MASSLAM
3D MODEL REQUIREMENTS

Version No.	Purpose/Change	Author	Date
1.0	Final version – approved by MASSLAM team	Joel Minder, Wood Engineer	12/05/2021

Contents

Introduction

This document has been written to ensure a smooth transfer of CAD models between the 'detailer' and Australian Sustainable Hardwoods Pty Ltd (ASH). The presented document will articulate our capability and what is important to consider when creating shop drawings. This will ensure that the product machined by ASH will be to your satisfaction.
This document is an initial guide for general purpose only. It is impossible to cover all capabilities of our CNC machine. Therefore, please share the concepts with ASH so that we can give further advice before creating shop drawings. Should you have requirements that deviate from the limitations outlined in this document, get in touch with us so that we can assist in finding a solution.

ASH uses CADwork as our CAD software to create drawings and models. CADwork is the market leader in software solutions and CAD / CAM 3D for wood construction, framing and carpentry.

File types suitable for import

The most suitable file is a 3D file from CADwork (*.3D). Otherwise, the following formats are suitable, listed from the most preferred file type to the least:

1. IFC file (.ifc)
2. REVIT (*.rvt, *.rfa)
3. ACIS based applications (e.g. Autodesk products) (*.sat)

Attributes

3D models have the capability of attaching useful information. For a smooth transfer of information, assignment to the correct attribute is required. The following table displays the expected assignment to the attributes.

Information	Attribute in CAD	Example of assigned Attribute
Identification of a part	Attribute 1	B123
Deliveries	Attribute 2	Delivery required by…
Truckloads/Packs	Attribute 3	Pack 1
Grade	Attribute 4	MASSLAM 45
Finish	Attribute 5	Gritt 60 (equivalent to planning)
Aris	Attribute 6	2mm aris
Hazard class treatment	Attribute 7	H3 treated
Coating	Attribute 8	Ultra-clear coated

If any attributes constitute critical information, make sure that this is noted and the attribute is correctly assigned to an appropriate grouping as above.

Sizes

Our Hundegger K2i CNC machine has a size limit of 1,300mm by 450mm. For sizes up to 1,300 x 800mm, members are to be CNC'ed in halves and then connected

together. In both cases, the press governs the maximum member length of 12m. Longer lengths are created by use of a scarf joint.

Modelling a slot correctly

Our Hundegger K2i can produce open slots, restricted slots on one side and hidden slots. Each slot comes with different limitations. Generally, slots have a minimal thickness of 8mm.

For restricted slots, regardless of whether completely restricted or restricted on one side, they are required to be modelled with additional width and depth to allow for the radius of the slot cutter (see Figure 1 as an example). Further to this, there is an option to manufacture the steel plates with a relief cut as depicted below.

All slots should leave additional space between the steel plate and the timber so that the material can contract and expand (refer to 'movement in service' as listed in the MASSLAM brochure). Minimal spacing requirements are shown in Figure 1. Please note that If these minimal spacing requirements of the width (5mm) and depth (10mm) are both chosen, a relief cut in the steel plate will be necessary as shown below.

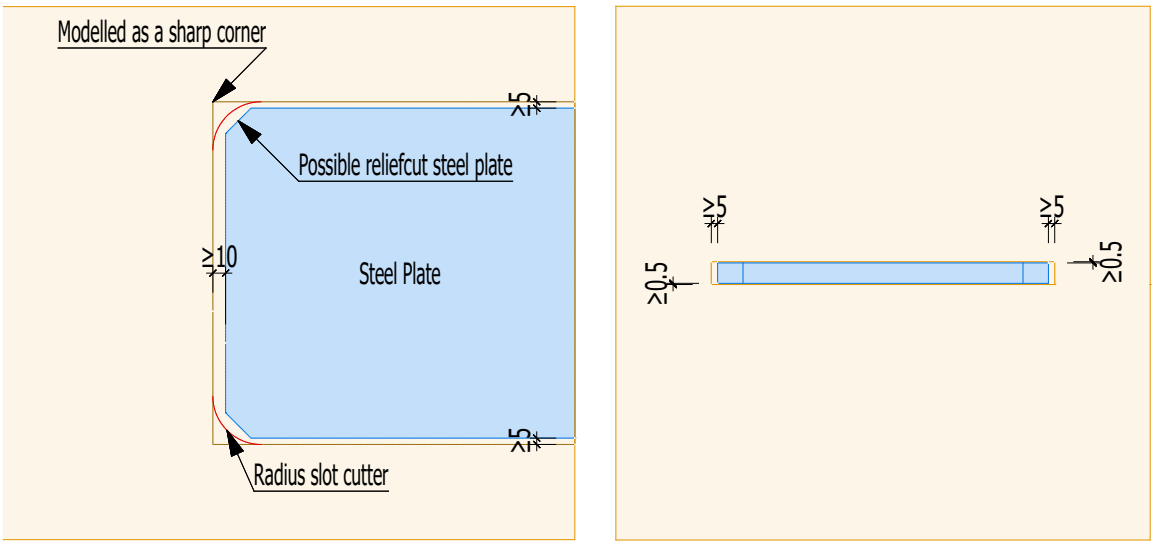

Figure 1 Required spacing between steel plate and timber

When modelling any restricted slot, it must be modelled as a sharp corner and not with the radius of the slot cutter (see Figure 1). Otherwise the CNC program will misinterpret the slot.

