Mass Timber Benchtop Project:

Instructor Guide

This project is designed to give students experience with material, fabrication techniques, tools, installation practices and hardware used in a mass timber build. The focus of the learning throughout is on **wood science**; understanding how moisture affects wood, grain direction & composition and how tooling will affect the material, **mass timber materials**; identifying various materials and use cases, **drawings**; read and interpret, **tools for mass timber**; selecting the correct tool and order of operation and tolerances, **hardware/connections**; installation techniques, layout & accuracy.

Learning outcomes

1.12 Explain wood as a living material and its basic anatomical structure (earlywood/latewood, cell composition, moisture states).
1.13 Identify grain direction, wood species, and cuts (flat/vertical).
1.14 Explain how grain orientation affects cutting, fastening, and finishing.
1.21 Explain dimensional changes in wood from humidity/temperature.
1.15 Read grain orientation in solid wood and align cutting/fastening accordingly.
1.16 Identify and fit patches using basic joinery techniques.
1.17 Identify cut of wood (e.g. flat vs. vertical grain)
1.24 Repair surface damage in MT using steaming, sanding, and basic refinish techniques.
1.25 Assess grain + machining direction to perform precise joinery operations.
2.13 Identify MT products in shop drawings.
4.33 Read/interpret MT shop drawings and assembly diagrams.
5.11 Identify specialized MT tools and hazards.
5.12 Describe saw blades, drill bits, and machining properties.
5.13 Operate basic MT power and hand tools.
5.14 Chisel recess corners accurately.
5.22 Shape, profile, and finish surfaces to tolerances.
5.23 Fabricate jigs and demonstrate tool proficiency.
5.32 Fabricate and fit advanced patch repairs for MT
5.21 Explain how machining methods relate to tolerances and surface finish for MT.
5.31 Assess tool selection needs for complex MT connections or repairs.
5.41 Evaluate quality of tool-based fabrication work.
6.11 Identify MT building components, hardware, and fasteners.
6.21 Explain torque effects, ductility, and connection behaviour.
6.22 Interpret shop-drawing connection details.
6.31 Analyze connection tolerances vs. conventional carpentry tolerances.
6.12 Install standard MT fasteners to specification.
6.23 Install MT connectors (knife plates, hangers, drag straps).
6.24 Install MT screws at angles correctly.
6.33 Troubleshoot and repair MT connection issues.
8.13 Use PPE appropriate for a MT site

Setup

This project is estimated to take 12 hours to complete depending on level of pervious woodworking experience. All tools should be demonstrated for best safety practice regardless of student's proficiency.
Students will be provided with 1 glulam beam @ 175 x 190 x 1200, MMC Mass Timber Benchtop Project drawing set, all hardware listed within drawing set pages LS101, LS102 &LS201, hand tools, marking gauges and tape measures. Power tools, bits and jigs may be communal use – fabrication of hand made jigs can be added to project to extend learning.
Each student will fabricate a stub column and beam and install all hardware included in the drawing provided. Instructor will fabricate 1 stub column for use in demos and marking. To mark the project, the instructor column will be mounted to the steel bracket (page LS203) on the right-hand side. Students will install their column to the left and the beam will span the 2 columns. ****NOT INCLUDED IN THE DRAWING**** Instructor will hit each glulam beam with a hammer - students will steam out dent with an iron.

Sample Rubric

Task	Conditions	12 – 8 Meets industry standard	8 - 4 Approaching industry standard	4-0 Below industry standard
Install Timber screws	Accuracy of layout Correct hardware used Heads are not stripped Fasteners are not over/under driven			
Fabrication of Column	Hardware and patch are all within 1/32" Length is within 1/32" Knife plate fits with no rocking & through bolts install with ease			
Fabrication of beam	Hardware is within 1/32" Length is within 1/32" Recess is within 1/32"& corners are squared			
Install of Beam	Beam installed without binding Gaps are accurate to drawing within 1/32”			
Overall Fit & Finish	No damage, dents, scratches, glue or graphite are visible			

