

# Horizontal Drift QA/QC Fiber Reinforced Plastic (FRP) Parts Preparation & Gluing Procedure

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SAM BLANCHARD

# Part Preparation and Cleaning

# Initial Visual Inspection

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Perform the following visual inspection of the material for the following defects

- Category 1 defects (severe)
- Category 2 defects (problematic if large)

# Category 1 Defects

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- Cracks
- Fractures
- Delamination (separation of two or more layers)
- Dry Fiber (lack of resin fill out)
- Burns or Thermal Decomposition
- Under-cured (dull or bleached surfaces)
- Wrinkles

# Category 2 Defects

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- Crater / Shrink Marks
- Craze (fine network of cracks)
- Chips (can't be more than 10 mm in length or width)
- Saw Burn (should be covered by resin / epoxy)
- Grooving (ok if material thickness reduction is less than 10% and the groove's width is less than 3 mm)
- Die Parting Line (within 0.5 mm and no loose fibers)

# Category 2 Defects (continued)

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- Porosity - Internal and Surface Voids (ok if does not affect structural integrity)
- Resin Rich Area (ok)
- Roving Knot (ok)
- Scale (ok if not sharp edges)
- Scuffing (ok if less than 30 cm long and 19 mm wide)
- Discoloration (ok)

# Scratches

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# Scuffing

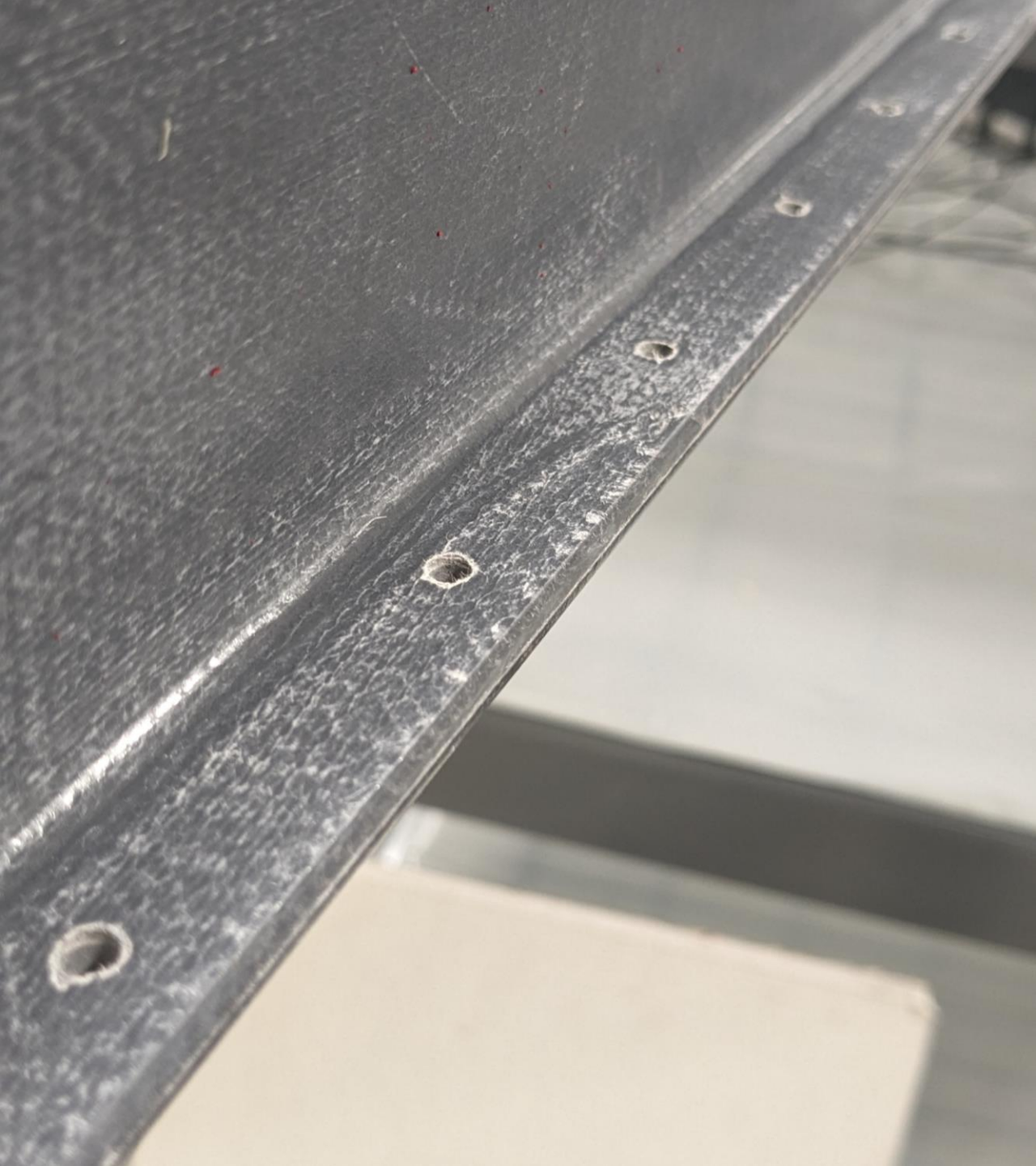
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# Craze and Scuffing

