

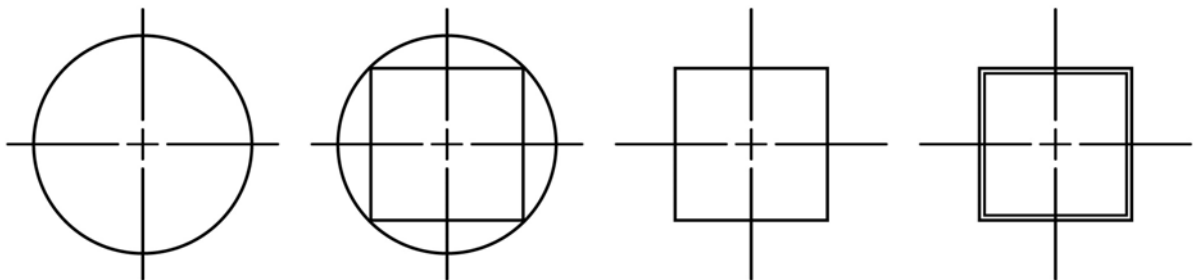
## VIRTUAL RULE

I have been teaching log and timber joinery for over thirty years and I must say, changing layout methods (and lesson plans) shifting from log building to timber framing was tiring for me, and disjointing for my students skills continuity. After all, if big wood includes log and timber forms then there must be a common way.

Historical data has always been difficult to get and prove, secrets kept between competing sects and guilds. And its hard to see layout marks after so many years. So we learn what we can from the examples remaining and go on. Today's big wood designs include log and timber elements, creating a need for a common method to easily join the two.

My objective is to present a logical and holistic approach to unifying log with timber joinery, supported by 15 years of field work and hundreds of my students. And in doing so, to reveal a new method called Virtual Rule to the Timber Framing community.

Consider the four icons below, they symbolize a common progression of the basic layout methods used for log and timber joinery. The obvious common denominator is centerline referencing, since it is the only way to begin layout on a log.



*Log Scribe Layout*

-Notched Laftwerk

- No resurfacing

*Log Virtual Layout*

-Stav og Laft (P&B)

-Miter joinery resurfacing ok

*Timber Square Layout*

-Includes Square Rule

- No resurfacing

*Timber Virtual Layout*

-Includes Virtual Rule

-Miter joinery resurfacing ok

Log Builders will recognize the first icon as standard centerline referencing planes on a log for layout using a scribe. Note with this method the log cannot be resurfaced or the notching loosens. Builders will also recognize the second icon as centerline referencing employing a virtual layout of a (hidden) timber, the prerequisite for making flat surfaces and squared locations for joinery, using a square. Note this latter method allows for mitered log connections that can be resurfaced without loosening the joinery.

Timber Framers will recognize the third icon as a rough timber (created from #2 icon) with

centerline referencing, using a square and/or templates for layout. A variation to this is a face referenced layout method called Square Rule. This method cannot be resurfaced without loosening the joinery.

But few Framers will recognize the fourth icon, a virtual layout of the perfect timber hidden inside the rough timber. This method is identical to virtual log layout (#2 icon), only the 'fat' (waste wood) differs. Layout using a square and/or templates is used to identify the joinery. Note this method allows for mitered timber connections that can be resurfaced without loosening the joinery.

Virtual layout completes a comprehensive, consistent and common path to learning big wood log and timber joinery. It also completes an interrelated circle of understanding and gains its position within. Round meets Square.

Now lets show an example of timber Virtual Rule as it applies to a demanding situation, building a Hammer Bent truss...

