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BBT Side Mold Assy

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Overview of the CADD/CNC Data Set
for the
BBT Side Mold Assy & Spreaders
for STEM Guitar Project's BBT Acoustic Guitar Kit

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Department of Engineering, Engineering Technology, & Surveying

Mr. Bill Hemphill, Associate Professor
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ETSU Guitar Building Project

- For use with the STEM Guitar Project's "BBT" Acoustic Guitar Kit
- Data set provided "as is"
  - No warranty; Use at your own risk
- Licensing Information: CC BY-SA 4.0
  - Preferred Attribution:
    BBT Side Mold Assy & Spreaders, CNC Toolpaths, Drill Template, & Layout for CNC designed by Bill Hemphill, ETSU Guitar Building

ETSU Guitar Building Project

- For information regarding specifics of CADD layer naming and such, please refer to the following documentation:

Design Standards & Best Practices for CADD/CAM/CNC

Available URL:
https://faculty.etsu.edu/hemphill/pdf/ETSU_Standards-CADD_CAM_CNC-Latest_Rev.pdf

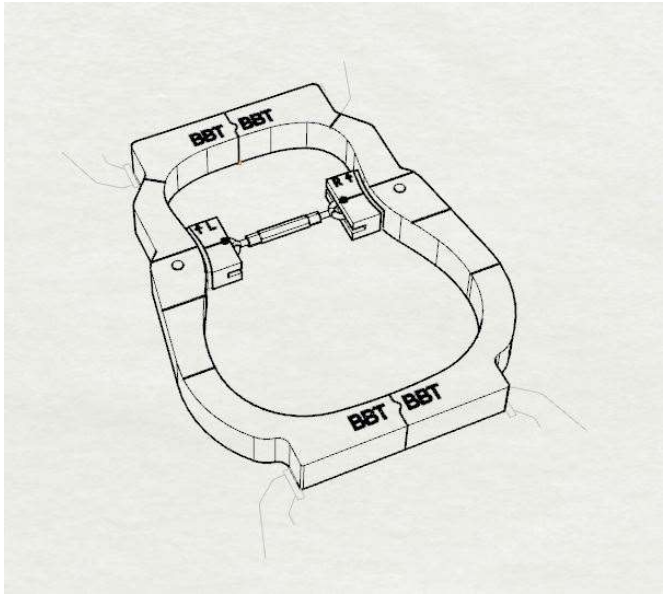
ETSU Guitar Building Project

- Our Primary CNC Lab Equipment:
  - AXYZ CNC Router (12’ x 5’)
    - ToolPath CAM package
    - Default T-Slot Spacing: 6.25 inches
    - ½” DIA 2” LOC down cut router bits
  - ULS 75-Watt CO_2 Laser System (2’ x 4’)
    - Raster Etch: Formatted Font is Arial
    - Templates: 0.08” PETG (transparent)
    - Bracing: 3mm Baltic birch plywood

ETSU Guitar Building Project

- Applicable Manual Equipment
  - Table saw
  - Drill press
    - Nominal ½” DIA holes
      - THRU for mounting the work piece(s)
      - To set depth for ½” DIA spiral down cut bit
  - Table router
    - 3/8” DIA flush cut bit (parts cut out)
    - 1/8” Round over bit (edge relief)

BBT Side Mold Assy Development Overview



- 3rd Gen. BBT Side Mold Assy Design
  - 32” x 16” x 2¼”
  - 3 Assys per 4’x8’ sheet
  - Laminated ‘cabinet-grade’ ¾” plywood
  - Straps, clamps, or toggles
  - Fits nom 24” x 18” Go-Bar Deck