For angled slots please contact us directly to confirm capabilities.

Open slot

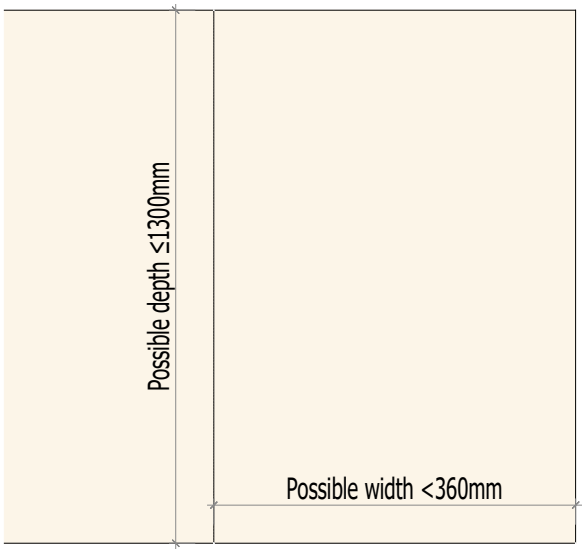

Figure 2 Limitations open slot with horizontal saw only (thickness slot ≥ 8mm)

Figure 3 Limitations open slot with horizontal saw and slot cutter (thickness slot ≥ 8mm)

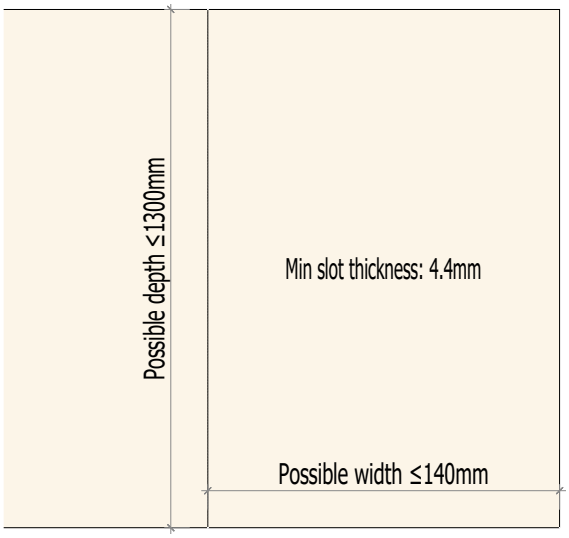

Figure 4 Limitations open slot (4.4mm ≤ thickness slot < 8mm)

Open slots with a width of 360mm or less utilise the horizontal sawing unit (see Figure 2). This represents the most cost-effective slotting option.

All slots that require a width greater than 360mm will need to be done in two steps with the horizontal saw and slot cutter. A maximum slot depth of 660 can be achieved with our main slot cutter. Slot depths greater than 660 to 940mm can be achieved with the help of the robot slot cutter from the operator's side which requires more CNC time.

Figure 4 represents an exception to the rule that all slots have a thickness of at least 8mm. Within these limitations it is possible to achieve slot thickness as minimal as 4.4mm.

Restricted slot on one side

Depending on the nature of the restricted slot on one side there are different limitations. The slot in Figure 5 and Figure 6 shows the limitations when using the

main slot cutter situated at the fence side of the machine. The maximum depth of the restricted slot on one side is 720mm. There are no restrictions for the length of the slot (see Figure 6). Please take into consideration the radius of our main slot cutter which is 62mm as shown in Figure 5.

If the restricted slot on one side is longer than 720mm the robot slot cutter is to be used. The limitations of this are shown in Figure 7 and Figure 8. However, if the slot is 720mm deep or less the main slot cutter with the radius of 62mm will be used.

