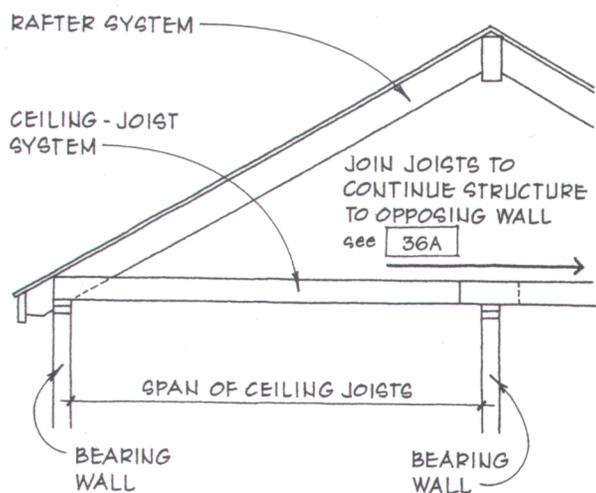
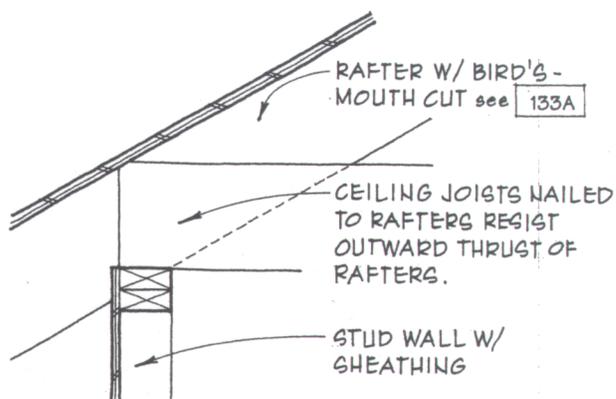


Ceiling joists are very similar to floor joists. In fact, the second-floor joists of a two-story building act as the ceiling joists for the story below. Ceiling joists are distinguished from floor joists only when there is no floor (except an attic floor) above the joists.

Ceiling joists are sized like floor joists. The span of the joists depends on spacing and whether the attic above the joists will be used for storage.

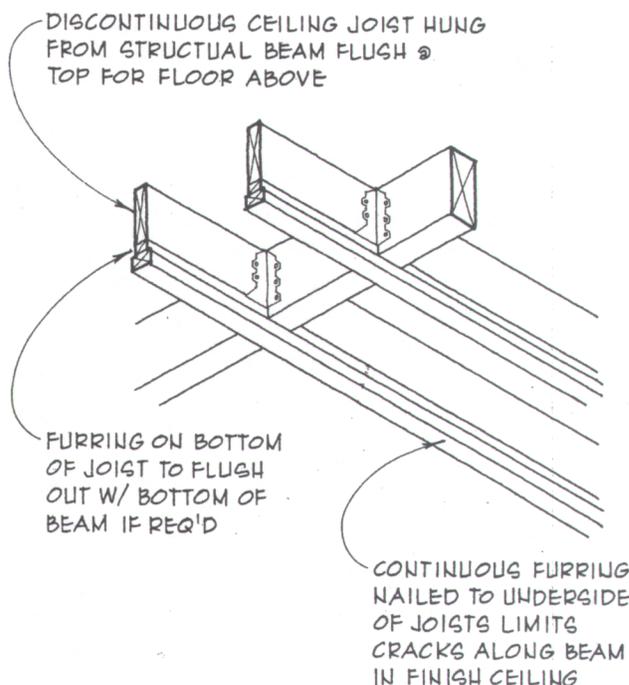


The joists can function as ties to resist the lateral forces of rafters. For this purpose, it is important to attach the joists securely to the rafters.



NOTE: CHECK CODES FOR NAILING REQUIREMENTS & ANGLE NAILS THROUGH JOISTS INTO RAFTERS TOWARD CENTER OF BUILDING.