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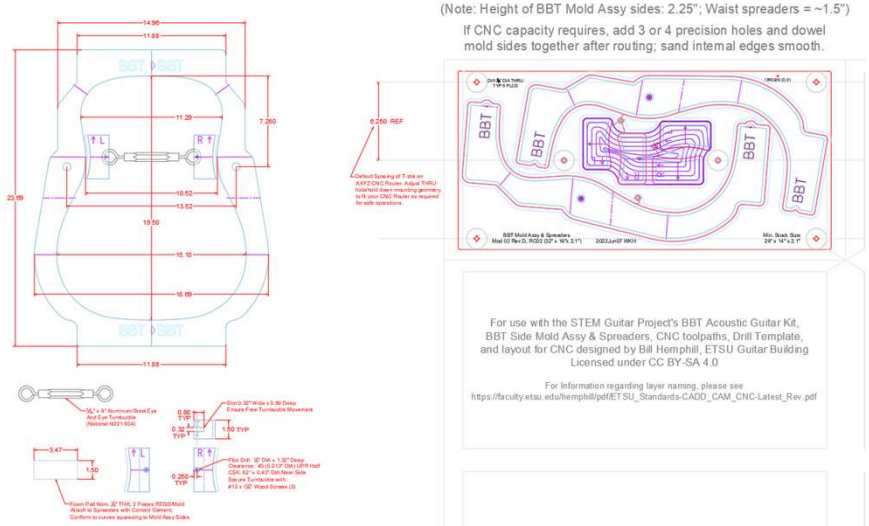
BBT Mold Assy Master CADD File

Primary or “Parent’ 2D CADD data file:

BBT_Mold-M02D-RC02-32_x_16-2022Jun07.dwg



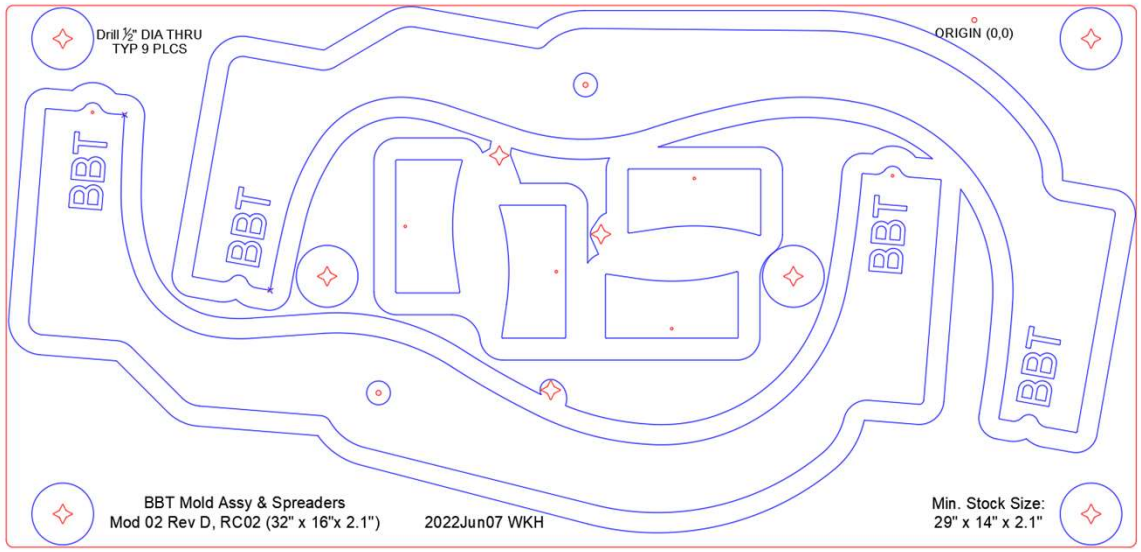
- All layers: edges, centerline tool paths, laser- cut drill templates, origin(s), reference data, stock sizes, etc.
- Saved in AutoCAD 2007 .DWG format
- Includes all “exportable data” in generic and/or ETSU’s “as built” format(s)

BBT Side Mold Assy Layout & Drill Template

Filename:

Laser-Template-BBT_Mold-M02D-RC02-32_x_16-2022Jun07.dwg

- Formatted for ULS print/plot
  - Recommended template material: transparent 80 mil PETG
  - Optimized for nominal 32” x 16” x ¾” sheet stock;
    Waist Spreaders (2 pair) inside ¾” deep pocket (i.e., ~1½” tall to fit inside sound box
    - Designed to be removed through sound hole after sound box is buttoned up



Layer properties
(in ULS run order):

- Black: Raster Etch
  - Font Style: Arial
- Blue: Vector Etch
- Red: Vector Cut

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CNC Data for the BBT Side Mold Assy

- "As Built" Generic & AXYZ-specific formatted CNC files
  - Centerline tool paths provided (Optimized)
  - Generic CADD data in both .DWG and .DXF R12 formats
  - .DXF R12-formatted files (2) have original layer names and shortened filenames for use with AXYZ ToolPath CAM app
    - MS/DOS-based system; Filename length max. 8 characters

Spreadsheet for AXYZ ‘Tool Path’ CAM App

- BBT_Side_Mold_Assy-M02D_RC02-32_x_16-2022Jun07 Router bits, depths, feeds & speeds, & multi-pass data
- Formatted specifically for AXYZ ToolPath CAM app
  - Three (3) worksheets (two programs & a tool list)
  - Excel (.XLS) and PDF-formatted files provided

AXYZ-ToolPath Programming Worksheet & Processes Checklist

Project Name:	BBT M02 RevD Side Mold Assy (32x16)			Date:	2022Jun07			Name(s):	Hemphill		
Project Description:	BBT (NCME/STEM Guitar Project Kit) Side Mold Assy & Spreaders Mod02 RevD Assy (29" x 14" min Stock)										
File Info:	BBT_Mold-M02D-RC02-32_x_16-2022Jun07	.DWG		BBTM2D21	.DXF		BBTM2D21		.RDY		
Material Info:	Material:	Plywood		THK:	2.250	Nom. ¾" THK		Stock Size:	32 x 16 x (3 x ¾" THK)		

Note: Cells for *user input* are in green; cells with data from other cells is in red; calculated &/or copied values is in blue font

Group Sequenc	Color	Tool #	Tool DIA (in)	Depth	Multi-Pass # Steps	Multi-Pass Depth	Feeds (ipm) Horiz	Feeds (ipm) Plunge	CADD Layer Name(s)	Comments
1	White									
2	Blue	1	0.250	0.985	6	0.165	60	20	CPT_0250-1_Sanding_Holder	
3	Green	5	0.500	0.752	2	0.377	85	20	CPT_0500-1_Spreaders_Pocket	Final Spreader Height = ~1.5"
4	Yellow	8	0.125	0.042	2	0.028	20	20	CPT_0125-1_BBT_Lettering	
5	Red	10	90°V	0.050			2	20	CPT_090V-1_Mold_SPOT	
6	Magenta	10	90°V	0.040	2	0.038	40	20	CPT_090V-1_Mold_Align	Run twice to clear channel
7	Cyan	10	90°V	0.802			2	20	CPT_090V-1_Spreaders_SPOT	
8	Gray	10	90°V	0.792	2	0.790	40	20	CPT_090V-1_Spreaders_Align	Run twice to clear channel