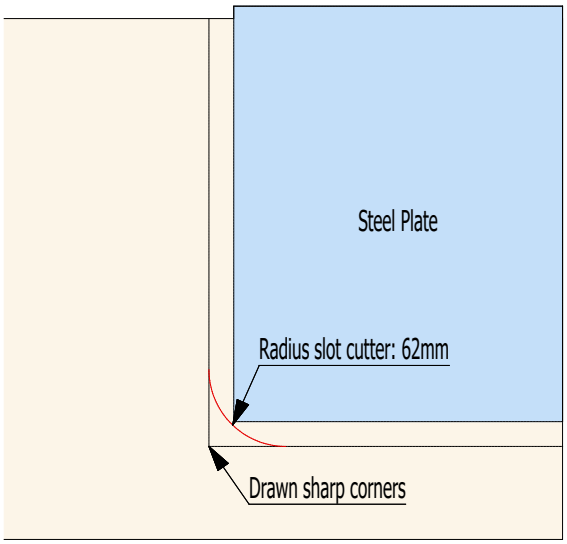

Figure 5 Fin plate in restricted slot on one side 1

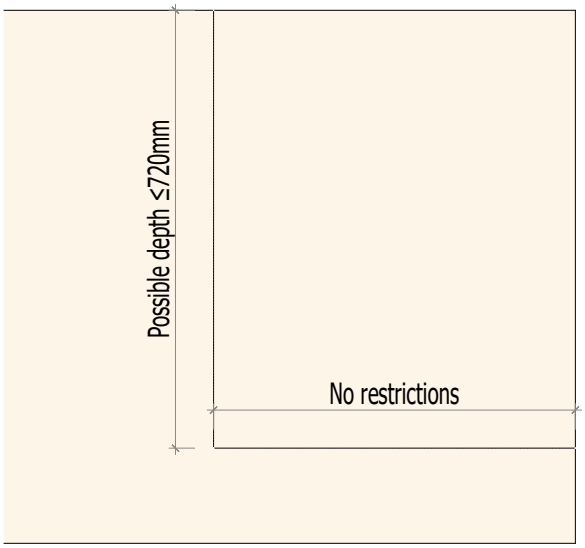

Figure 6 Limitations restricted slot on one side 1

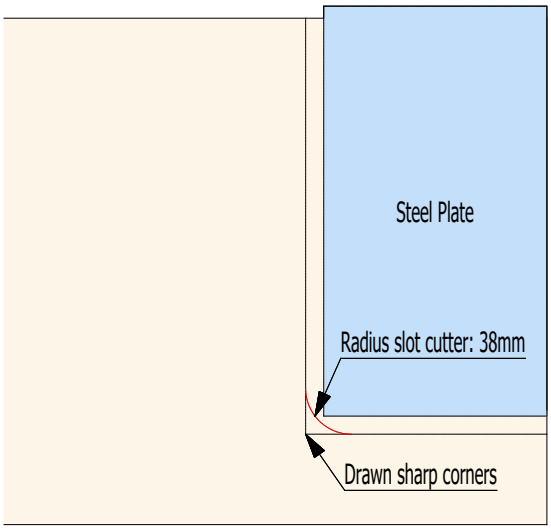

Figure 7 Fin plate in restricted slot on one side 2

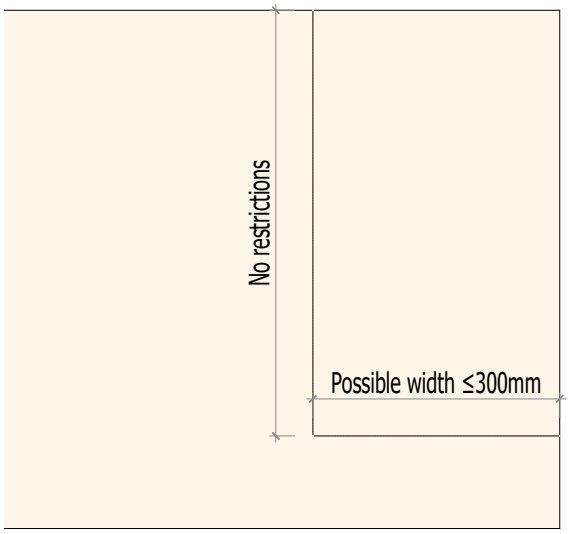

Figure 8 Limitations restricted slot on one side 2

Completely hidden slot

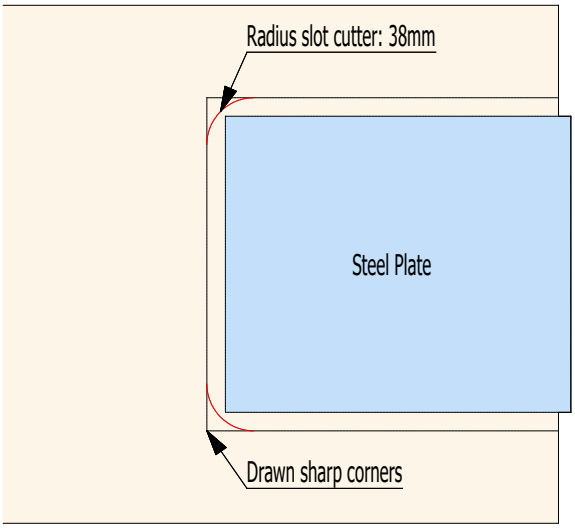

Figure 9 Fin plate in hidden slot

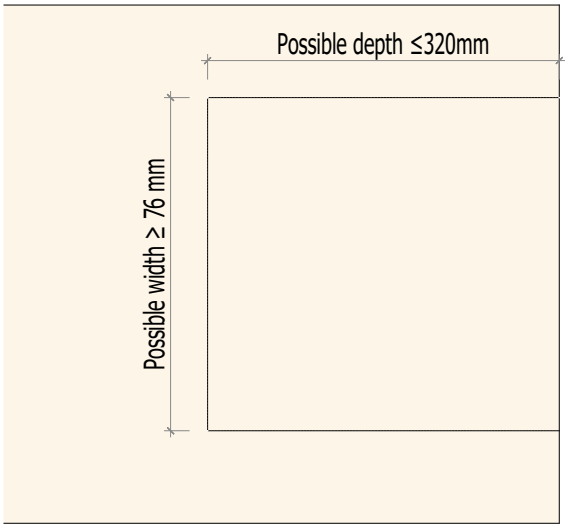

Figure 10 Limitations in hidden slot

The maximum depth of a completely hidden slot is 320mm. Completely hidden slots with the limitations shown in Figure 9 & Figure 10 can be produced on any of all the 6 faces of a timber piece. A completely hidden slot increases CNC time, making the process more expensive than restricted or open slots.

For slots perpendicular to the end grain faces, ASH offers the option to CNC this slot as an open slot. A timber cover plate can then be glued in after the CNC process and colour matched with the rest of the timber.

Completely hidden slots with the limitations shown in Figure 11 and Figure 12 are only possible from the fence facing side of the timber piece. These slots are horizontally aligned and need to be modelled exactly 90 degrees to the fence side. All other hidden slots required can be achieved with the limitations shown in Figure 10.