## **VIRTUAL RULE**

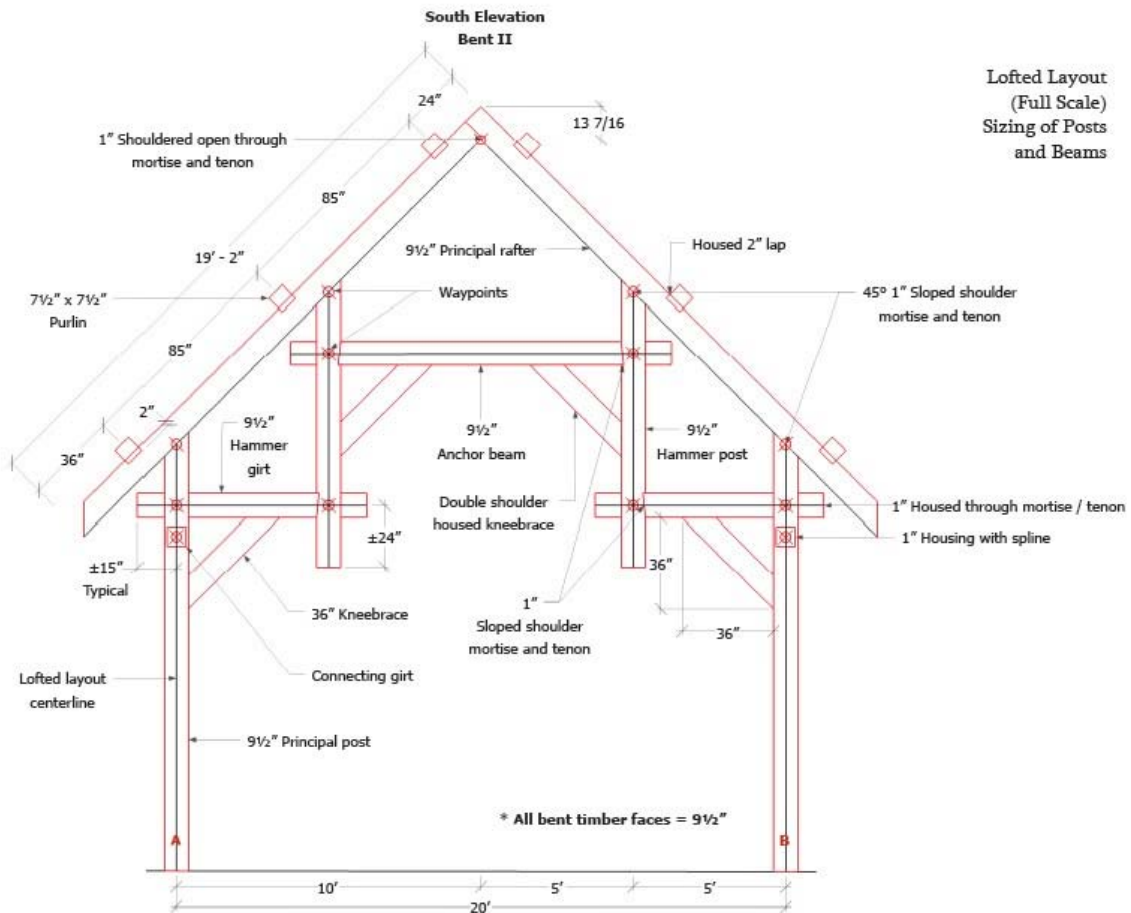
When total accuracy and control over the wood is required, as with the Hammer Bent truss, I refer to Virtual Layout, a method with roots to log building. The mitered joinery produced is the only method that allows resurfacing of the framework without loosening the joints. This is an essential requirement to prevent sagging of the truss.

To begin with, shop drawings using a face referencing (square rule) can be expensive to create, considering all the face measurements, joinery points of reference and dimensioning numbers required. And if any timbers differ in size from the plan, the numbers change and the drawings become useless. Our project hammer bent is a simple assortment of squares, rectangles and triangles that can be easily centerline lofted, full-scale on a floor. The sizes and shapes of each material component can all be different, yet the shop drawing waypoints remain the same.

We begin by lofting a full-scale centerline model of the hammer bent to obtain the joinery waypoints and develop the joinery templates. For an instructor it is then easy to check individual student joinery and the entire framework accurately and quickly, with a few templates and a few waypoints.