Programming Process Checklist | **Sketches, Notes &/ or Comments**

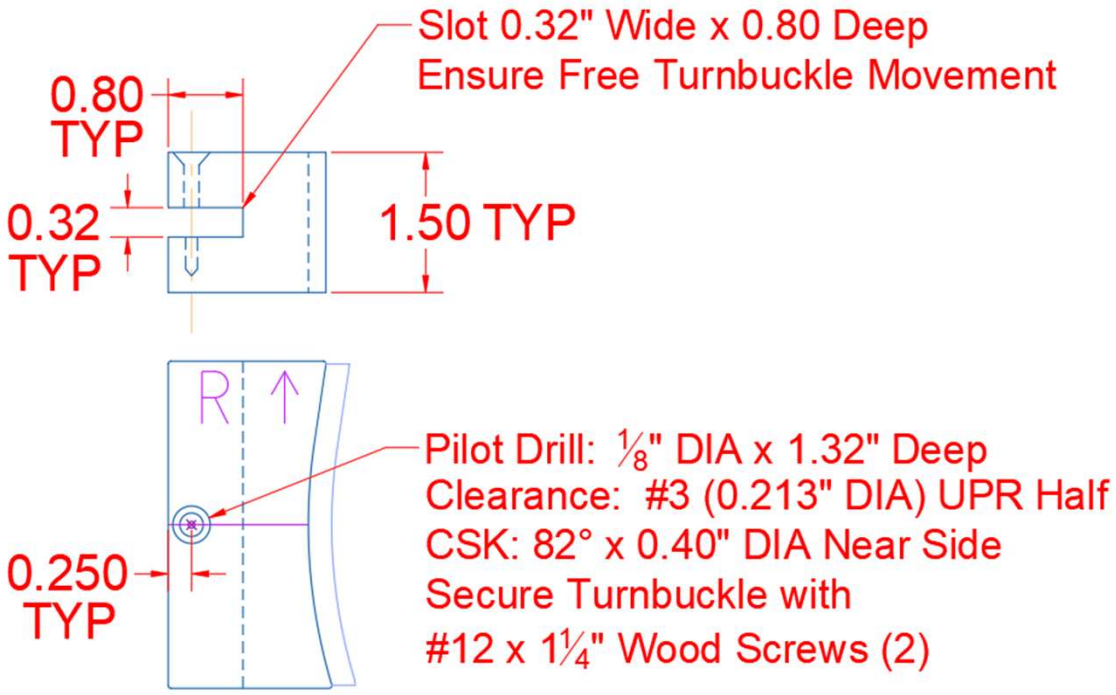
Layout -> CADD Origin:

Analysis -> Direction Errors:

- Layers/“Groups” are typically run in the order listed in spreadsheet
- Toolpath CAM app has eight (8) group max. limit per file… so there are multiple CNC .DXF files

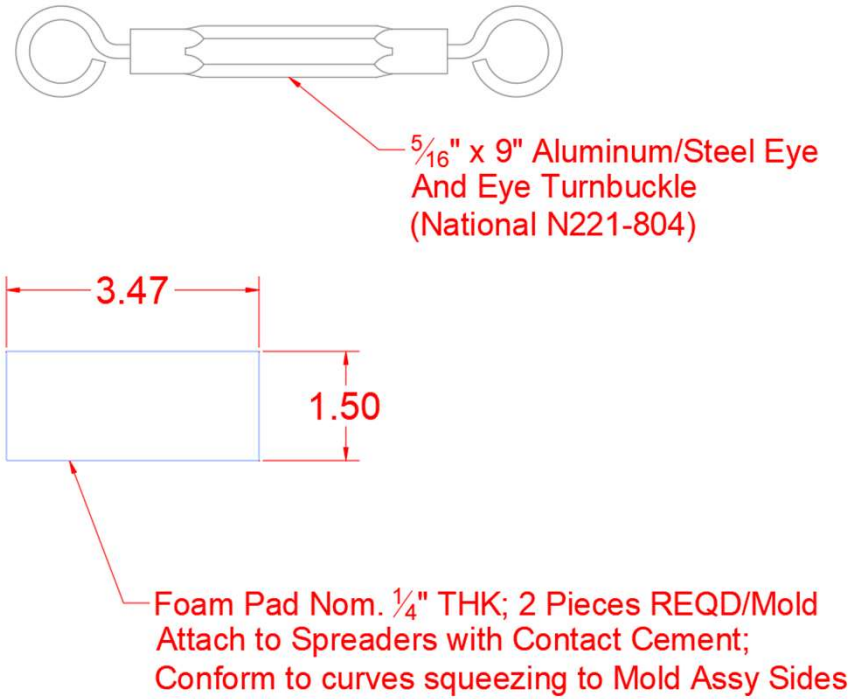
BBT Side Mold Spreaders

- Design makes two (2) spreader pairs



  - Use table saw to cut slot.
    - Resize as required to fit turnbuckle
  - Use spacer when drilling pilot hole.