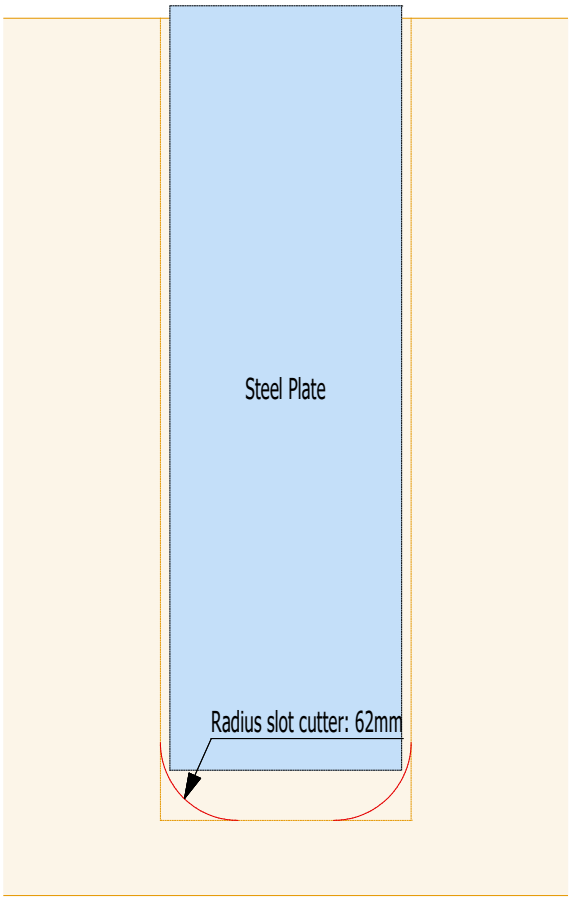

Figure 11 Fin plate in hidden slot from side

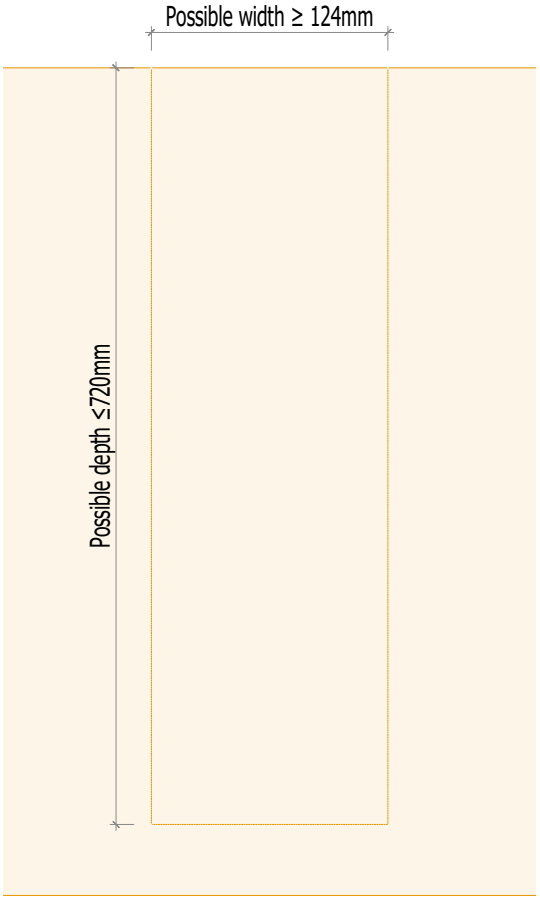

Figure 12 Limitations hidden slot from side

Hidden slots that are open at both ends are preferably equal to or wider than 124mm with a maximum depth of 720mm. These limitations represent the most efficient way to make a slot. However, the overall limitations of the machine are shown in Figure 13 and Figure 14.

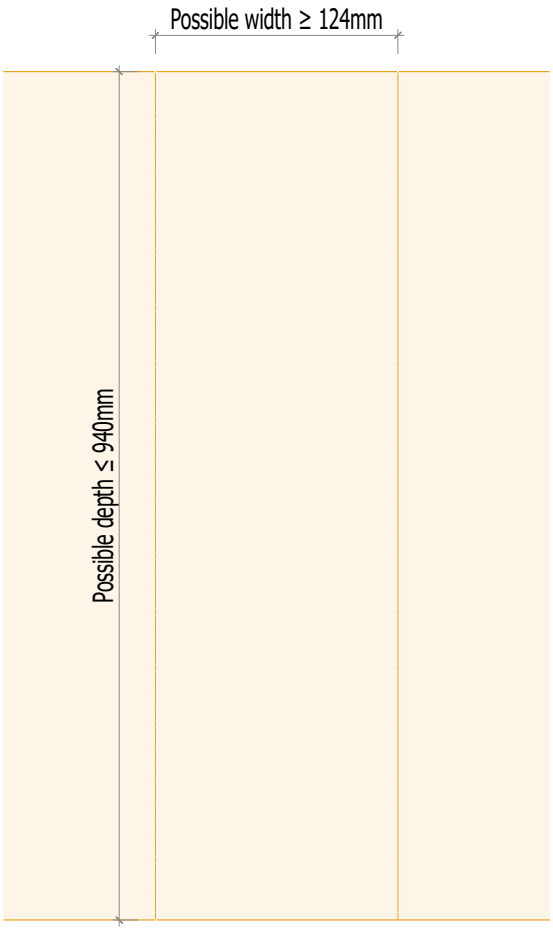

Figure 13 Limitations hidden slot open both ends 1

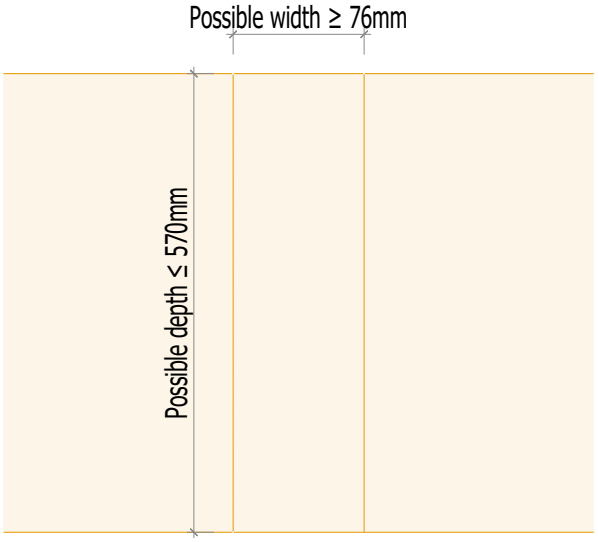

Figure 14 Limitations hidden slot open both ends 2

Milling operations

When it comes to drawing up a milling operation in CAD, it is again essential to draw them as sharp corners as shown in Figure 16. Otherwise the CNC software will misinterpret the operation.

To ensure that the steel plate will fit to its desired location it is important to consider a few details. The endmill that will process these milling operations, comes with a radius of 20mm. The most common way of ensuring that the steel plate will fit into its designated area is shown in Figure 15. There is also the option of cutting a relief cut into the steel plate to ensure enough space is given. If the relief cut option is chosen, please ensure that there is at least 5mm spacing around the perimeter as shown below.