## Centerline Lofted Layout

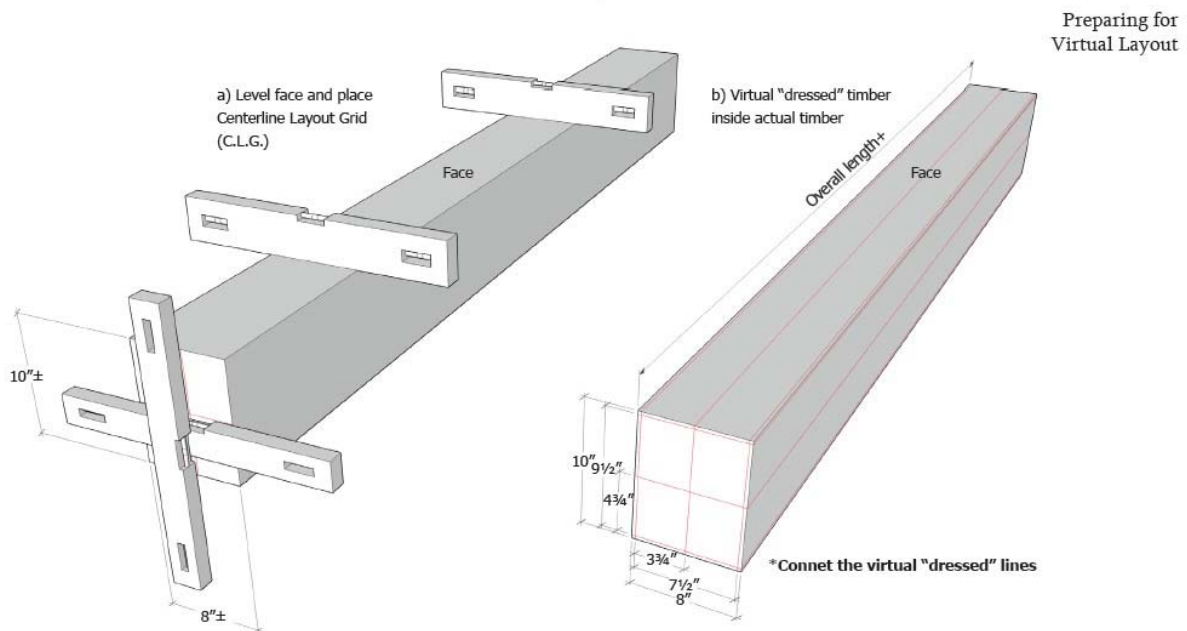
This drawing shows a centerline lofted layout of a Hammer Bent truss and the virtual (dressed) timber sizes. The important joinery points of reference (called waypoints) will be the intersecting centerlines of the posts and beams (girts). These thirteen joinery waypoints become the point of origin to begin layout on the timber, using either a square or templates.



Since the bent has two mirror-opposite sides, the joints will be duplicated and so only half the templates will be required. Precise distances and diagonals can be easily checked for correctness. Timber sizes can vary throughout the frame, including substituting log components, with no variation to the centerline waypoints. Shop drawings of the components can be made in scaled-size and joinery templates made in real-size.

## Virtual Sizing of Timbers

Timbers are just square(ish) logs, to compensate for irregularity we virtually map out the perfect, slightly smaller timber hidden inside. For example, our 8" x 10" principal posts will become 7 1/2" x 9 1/2" measured from the centerline referencing lines. The centerline planes in turn are *always* referenced from the Joinery face, this presents a perpendicular surface to the incoming girt, making joinery easier (than on a sloped surface). In this case, the principal post Joinery face is the inside surface facing the incoming hammer girt and kneebrace.

