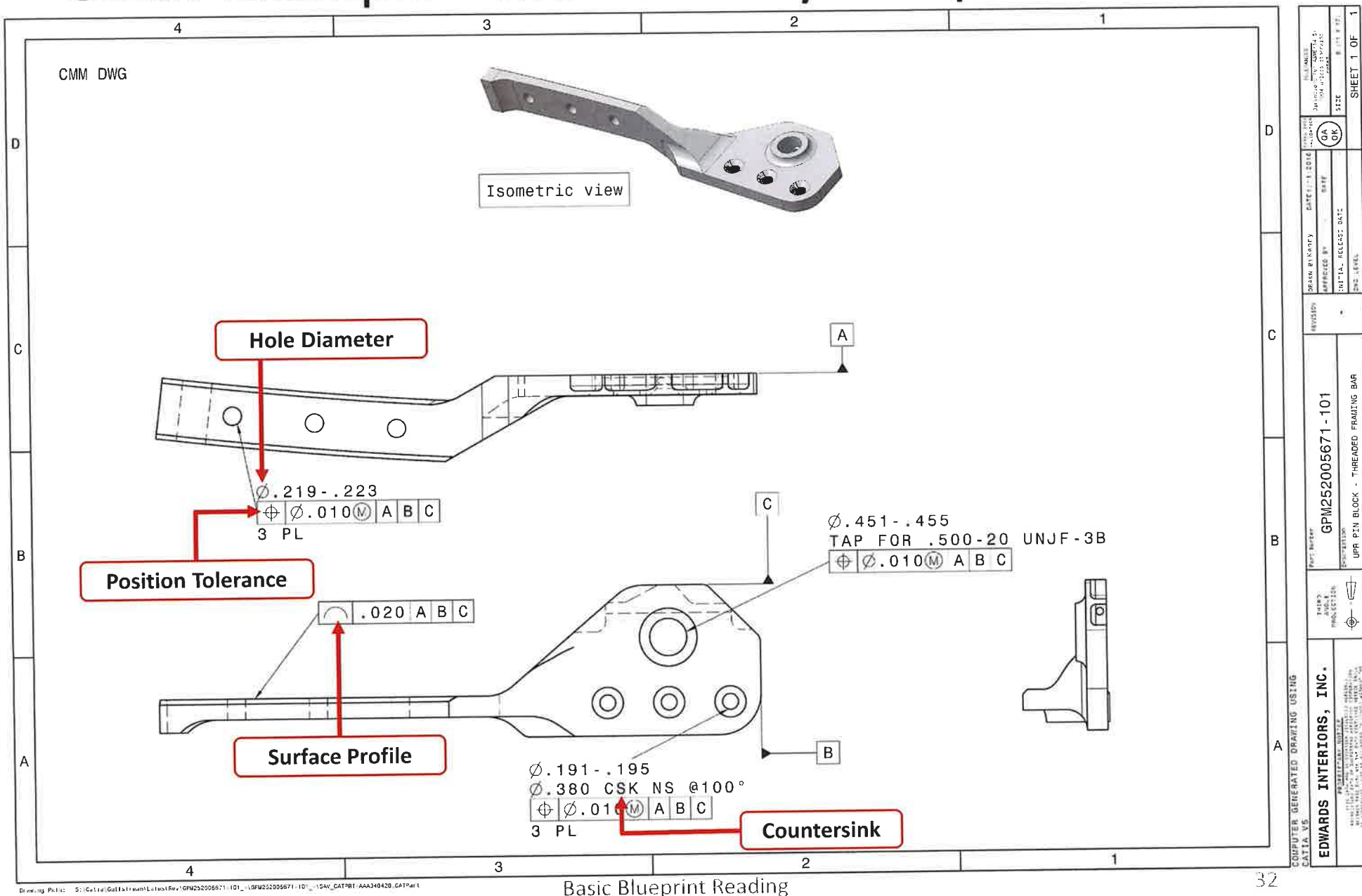
$\pm .002$ Means that the measurement can be Above or Below the Dimension by .002

$+ .005$
 $- .002$ Means that the measurement can be .005 Above the dimension, but only .002 Below.

$+.000$
 $-.005$ Means that the measurement cannot exceed the dimension but can go .005 Below.