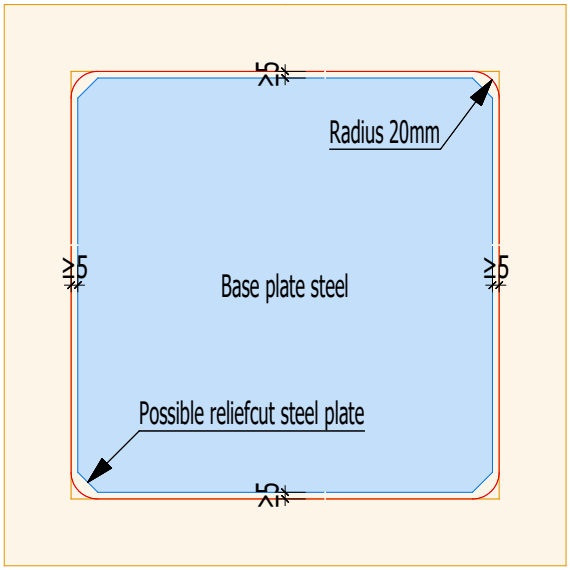

Figure 15 Steel plate rebated into timber Option 1

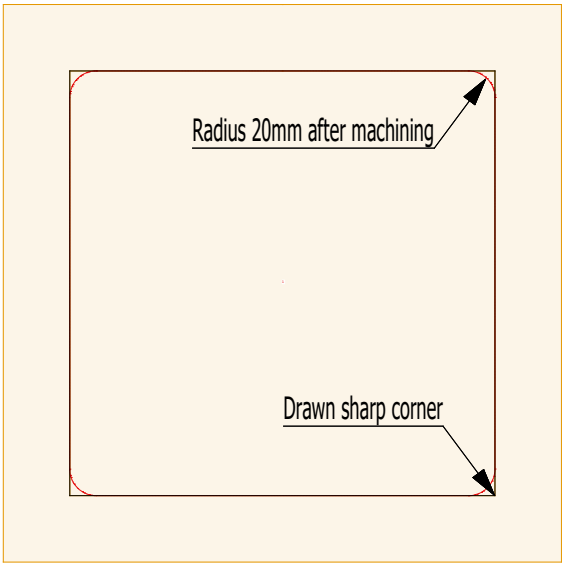

Figure 16 Recess drawn with sharp corners

Alternatively, there are other options available to make sure that the steel plate fits into its designated place as shown in Figure 17 - Figure 19. Regardless of which option is applied, the milling operation must be drawn with sharp corners as depicted in Figure 16. It is the customers responsibility to ensure the specified contact at ASH knows which option is preferred. If nothing is specified by the customer, the milling operation will be executed according to option 1. Regardless of which option is chosen, we ask to leave at least a 5mm gap between the steel and the timber around the perimeter for movement in service.

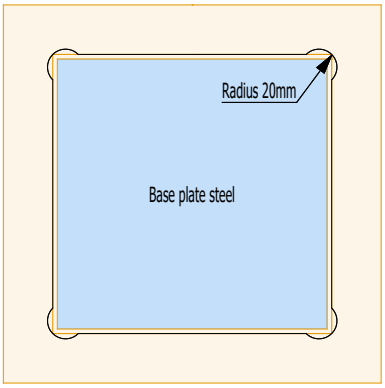

Figure 17 Steel plate rebated into timber Option 2

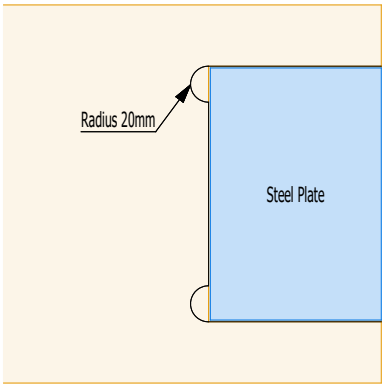

Figure 18 Steel plate rebated into timber Option 3

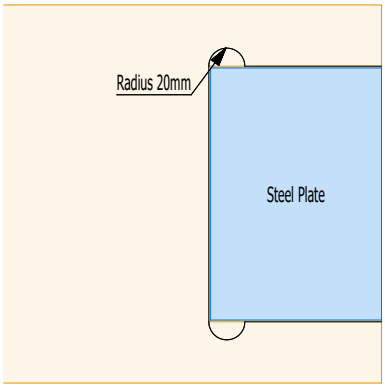

Figure 19 Steel plate rebated into timber Option 4

Milling operations on angled and/or shifter cuts must always be modelled perpendicular to the face of the timber. Figure 20 illustrates this.