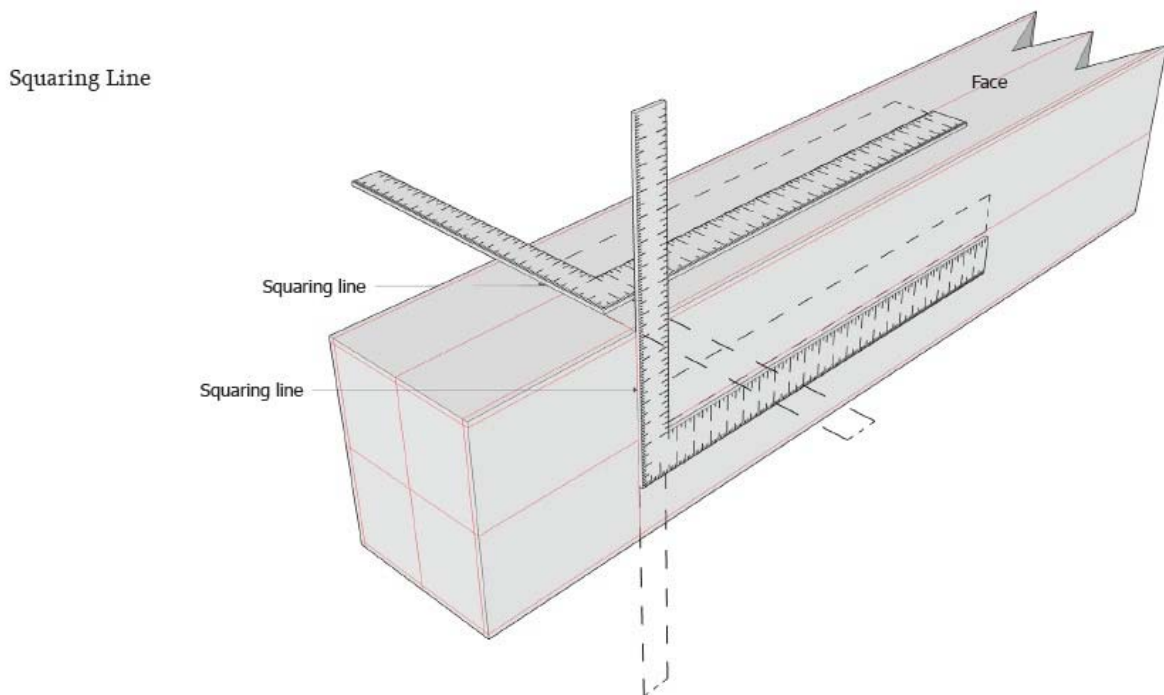


In comparison, square rule layout specifies to reference and layout from the exterior face...this results in the perpendicular (best) surface being presented to the exterior wall envelope... and a sloped (worst) surface presented to the incoming girt! This means all housings, shoulders, etc. and tools will be on an angled surface. Remember the priority is tight joinery, not straight clapboard siding. Besides, today we use an exterior panel or strap-and-wrap system that gets typically furred out 3/4" for the interior finish, thereby not requiring a perpendicular surface.

## Joinery Waypoints

The lofted drawing identified the centerline waypoint measurements for the joinery. These waypoints reduce the myriad of numbers associated with face (square rule), making it easier to check for accuracy and locate errors.

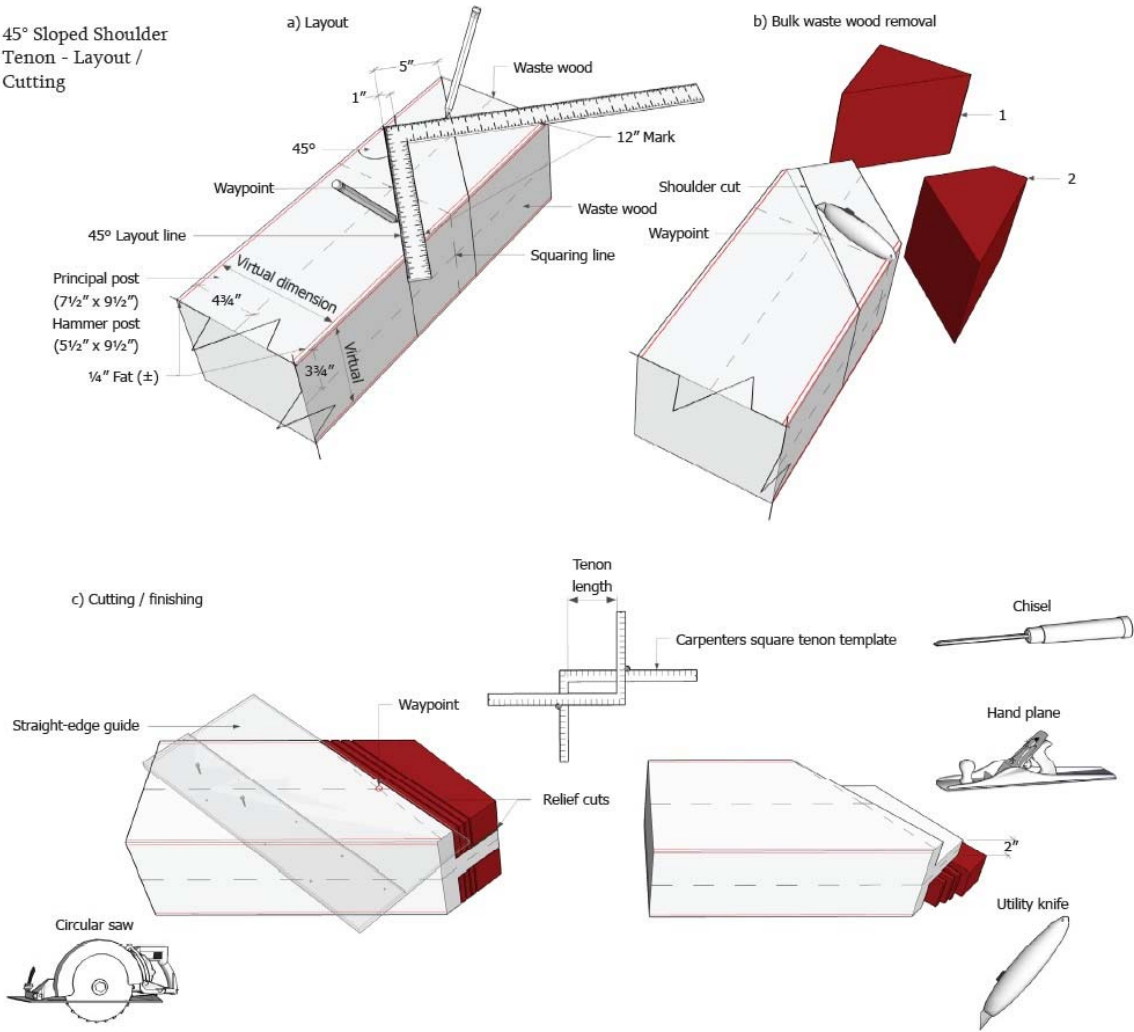
Transfer these waypoint measurements to the timber component(s) along the centerline and square around the timber (Squaring line) at these points. This places the waypoints on all timber faces, keeping the joint square, in alignment and ready for layout.