BBT Side Mold Assy Hardware

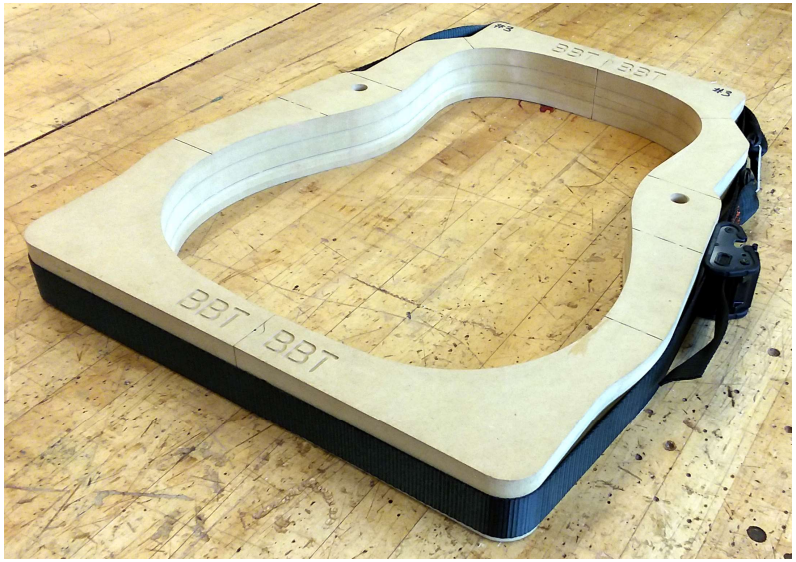


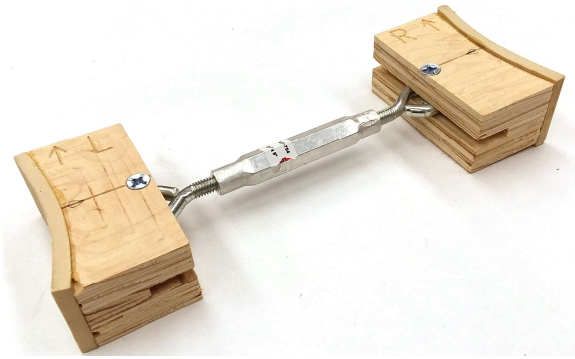
- Turnbuckle:
  - 5/16” x 9 ‘Eye-to-Eye’
  - National P/N: N221-804
  - Lowe’s
- Elastomer Pad
  - 1/8” to 1/4” THK
  - Attach with contact cement
- #12 x 1¼” Wood Screws (2)

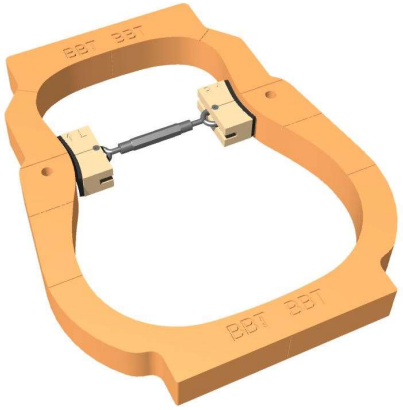
BBT Side Mold Assy Clamping

- Multiple Choices:
  - 1” ‘Endless’ Ratchet Strap
    - Min. 7’ (84”) length
    - usaratchet.com -> P/N: USA-RGH2910E
  - “Squeeze” Clamps (12” at ends)
  - Toggle Clamps, Adjustable U-bolt, Quick Release (2 per Mold Assy)
    - 700 lbs or greater recommended
    - Not recommended for MDF