GD&T Example – Measured by Computers



Coordinate Measuring Machine (CMM)

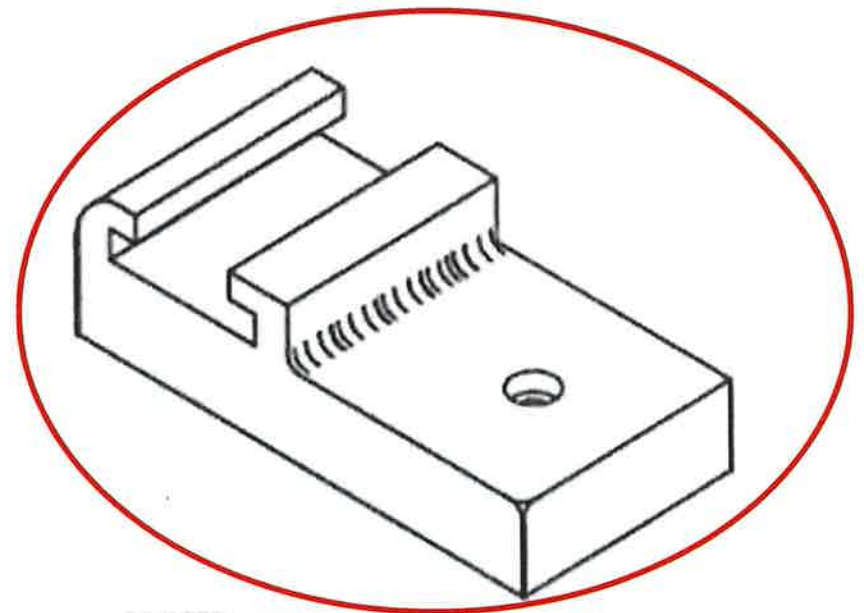
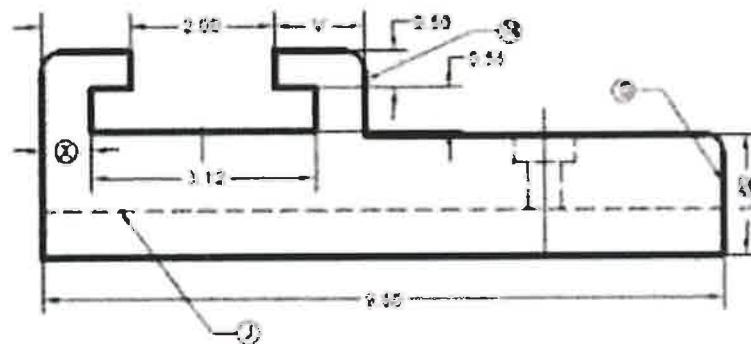
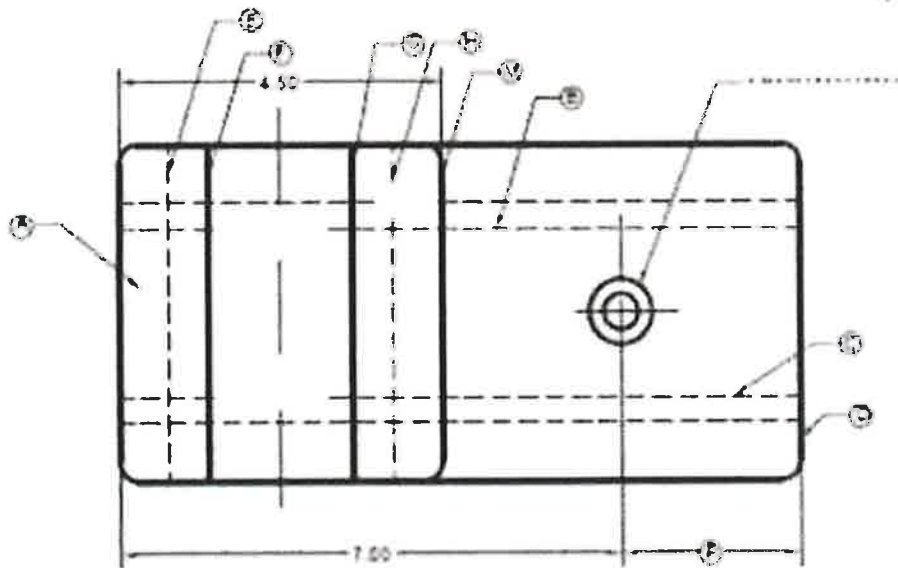
- We utilize FARO Arms for all CMM measurements.