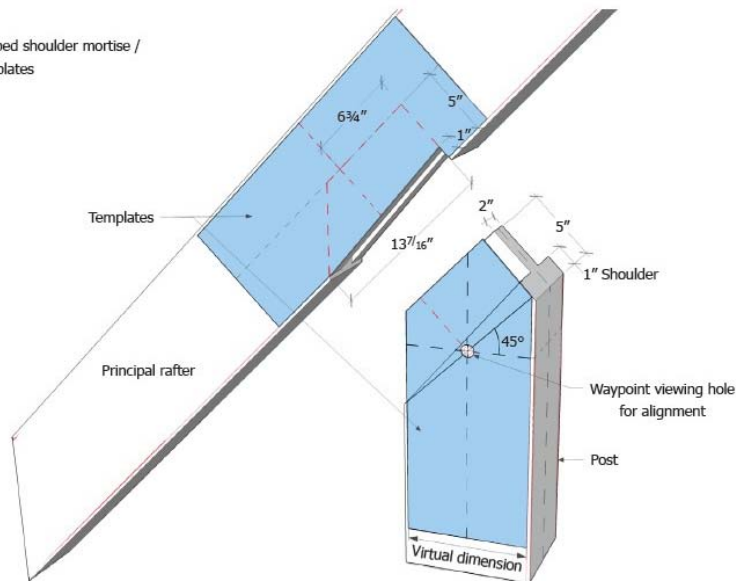
## Virtual Joinery Layout

The layout of each joint can be accomplished with either a square or template(s) as shown on the principal post below. All joinery layout is within the virtual lines, making all joints sized perfectly, with housings/shoulders all the same depth...only the fat varies! Damaged edges or excessive wane present no problem, a template (located on the waypoint) will identify the joint faces.