The underside of ceiling joists is often furred down with a layer of 1x lumber to resist plaster or drywall cracking due to movement of the joists. The drawing below illustrates furring parallel to the joists to resist cracking along a beam that interrupts the continuity of the joists. Furring perpendicular to the joists, usually called strapping, is also common.



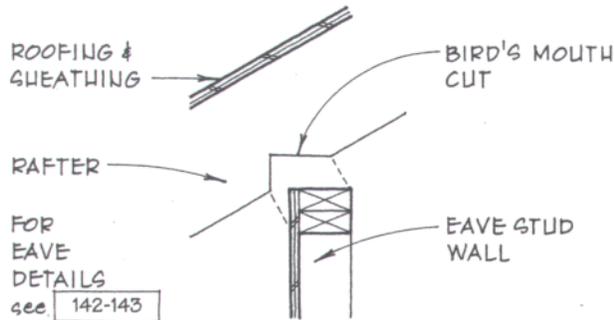
Ceiling-joist span comparison

Joist size and species	Ceiling joist span (ft.)		
	12 in. O.C.	16 in. O.C.	24 in. O.C.
2x6 hem-fir #1	13.2	12.0	10.5
2x6 south. pine #1	13.7	12.5	11.0
2x6 Douglas-fir #1	14.0	12.7	11.1
2x8 hem-fir #1	17.5	15.8	13.8
2x8 south. pine #1	18.2	16.5	14.5
2x8 Douglas-fir #1	18.5	16.7	14.7
2x10 hem-fir #1	22.2	20.2	17.7
2x10 south. pine #1	23.2	21.0	18.4
2x10 Douglas-fir #1	23.6	21.5	18.7
2x12 hem-fir #1	27.0	24.5	21.5
2x12 south. pine #1	28.1	25.6	22.4
2x12 Douglas-fir #1	28.7	26.0	22.8

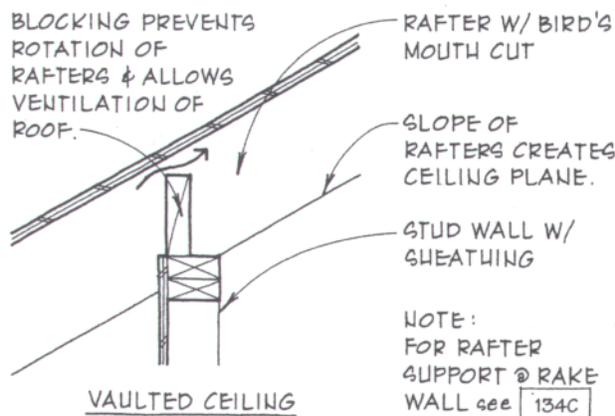
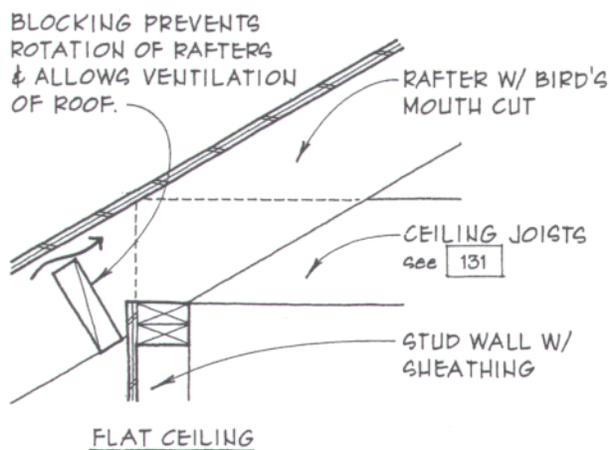
This table is based on a light attic load of 20 psf and a deflection of L/360. The table is for estimating purposes only.

**A** RAFTERS/CEILING JOISTS

At walls or beams that support them at the eave, rafters are cut at the point of support with a notch called a bird's mouth.