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Needs to be  
Deburred,  
Small  
Scuffing

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# Curves Too Much

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# Gluing That Failed

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# Deburring, Defibering, Sanding, Coating, and Cleaning of FRP Parts

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1. Debur machined holes and slots with the deburring tool to remove large remaining pieces of the FRP from all parts
2. Defiber using sandpaper. Start with 600 grit. Move to 1500 grit wet.
3. Clean the processed FRP part with clear “simple green” solution followed by de-ionized water, using the Kimwipe(s). Make sure that no lint is left over after the wiping.
4. Move the cleaned parts into the semi-clean area and dry them in air on a drying rack for 24 hours to remove all moisture.

# Deburring, Defibering, Sanding, Coating, and Cleaning of FRP Parts (cont.)

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5. Glue two reinforcement plates to either side of the main I-beams according to the drawing and the gluing procedure attached to this presentation. Let the glue cure sufficiently level to keep the plates in place.
6. Apply coating as uniformly as possible on all machined surfaces, excluding holes smaller than 1cm in diameter. Apply coating to surface defects on latch and main I-beam. Wipe excess coating material off the beams. Inspect the coating quality to ensure uniform application of the coat.
7. Let the coating dry and cure for at least 24 hours in the semi-clean area.
8. After 24 hours of curing, move the processed I-beams and latch beams to the semi-clean storage rack.



# Measuring

# Dimensional Inspection of the I-Beams, Latch Beams, and Reinforcement Plates

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- Perform a thorough visual inspection before taking measurements (Failed visual inspection will be noted).
- Dimension types inspected.
  - Length
  - Straightness
  - Flatness
  - Hole Position
  - Hole Diameters