45° Sloped Shoulder Tenon - Layout / Cutting

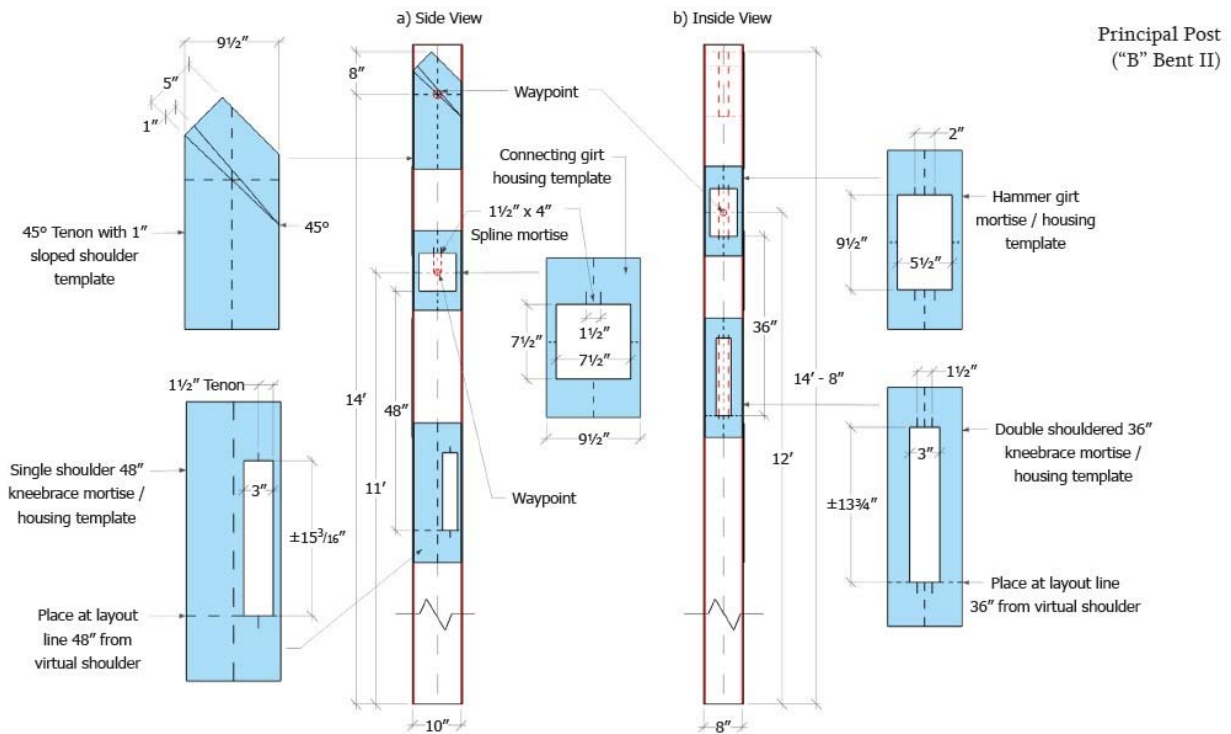


d) 45° Sloped shoulder mortise / tenon templates



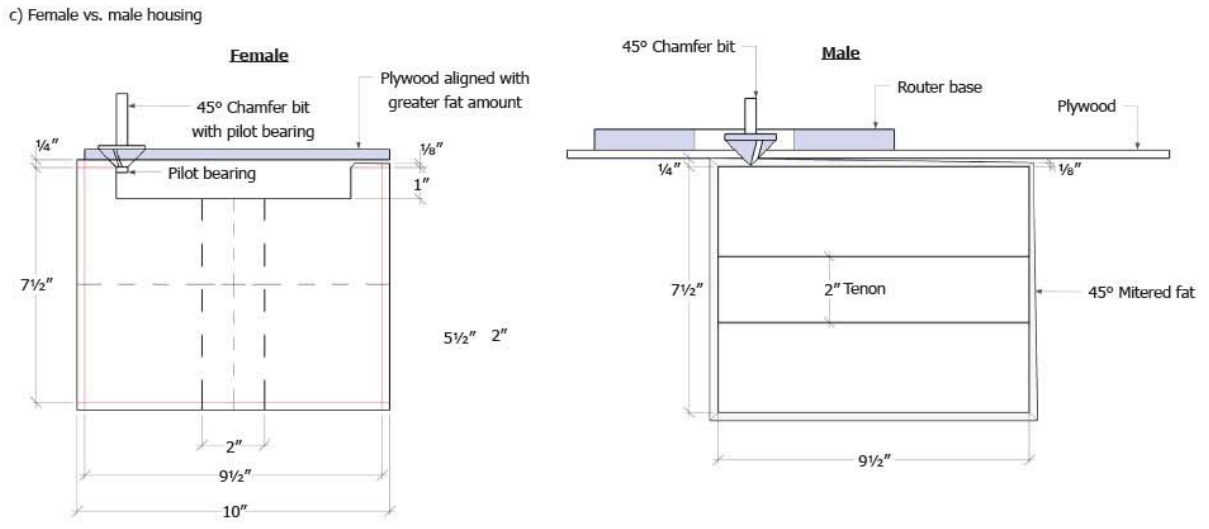
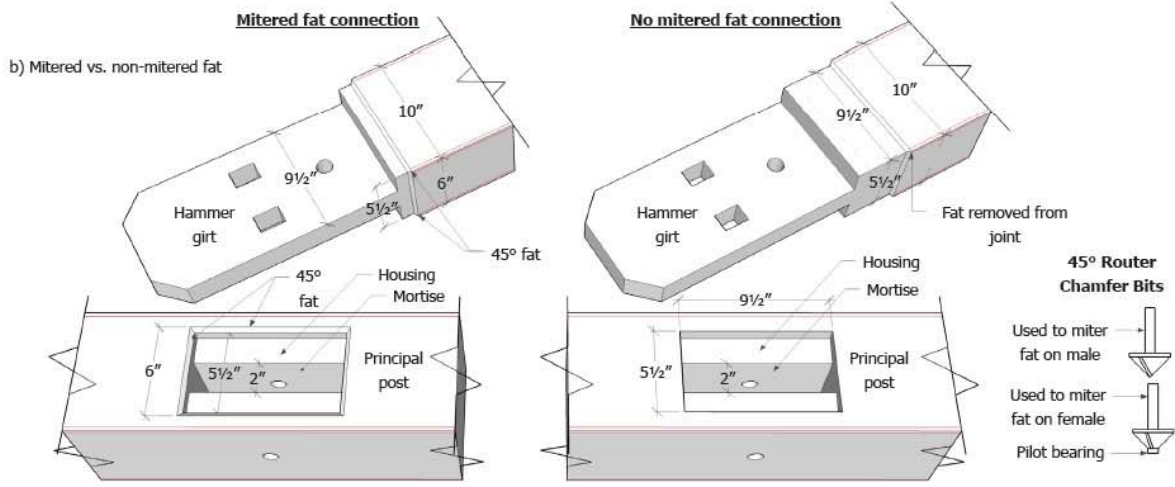
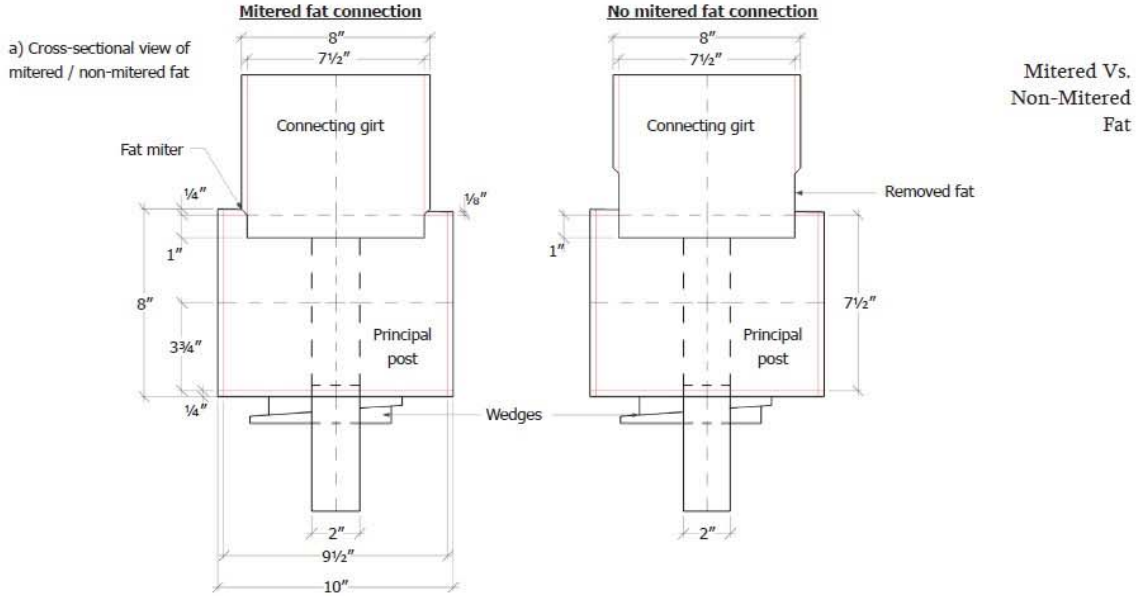
## Template Joinery Layout

Ultimately it is possible to layout the entire hammer bent truss using a few templates and a storey-pole, without even a tape measure... templates located at waypoints down a centerline can eliminate even the virtual lines. Testing of the joinery or locating errors can be done quickly and accurately with templates.