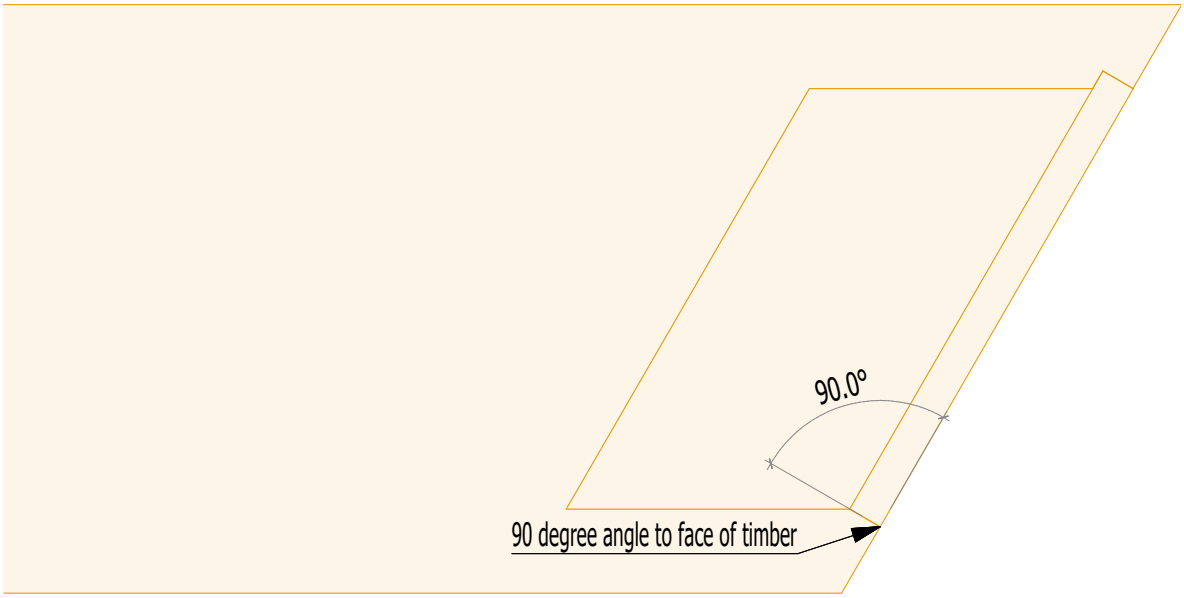

Figure 20 Recess on an angled cut

For restricted slots regardless of whether restricted only on one side or completely, ASH strongly recommends modelling a squared recess. Otherwise wood fibre may be in the way of the fillet weld around the corners. Figure 21 and Figure 22 show a squared recess to allow for a fillet weld on a restricted slot.

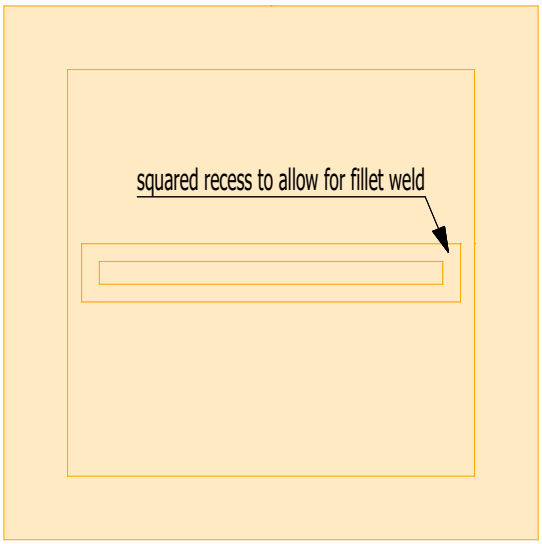

Figure 21 Front view fillet weld recess restricted slot

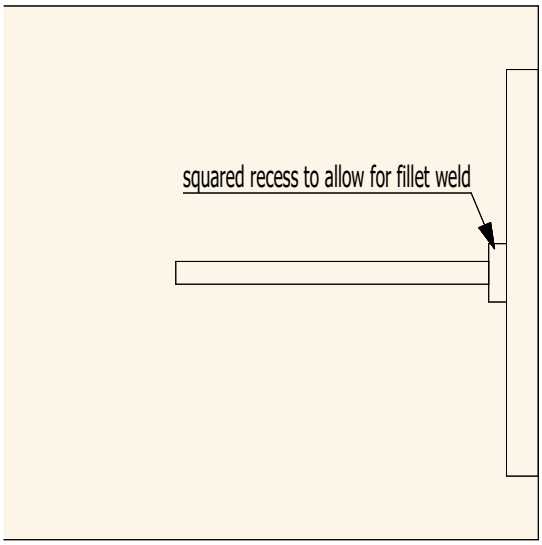

Figure 22 Side view fillet weld recess restricted slot

For all other situations where a recess is required to allow for the fillet weld, a 45-degree chamfer is possible. Figure 23 and Figure 24 show a selection of applications where a 45-degree chamfer is possible. We recommend adding 5mm to the fillet weld size for the chamfer size.