# Critical Dimensions

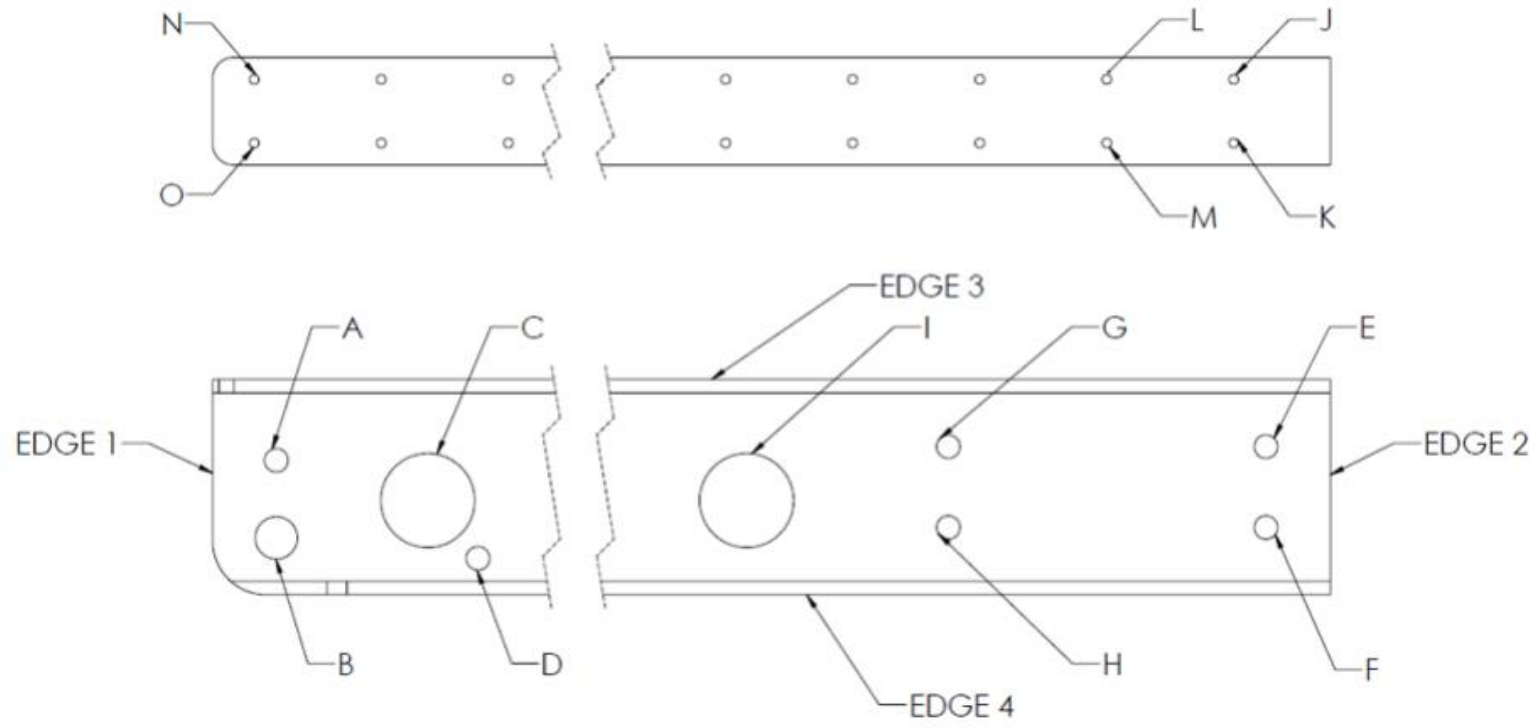
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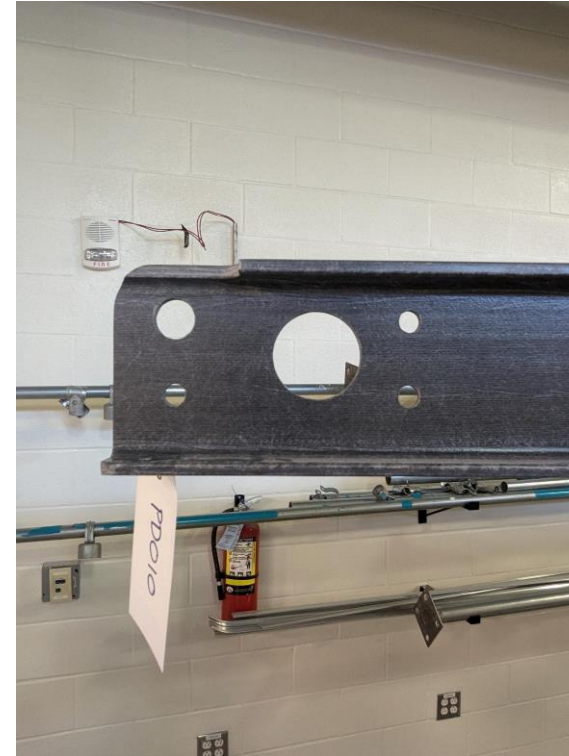
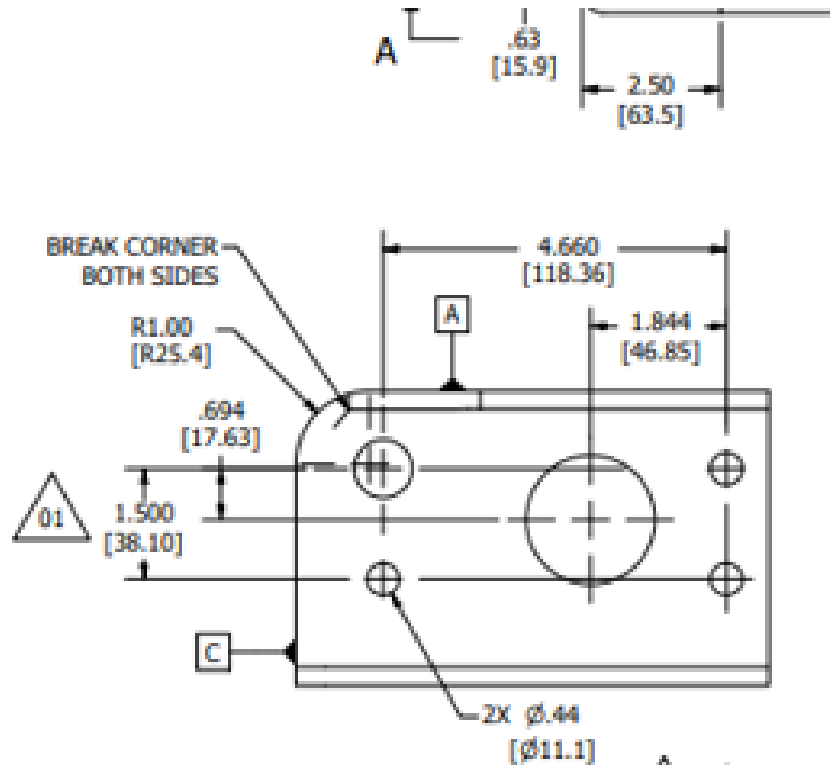
Critical dimensions – The distances between the adjacent slip-nut holes, diameter of hole B, the distance from edge I to hole B for Main I Beams, and diameter of hole B for the Reinforcement plates - must be verified within 0.010 in (0.25 mm).