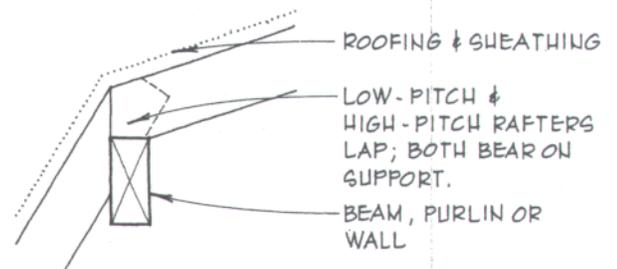
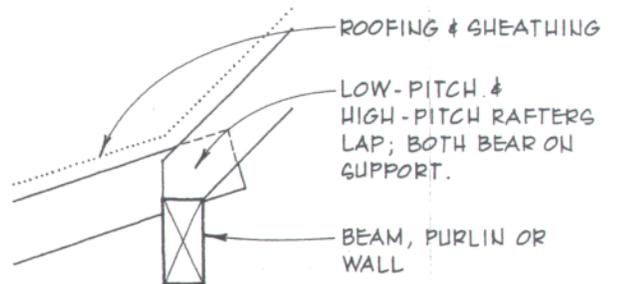
The width of the bird's mouth is equal to the width of the sheathed stud wall (or unsheathed wall if sheathing is to be applied later). The underside of the rafters should meet the inside corner of the top of the wall. This is especially important if the ceiling is vaulted and a smooth transition between wall and ceiling is desired (see below).



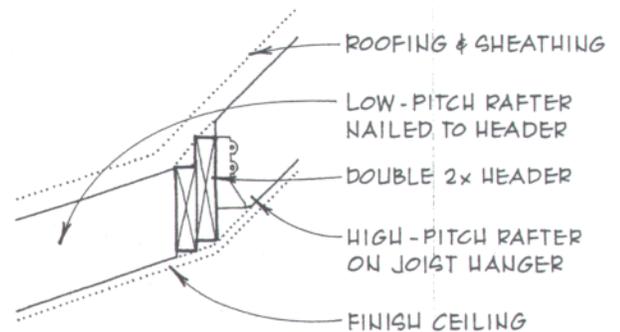
**A** RAFTER / EAVE WALL  
BIRD'S MOUTH CUT

Wherever the pitch of a roof changes from shallow to steep (as in a gambrel roof) or from steep to shallow (as in a shed dormer) the two ends of the rafters must be supported. If the pitch change occurs over a wall, the wall itself will provide the support.

If the pitch change does not occur over a wall, the support will have to be provided by a purlin or a beam (header).

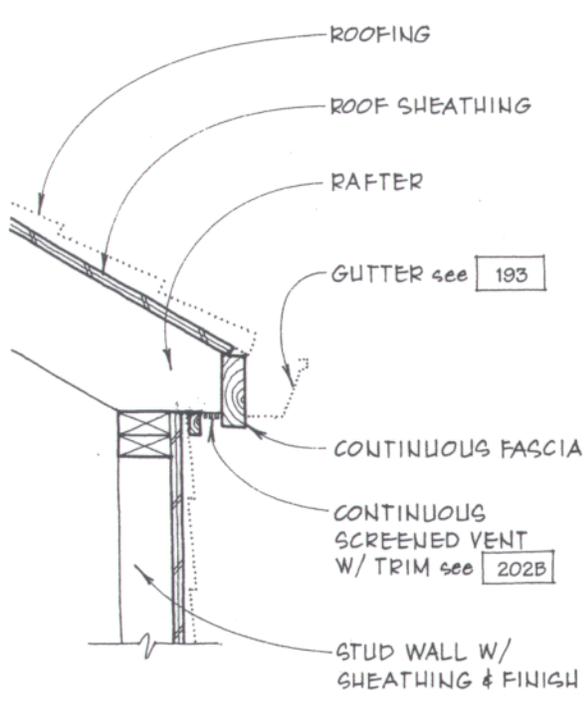


PITCH CHANGES WITH SUPPORT BELOW.