## Mitered Joinery

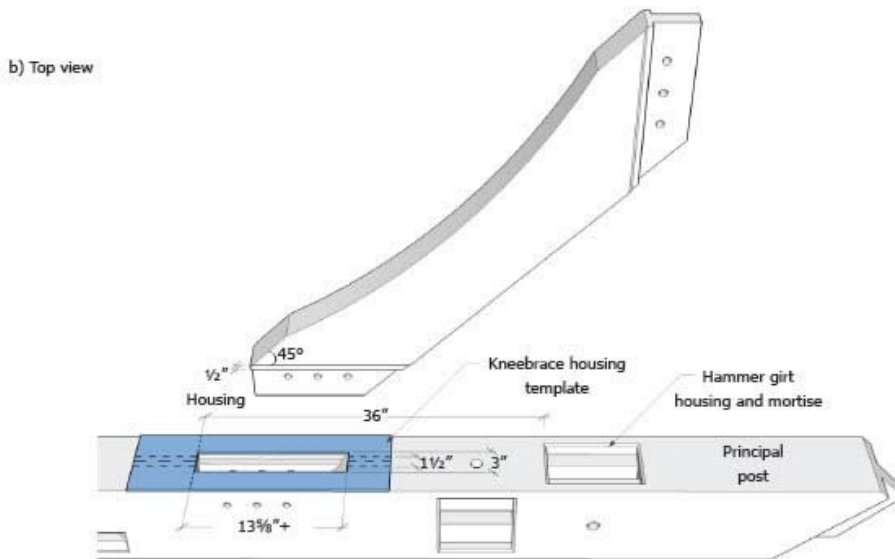
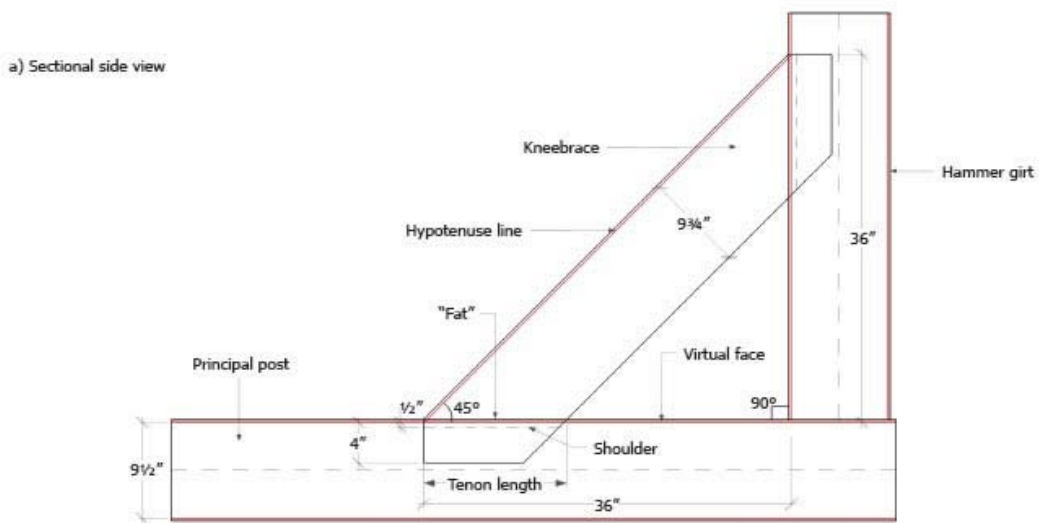
The term *fat* refers to the variant material enclosing the perfect (virtual) timber. The fat created from the virtual layout must be dealt with, the question is whether to get rid of this fat or make it work to the benefit of the connection. The following drawings show both of these options; which is to either *miter* the matching fat and form a third connection (tenon, housing and miter) or to remove it back from the joint. Both methods enable resurfacing without loosening the joinery. The latter method is simpler with no miter preparation required at the mortise housing or tenon shoulder. The former is stronger with the added benefit of the miters.



We will be mitering the fat. In either case it is the Joinery face (think housings and shoulders) that gets leveled to produce the centerline referencing planes. The objective is to present a perpendicular receiving surface (and matching fat) for the incoming timber. One could say this is truism for all mating bodies, regardless the species or material.

### Housed and Mitered Kneebrace

Housing a kneebrace into a receiving post and beam (girt) requires first penetrating through the variable fat, then all the housings and mortises are the same. It's even possible to match the kneebrace fat to the receiving post and beam fat separately, by adjusting the kb. shoulder width... we call it playing with the fat.



Now its possible to virtually size timbers and joinery exactly and work each piece separately, even on variable material, without relying on time-consuming adjustments or expensive re-machining.



Virtual Layout / Mitered Joinery

Finish Resurfacing / No Loosening





James Mitchell, Author, *Master's Guide to Timber Framing* and *Craft of Modular Post & Beam*, is principal instructor of Big Wood, Log and Timber joinery courses and founder of the Island School of Building Arts.

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