- Jigs that adhere to the tolerances above are developed for a rapid quality control the critical dimensions of all FRP parts. Parts will be labeled pass or fail. Failed parts will be rejected. Passed parts will be inspected closer for qualifying them.

# Critical Dimension

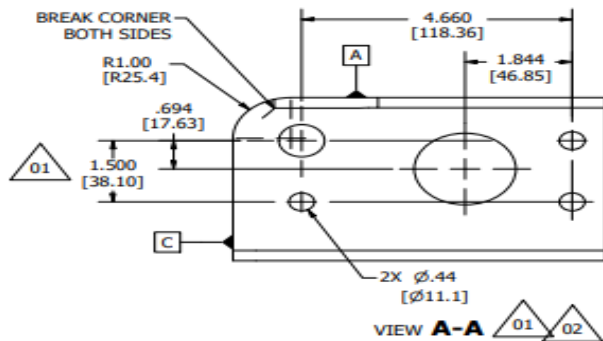
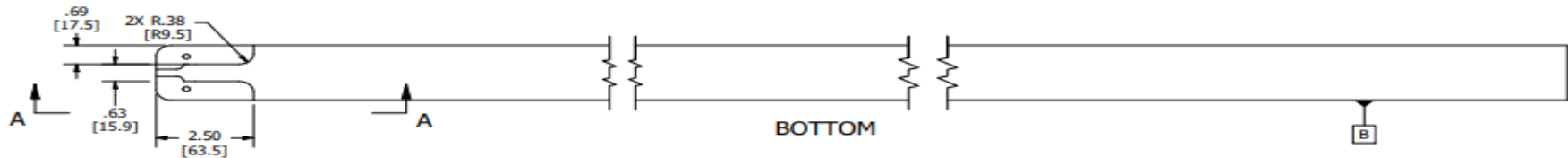
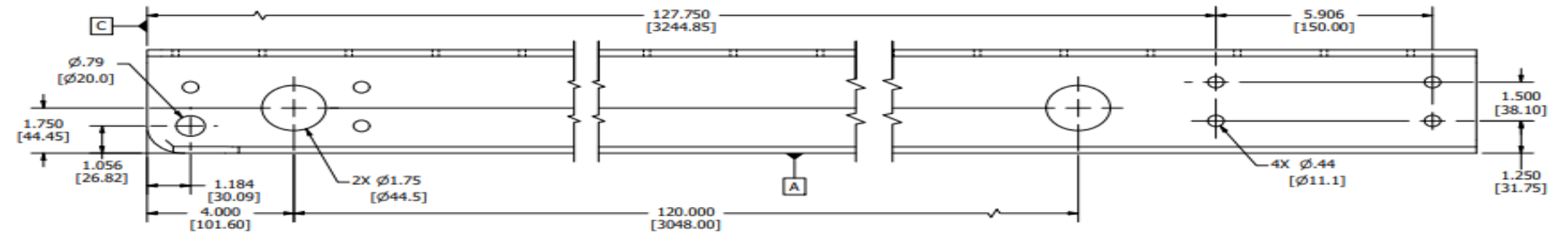
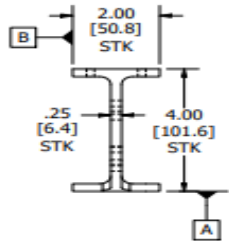
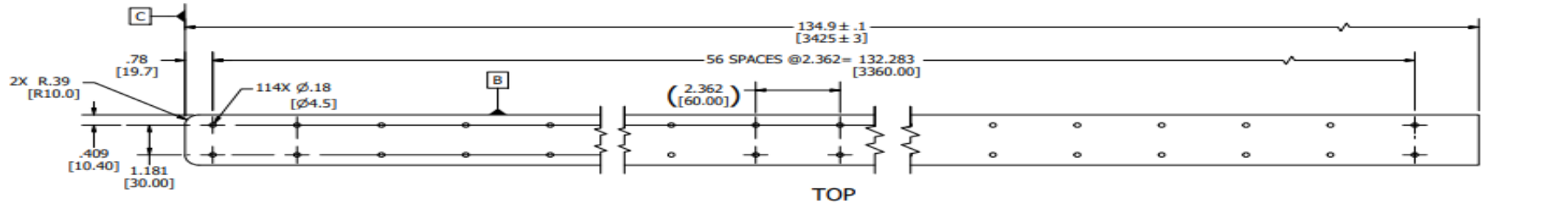
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# Most Important Section of I-Beam