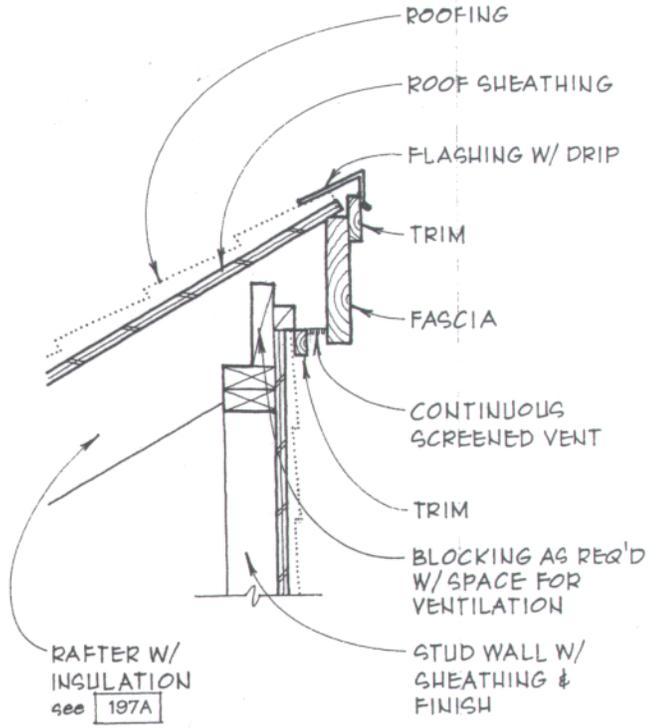


PITCH CHANGE WITHOUT SUPPORT BELOW

**B** ROOF PITCH CHANGE

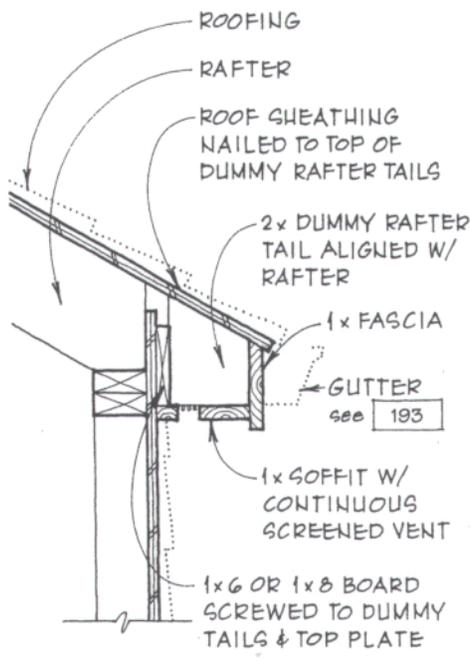


**A** ABBREVIATED EAVE

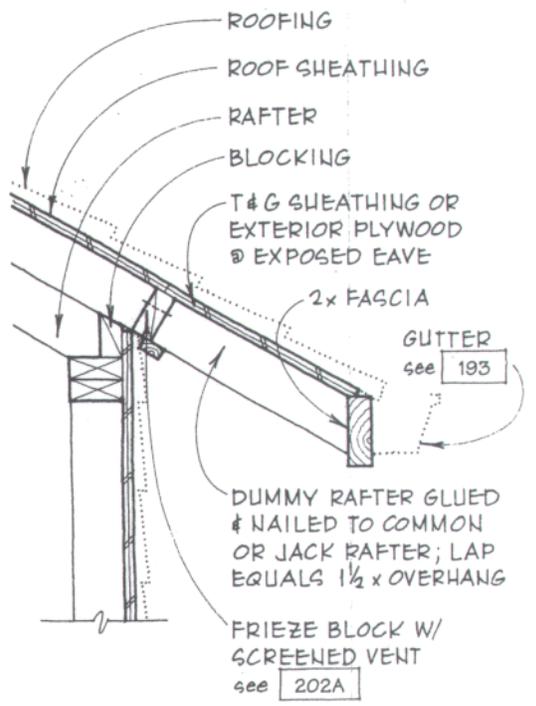


**B** SHED-ROOF EAVE  
TOP OF RAFTER @ WALL

NOTES:  
DUMMY RAFTERS ARE RELATIVELY SHORT, SO A HIGH GRADE OF MATERIAL MAY BE USED. CONSIDER USING THEM IF THE EXPOSED PART OF