BBT Side Mold Assy & Spreaders







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BBT Side Mold Assy & Spreaders

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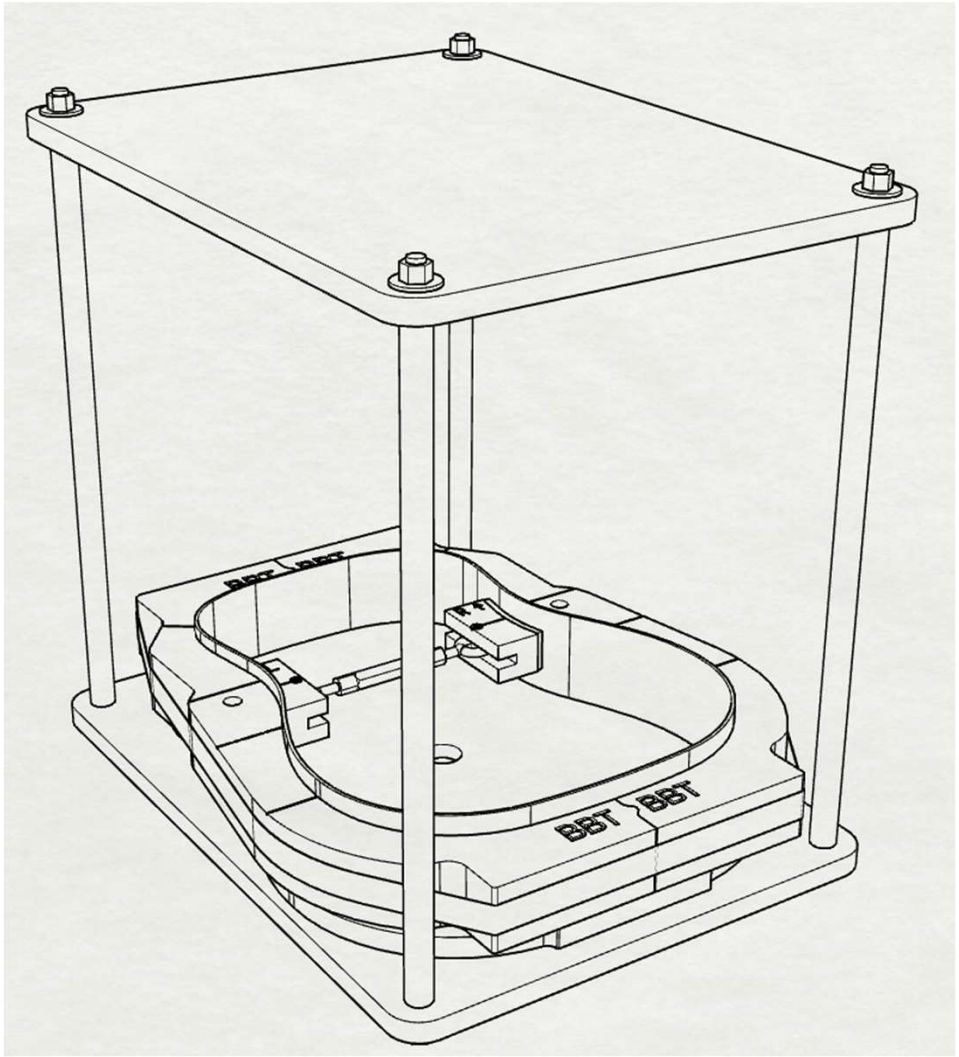

Final Thoughts:

- Use the alignment geometry for placing the spreaders
- Do not over-tighten the turnbuckle
  - Avoid ‘opening up’ the mold seams

For more information:

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ETSU Guitar Building's
Social Media Site:
https://www.facebook.com/ETSUGuitars

Department of Engineering,
Engineering Technology, & Surveying