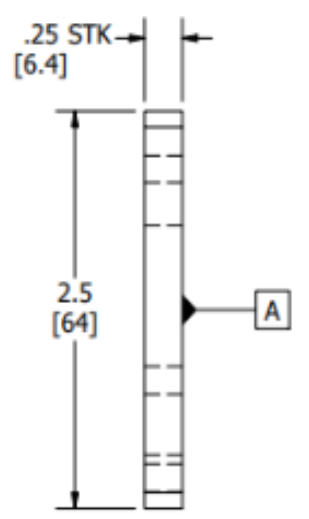
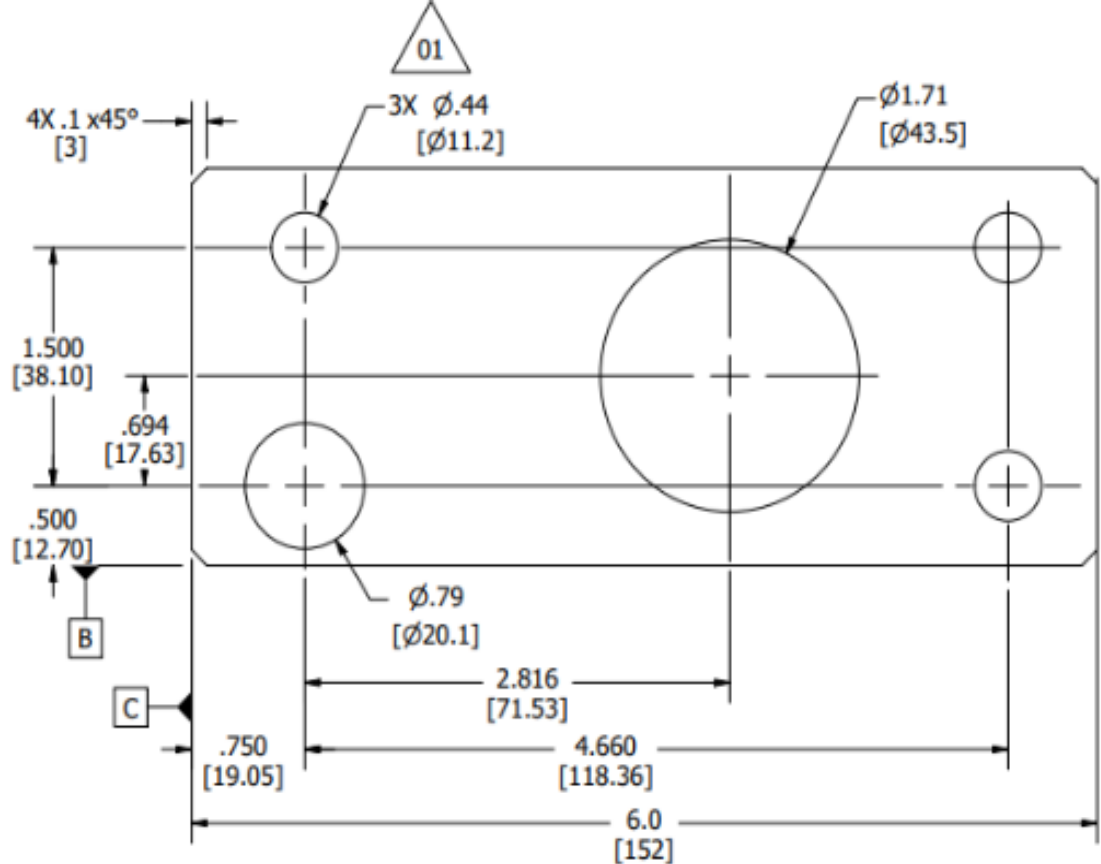
REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
B-4	01	ADD RADIUS, HOLES, & VIEW A	5/29/2020	RTK
A-4	02	ADD/MOVE HOLES; VIEW A	8/18/2021	RTK



- NOTE:
- 1 - ALL DIMENSIONS IN inches [mm]
  - 2 - ALL HOLES  $\varnothing .010 | A | B | C$  UNLESS OTHERWISE NOTED
  - 3 - ALL MACHINED / SAWCUT EDGES TO BE COATED WITH 3M #2216 TRANSLUCENT EPOXY. DO NOT COAT HOLES Ø.50 OR SMALLER.

UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE INCHES DECIMAL TOLERANCE: X .1 XX .01 XXX .005 ANGULAR TOL FRACTIONAL TOL	STATUS: <b>RELEASED</b>	DO NOT SCALE DRAWING		Argonne NATIONAL LABORATORY	NEXT ASSEMBLY: DFD-21-2100	QTY. REQD
	DRAWN BY: <b>RTKMAK</b>	DATE: 9/13/2019	GROUP LEADER:		DATE:	DESCRIPTION: <b>MAIN BEAM</b>
CHECKED BY:	DATE:	PROJECT MGR:	DATE:	PROJECT: DUNE-FAR DETECTOR	PROJECT NUMBER: P011001642	REV
					<b>DFD-21-2101</b>	<b>02</b>

RELEASED SEPT 29 2022



- NOTE:
- 1 - ALL DIMENSIONS IN inches [mm]
  - 2 - ALL HOLES  $\pm .010$  A B C UNLESS OTHERWISE NOTED
  - 3 - ALL MACHINED / SAWCUT EDGES TO BE COATED WITH 3M #2216 TRANSLUCENT EPOXY. DO NOT COAT HOLES  $\phi .50$  OR SMALLER.

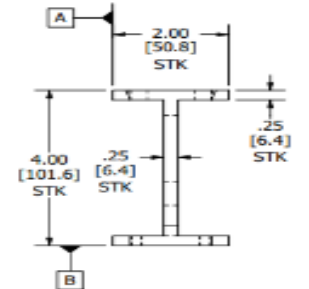
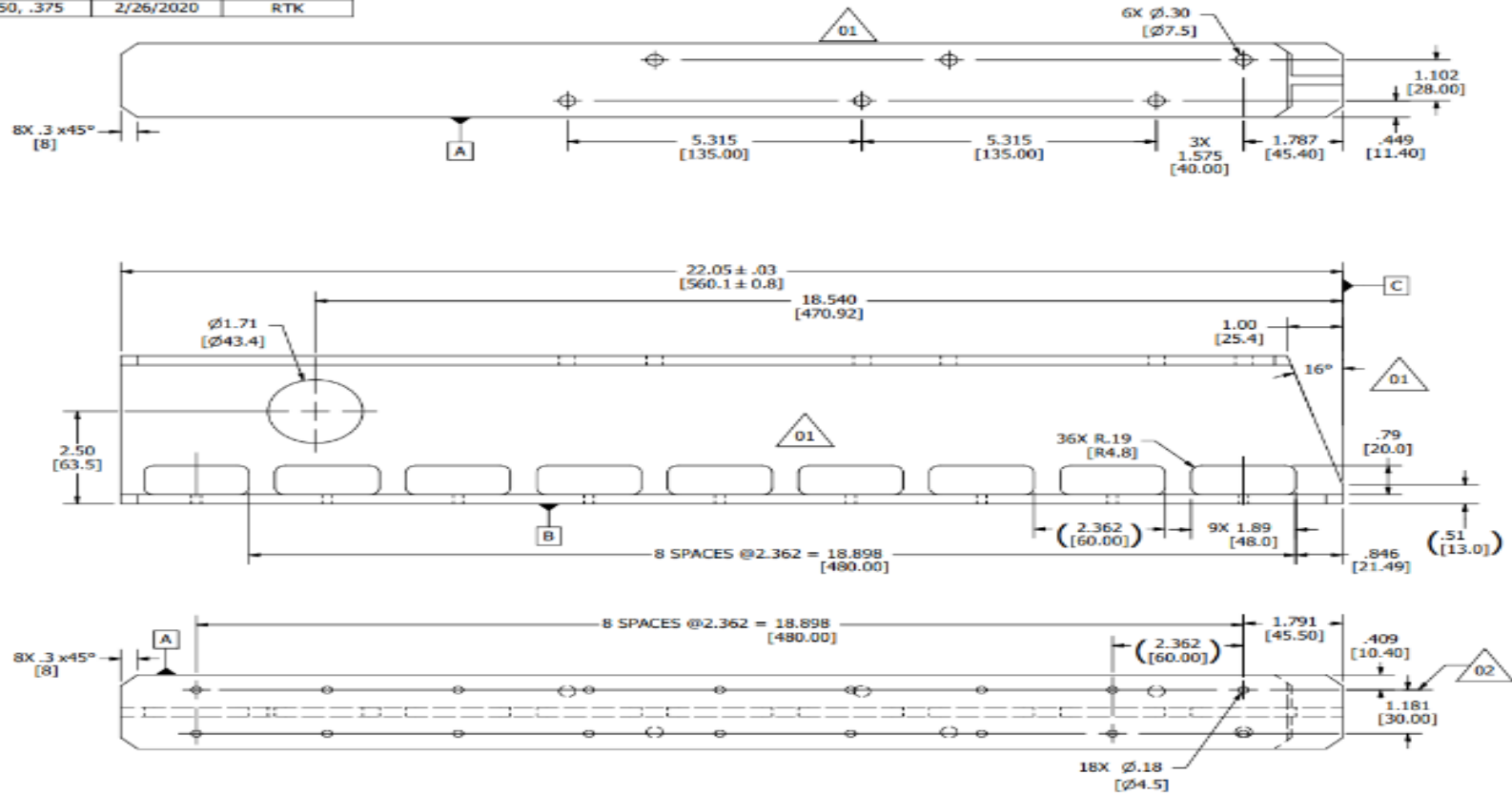
UNLESS OTHERWISE NOTED  
ALL DIMENSIONS ARE IN INCHES  
DECIMAL TOLERANCE  
X  $\pm .1$   
.XX  $\pm .01$   
.XXX  $\pm .005$   
ANGULAR TOL  $\pm 1/2$   
FRACTIONAL TOL  $\pm 1/64$   
THIRD ANGLE PROJECTION  
REMOVE ALL BURRS AND SHARP EDGES SURFACES TO BE IN ACCORDANCE WITH LATEST ANSI B96.1 DIMENSIONS & TOLERANCES IN ACCORDANCE WITH LATEST ASME Y14.5M