THE RAFTER IS TO BE A DIFFERENT SIZE THAN THE UNEXPOSED PART OF THE RAFTER OR TRUSS; OR IF EXPOSED RAFTERS ARE DESIRED WHEN PLYWOOD I-RAFTERS ARE USED FOR THE ROOF STRUCTURE see 151-154  
FOR ABBREVIATED EAVES, THE ENTIRE EAVE ASSEMBLY MAY BE SHOP-BUILT IN LENGTHS UP TO ABOUT 16 FT.



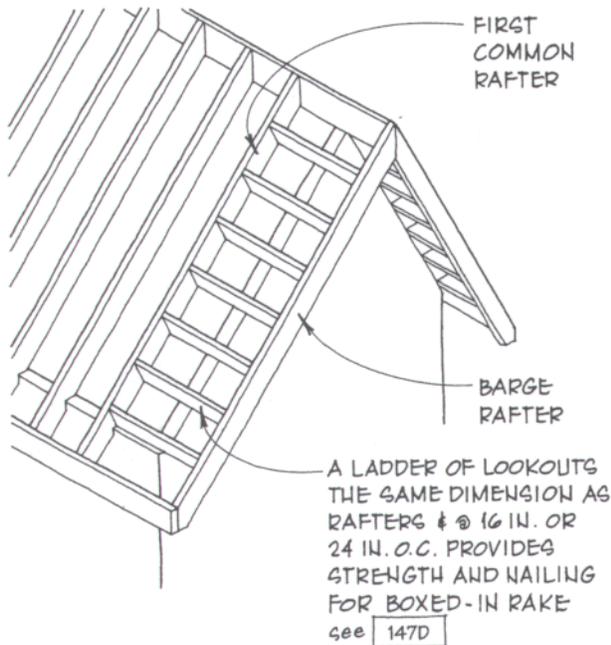
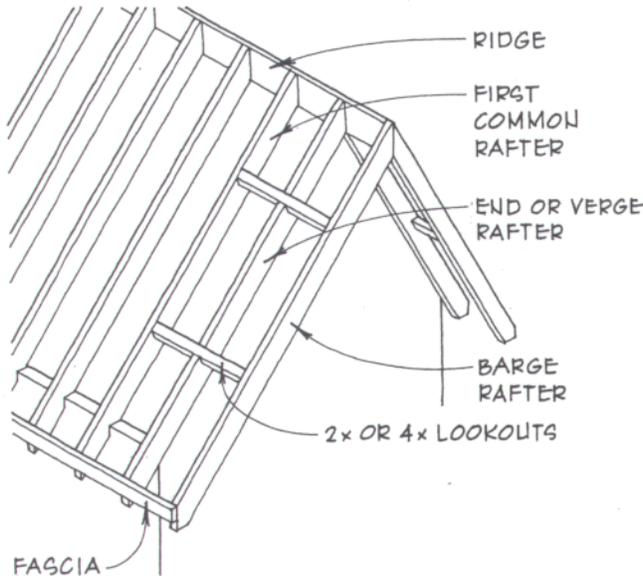
ABBREVIATED EAVE