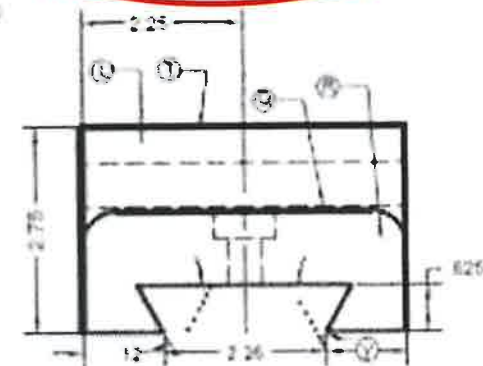
Examples of Nonconforming Parts

Part Problems: Example 1

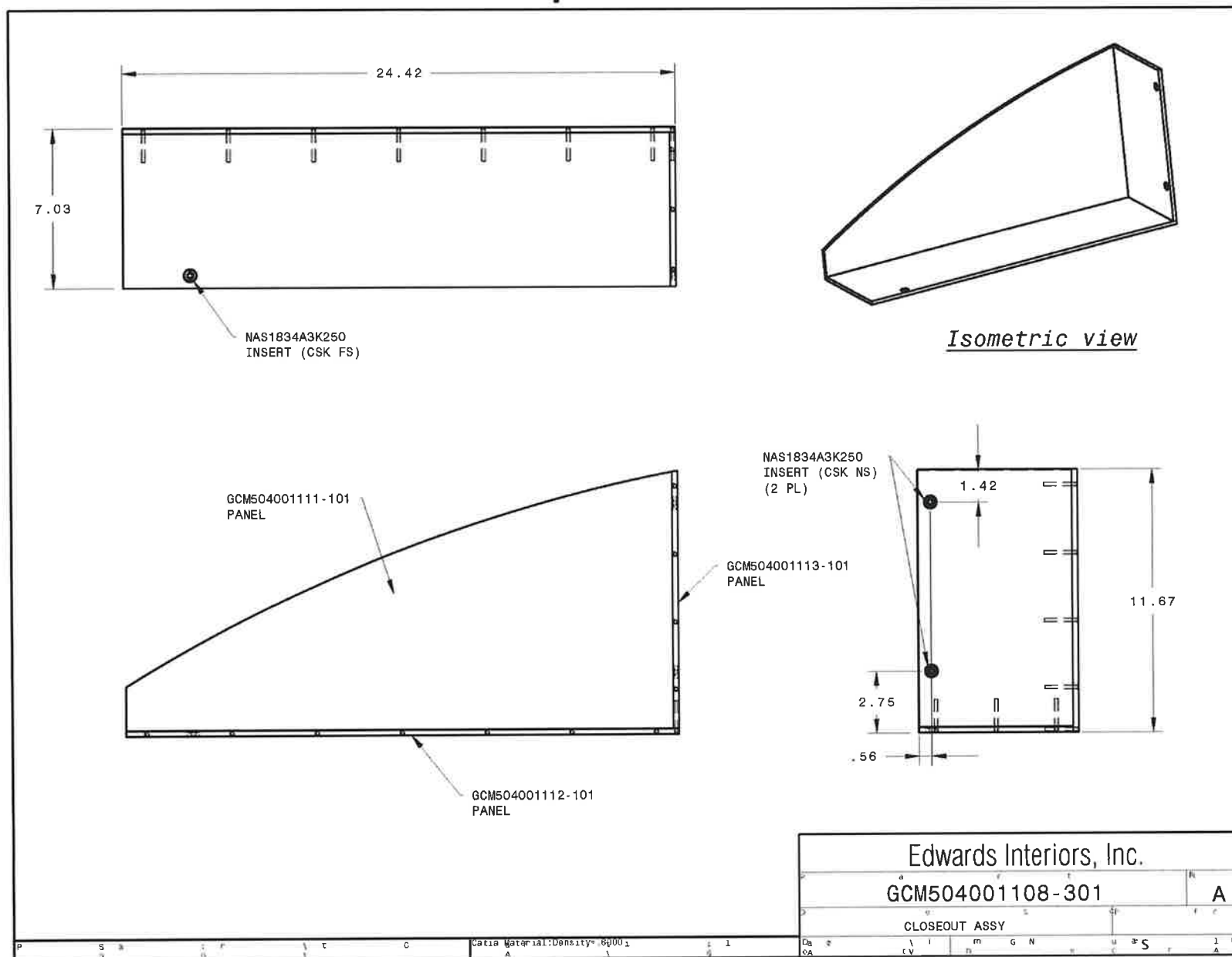
- Incorrect Isometric View



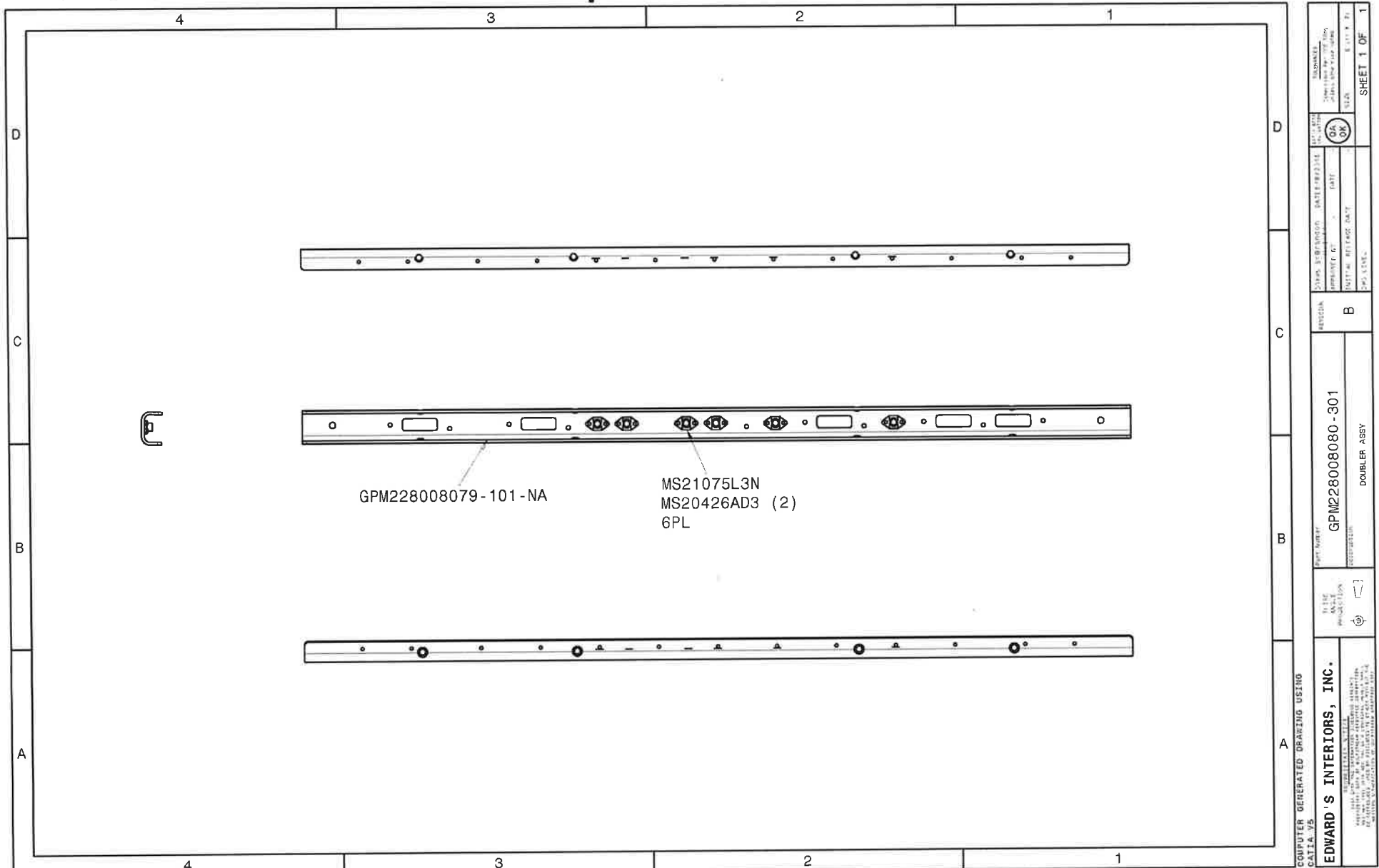
ROUNDED
CORNER



Part Problems: Example 2

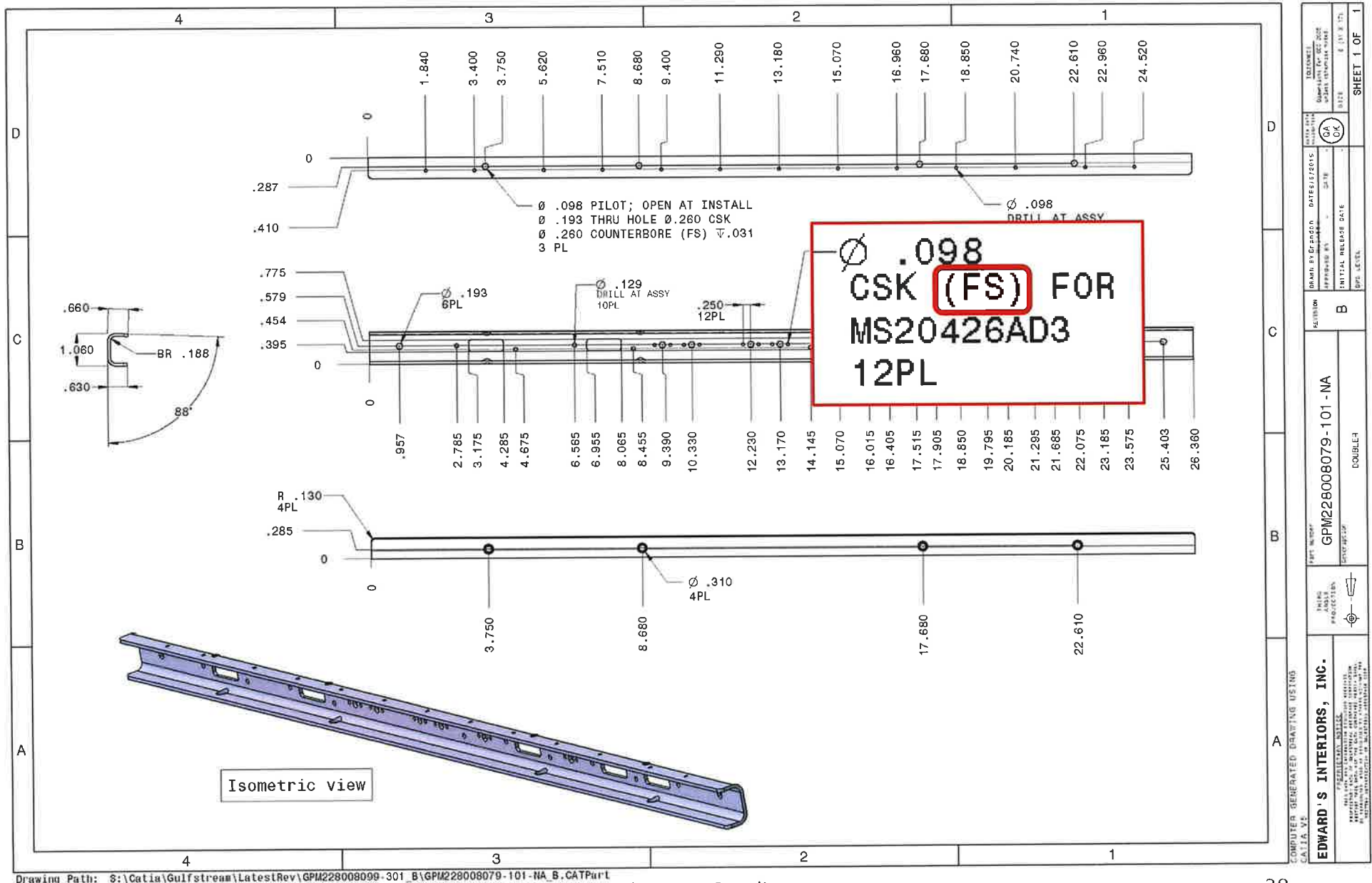


Part Problems: Example 3



Drawing Path: S:\Catia\Gulfstream\LatestRev\GPM228008099-301_B\SAV_CATPRD-AAA231845.CATProduct

Part Problems: Example 3 (Continued)



Isometric view
Scale: 2:3

19.14
18.26
17.16
11.77
6.34
1.00

45°

Ø .193 H-H HOLE
Ø .332 C-C HOLE @ 100"
(4 H)

1.00

Custom Metal Works
GSM512001069-101
CHANNEL
SHEET 1 OF 1

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 - AMOUNT- Count the parts to verify that you have the Amount it says you have
 - VERIFY that the Material Used matches the Material Callout on the BOM.
 - EQUATE – Take a moment to compare the part to the Isometric Drawing.

(Fun Fact)

A single Boeing 747 engine weighs around 9,500 pounds. About the same as an adult Elephant. And it has two on each wing.

Questions?