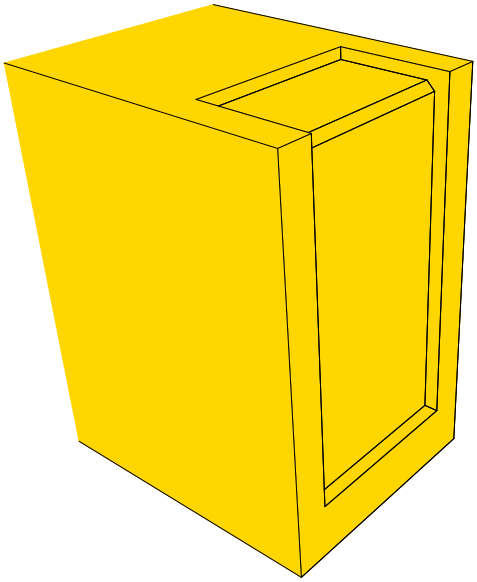

Figure 23 Fillet weld for bracket

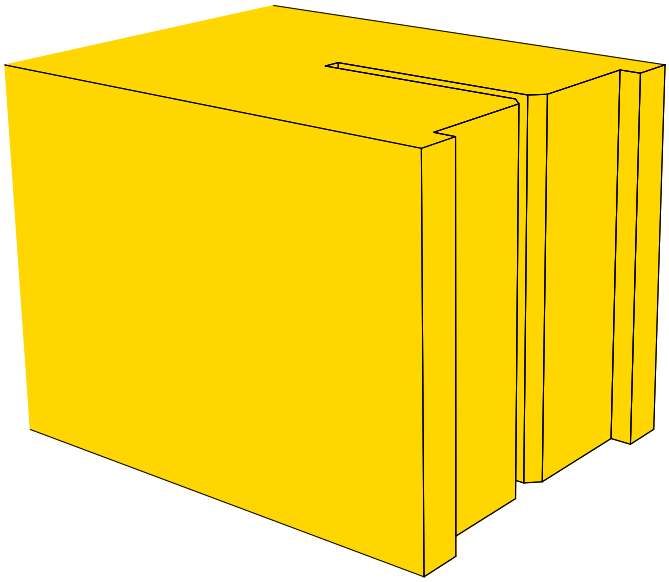

Figure 24 Filet weld for open slot

Drilling Operations

- Drill bits are available from a diameter of 6mm up to 24mm in 2mm increments. Odd diameters will be ordered at the customer's expense. Please contact a MASSLAM expert early if larger diameters are required.
- Holes with a diameter of 20mm or more can be milled in any desired diameter with the following restrictions:
    - 20 ≤ Ø < 30; up to 75mm deep
    - 30 ≤ Ø < 40; up to 120 mm deep
    - Ø ≥ 40; up to 160mm deep
    - Any shape can be milled into the timber within the limitations above.
    - For angled milling holes and other non-typical drillings please seek confirmation with a MASSLAM specialist.
    - This option represents a great opportunity to create a plug hole to protect the connector from fire. ASH supplies the following plugs:
        - A Ø146.5mm plug fits a Ø147.0mm hole
        - A Ø105.2mm plug fits a Ø105.7mm hole
        - A Ø115.5mm plug fits a Ø116.0mm hole
        - A Ø95.8mm plug fits a Ø96.3mm hole
        - A Ø85.5mm plug fits a Ø86.0mm hole
        - A Ø79.7mm plug fits a Ø80.2mm hole
        - A Ø63.3mm plug fits a Ø63.8mm hole
        - A Ø57.7mm plug fits a Ø58.2mm hole
        - A Ø47.5mm plug fits a Ø48.0mm hole
        - A Ø45.0mm plug fits a Ø45.5mm hole
        - A Ø37.0mm plug fits a Ø37.5mm hole
        - A Ø35.7mm plug fits a Ø36.3mm hole
        - A Ø33.5mm plug fits a Ø34.0mm hole

    - A Ø23.5mm plug fits a Ø23.8mm hole
    - A Ø20.0mm plug fits a Ø20.3mm hole
- Depending on the depth required, smaller diameter drills (≤10mm) will snap and wander easily. Therefore, drilling operations with a diameter of 10mm and less should be drawn as pilot holes only and then executed by hand later. This may be performed by ASH if we have been engaged for bracketry pre-assembly. Please discuss your requirements with a MASSLAM specialist.
- There are no depth limitations to vertical drilling operations given that the hole is drilled throughout the timber piece. Drill holes throughout the timber piece will always be completed from top and bottom to eliminate splintering.
    - There is a limit of 300mm depth when drilled from the bottom only. If deeper is required, consider rotating the member and drilling horizontally. Members 450mm wide or less can be rotated.
    - The depth limit from the top face down is 200mm
- Horizontal drilling operations have a limit of 1280mm given that the hole is drilled throughout the width of the element.
    - Otherwise the depth limit of a horizontal drilling hole is 670mm for all 4 faces.
    - If horizontal hole depths of more than 300mm are required for the project, please let us know. We need 3 months' notice so that we can get them ordered if not in stock.
- Angled drilling operations of any kind are possible too. Due to the changing limitations depending on the degree of an angle, the limitations for these are not given in this document. Please get in contact for more information based on your specifications.