EXPOSED EAVE

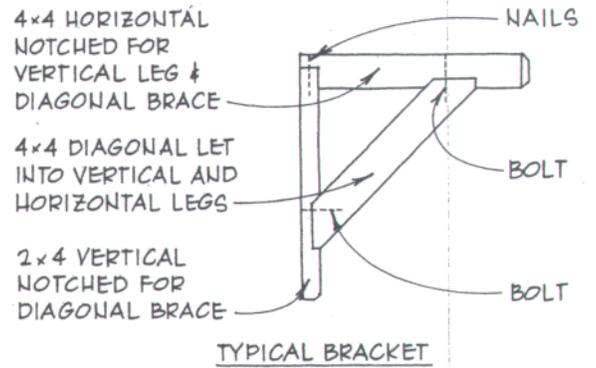
**C** DUMMY RAFTER TAIL

If the ridge, the fascia and the sheathing together do not provide sufficient support for the barge, lookouts extend from the barge rafter to the first common rafter (or truss) inside the wall. The lookouts are notched through the end rafter at the top of the wall. The size and spacing of lookouts depend on rafter spacing and live loading.

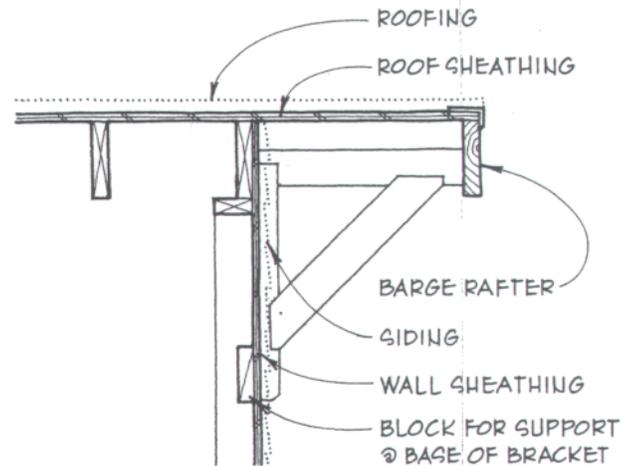


**A** OVERHANGING RAKE SUPPORTED BY LOOKOUTS

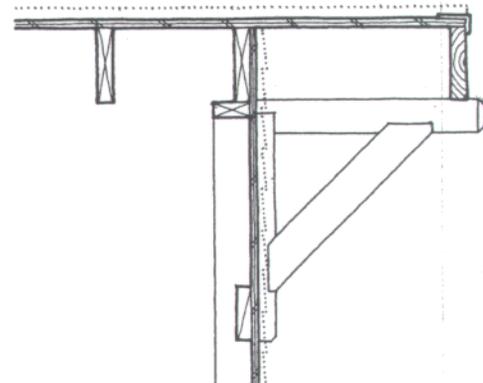
Brackets attached to the face of the wall framing can support the barge rafter by means of triangulation.



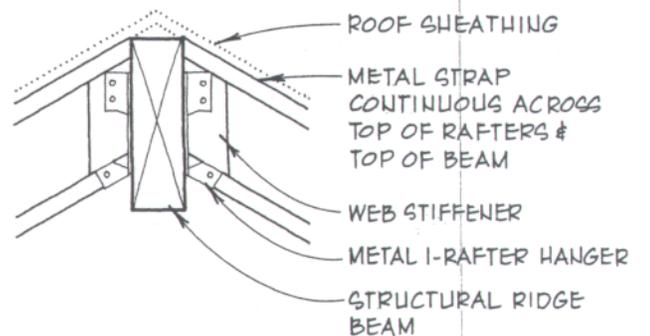
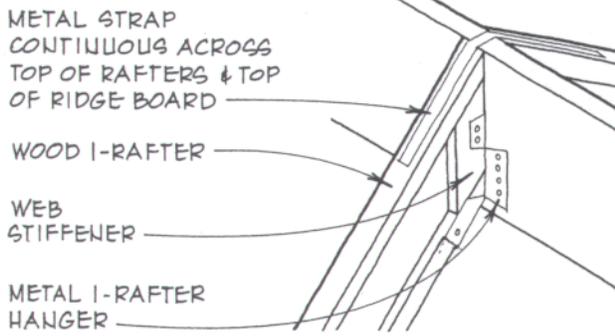
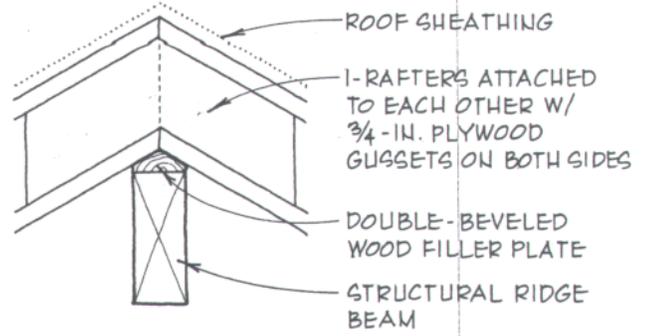
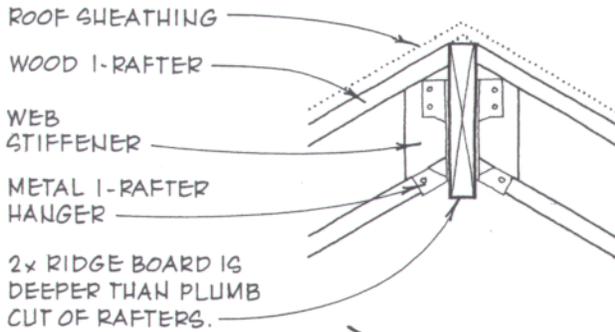
Attaching the bracket to the inside of the barge rafter avoids problems of weathering.