STATUS <b>RELEASED</b>		DO NOT SCALE DRAWING	
DRAWN BY <b>RTKMAK</b>	DATE <b>9/17/2019</b>	GROUP LEADER	DATE
CHECKED BY	DATE	PROJECT MGR	DATE
RESPONSIBLE ENGINEER <b>V GUARINO</b>	DATE	APVD/RELEASED	DATE
MATERIAL <b>FRP, Flame Resistant</b>	SCALE <b>1 : 1</b>	SHEET <b>1 OF 1</b>	SHEET SIZE <b>B</b>

	NEXT ASSEMBLY: <b>DFD-21-2100</b>	REV. BY
	DESCRIPTION: <b>REINFORCEMENT PLATE</b>	
PROJECT: DUNE-FAR DETECTOR		PROJECT NUMBER: PRJ1033642
PART NUMBER: <b>DFD-21-2107</b>		REV <b>02</b>

RELEASED SEPT 29 2022

REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED
2	01	ADD 16° CUT & TOP HOLES; REM. OBSOLETE HOLES & SLOTS	1/2/2020	RTK
	02	1.181, .409 was 1.250, .375	2/26/2020	RTK



- NOTE:
- 1 - ALL DIMENSIONS IN inches [mm]
  - 2 - ALL HOLES & SLOTS  $\pm .010$  [A][B] UNLESS OTHERWISE NOTED
  - 3 - ALL MACHINED / SAWCUT EDGES TO BE COATED WITH 3M #2216 TRANSLUCENT EPOXY. DO NOT COAT HOLES  $\phi .50$  OR SMALLER.

UNLESS OTHERWISE NOTED  
ALL DIMENSIONS ARE IN INCHES  
FRACTIONAL TOLERANCE  
X .1  
XX .01  
XXX .005  
ANGULAR TOL. ± .02  
FRACTIONAL TOL. ± .004

THREAD PROJECTION

REMOVE ALL BURRS AND SHARP CORNERS TO BE IN ACCORDANCE WITH ASSEMBLY AND TEST PROCEDURES & THE PROGRAM IN ACCORDANCE WITH ASTM A955-11A

STATUS		DO NOT SCALE DRAWING	
RELEASED	DATE	GROUP LEADER	DATE
DRAWN BY RTKMAK	12/11/2019		
CHECKED BY	DATE	PROJECT MGR	DATE
RESPONSIBLE ENGINEER V. GUARINO	DATE	APP. RELEASED	DATE
MATERIAL FRP, Flame Resistant	SCALE 1:1	SHEET 1 OF 1	SHEET SIZE C

Argonne NATIONAL LABORATORY		PROJECT ASSEMBLY	QTY. REQ'D
		DFD-21-2100	
LATCH BEAM			
PROJECT: DUNE-FAR DETECTOR		PROJECT NUMBER: PSL180642	
PART NUMBER: DFD-21-2111		REV	
		02	

RELEASED SEPT 29 2022

# Basic Tolerancing of Parts

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All tolerances in the drawings follow a rule unless otherwise specified.