Sample day plan

Time	Location	Day 1	Demo
7:30 – 9:00	Classroom	Understanding wood fiber, Intro to mass timber materials, Walk through of project drawing	
9:00 – 9:15	**Coffee**		
9:15 – 11:00	Shop	Layout project components	Layout: using combination square, marking accuracy
11:00 – 11:30	**Lunch**		
11:30 – 12:00	Shop	Prep for cutting	Grain: steaming out a dent, how cutting tools affect grain
12:00 – 1:00	Shop	Cut material to length	Timber saw: safe use, deflection, blade types
1:00 – 1:45	Shop	Drilling	Drills & jigs: safe use, order of operation, spurs & grain
1:45 – 2:00	Shop	Clean up & debrief	
Time	**Location**	**Day 2**	**Demo**
7:30 – 9:00	Classroom	Mass timber install considerations, Timber screws; torque effects, ductility, and connection behaviour.	
9:00 – 9:15	**Coffee**		
9:15 – 10:00	Shop	Mortise slot for knife plate	Chain mortiser: safe use, grain, tool path
10:00 – 11:00	Shop	Route recesses	Routers: safe use, direction of feed, depth of pass, use of jigs/bearings
11:00 – 11:30	**Lunch**		
11:30 – 12:00	Shop	Fit patch	Chisel: safe use, breaking grain
12:00 – 1:00	Shop	Finish sand	Sanders: safe use, grit
1:00 – 1:45	Shop	Install hardware	Accuracy, order of operation, tack screws
1:45 – 2:00	Shop	Clean up & debrief	

Tools List

Power Tools	Bits
16 5/16” Timber saw https://www.makita.ca/index2new.php?event=tool&id=73	1/4" Radius Round Over Router Bit https://www.kmstools.com/dimar-1-4-quot-radius-round-over-router-bit.html?srsltid=AfmBOooH9H1nDecOIijPijZKa3eJkW8bbCXhx8CYLkAuRrTE0KPTtTty
1 ¼” Chain Mortiser https://www.makita.ca/index2new.php?event=tool&id=134	1/2" x 2-1/2" Straight Bit https://www.kmstools.com/freud-12-130-two-flutes-1-2-in-shank-1-2-2-1-2-straight-bit.html
Small Router https://www.makita.ca/index2new.php?event=tool&id=3831&catid=2	3mm 4” twist drill bits
Plunge Router https://www.festoolcanada.com/products/routing/routers/576213---of-1400-eq-f-plus-us	1-5/8" x 5/8" Chamfer Bit https://www.kmstools.com/freud-40-114-1-2-in-shank-1-5-8-5-8-chamfer-bit.html
Corded Drill https://www.dewalt.ca/product/dw246/12-13mm-vsr-drill-keyless-chuck?tid=576976	60mm diameter Forstner bit https://www.fisch-tools.com/en/produkte/0317-wave-cutter-forstner-bit
Hole Hawg ½” right angle drill https://www.milwaukeetool.ca/products/details/m18-fuel-hole-hawg-1-2-right-angle-drill-high-demand-kit/2707-22hd	3/4” diameter 17” Auger bit
Belt sander https://www.makita.ca/index2new.php?event=tool&id=111	7/8” diameter 17” Auger bit
Random Orbital Sander https://www.makita.ca/index2new.php?event=tool&id=1751&catid=2	ASSY RW driver bits https://mtcsolutions.com/products/assy-rw-bits/
Hand Tools	**Jigs/ Sundries**
Iron https://www.blackanddecker.ca/product/ir0820c/1200w-iron?tid=588371	Drilling station https://produkte.mafell.de/usa/drilling-and-driving/drilling-station/drilling-station-bst-460-s
Dead blow mallet	Jig for chain mortiser blowout/length – Hand made
Combination square	Jig for routing patch – Hand made
F-Clamps	Wood glue https://www.titebond.com/product/glues/e8d40b45-0ab3-49f7-8a9c-b53970f736af

https://besseytools.com/en-us/bessey-tools-north-america/products/clamping-tools/woodworking-clamps-cast-jaw-bar-clamps/tgk-series-heavy-duty-2k-handle#technische-daten	
Combination metric/Imperial tape measure	Sandpaper
5/8” socket	3” X 24" Sanding Belt 80G
Spud wrench	
½” chisel	