The alternative bracket connection to the barge rafter shown below is common on Craftsman-style buildings. With this detail, moisture collects on top of the bracket, and this contributes to the decay of the bracket and the barge rafter.



**B** OVERHANGING RAKE SUPPORTED BY BRACKETS



**A** WOOD I-RAFTER/RIDGE  
RIDGE BOARD

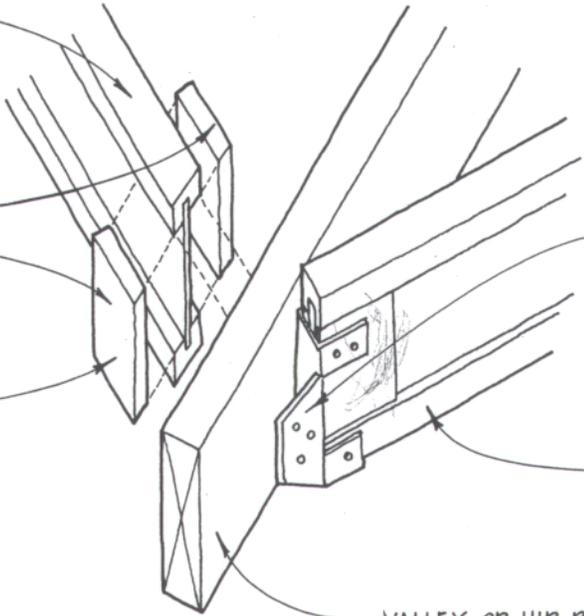
**B** WOOD I-RAFTER/RIDGE  
STRUCTURAL RIDGE BEAM

WOOD I-JACK RAFTER

WEB STIFFENERS W/ 45° BEVELED EDGE TO MATCH ANGLE OF VALLEY (OR HIP) RAFTER

NAIL JACK RAFTER TO VALLEY (SHOWN) OR HIP RAFTER THROUGH WEB STIFFENER

NOTE:  
WEB STIFFENERS ARE REQ'D FOR ALL (VALLEY & HIP) JACK RAFTERS



NOTE:  
FOR POSITIONING OF JACK RAFTERS RELATIVE TO VALLEY OR HIP RAFTERS  
see 137 & 138

ADJUSTABLE METAL HANGER ACCOMMODATES A RANGE OF PITCHES

WOOD I-JACK RAFTER

VALLEY OR HIP RAFTER OF LVL OR WOOD I-RAFTER

**C** WOOD I-RAFTER/VALLEY OR HIP  
CONNECTION OF JACK RAFTERS WITH NAILS OR HANGERS