(all measurements in inches)

.X       $\pm 0.1$

.XX      $\pm 0.01$

.XXX     $\pm 0.005$

There is one exception in the drawings

All positions of holes must be  $\pm 0.01$  of their specified dimension in relation to edges A,B, and C



# Using Jigs

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# Gluing Procedure for Reinforcement Plate

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# Materials

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- FRP Reinforcement Plates
- 3M #2216 Translucent Epoxy
- Silicone Brush and Knife
- C-clamps or Vice Grips
- PPE: Latex Gloves, Coat, Glasses

# Reinforcement Plate Preparation

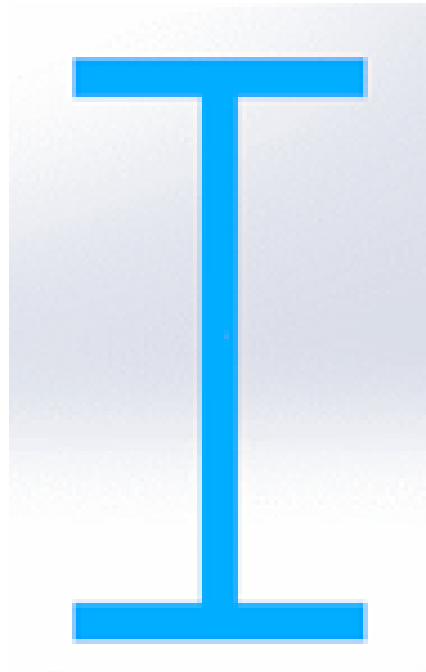
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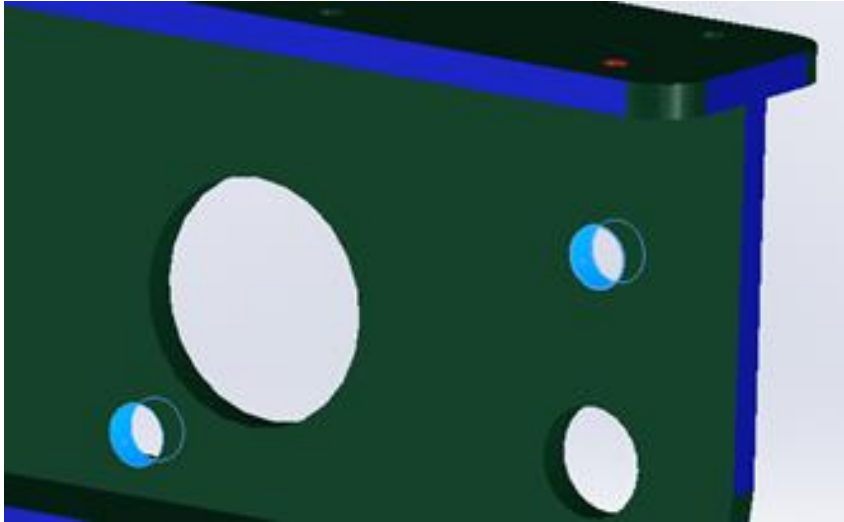
- Make sure Reinforcement Plates are sanded properly (edges need to be filleted)
- o Left and Right Reinforcement Plates should be clearly distinguishable.
- o Clean, wash, and dry with Kim Wipes.
- o Pair reinforcement plates with I-beam (2 reinforcement plates for each main I-beam).
- o Wait 24 hours to dry.

# Procedure

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Place I beam in the vertical position





# Procedure

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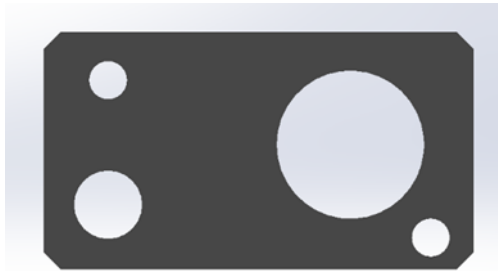
- Insert two alignment pegs into alignment holes.



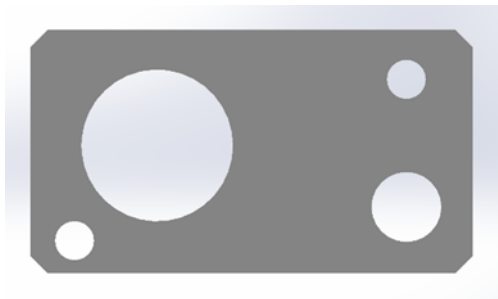
# Procedure

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- Apply glue onto inner surface of plates using the brush as evenly as possible.
- o Left Reinforcement Plate inner surface



- o Right Reinforcement Plate inner surface



# Procedure

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- Carefully place plates onto I-beam using the alignment pegs as guides.
- Clamp the plates in place.



# Procedure

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- Excess glue seeping out from the plates should be scraped off immediately.
- Wait 1 minute and remove the alignment pegs.
- Remove C-clamps after two hours for sufficient level of curing.
- Move I Beam to storage rack





# Conclusion

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QA/QC consists of –

- Checking parts for initial damage
- Checking the dimensions of parts
- Gluing reinforcement plates

END