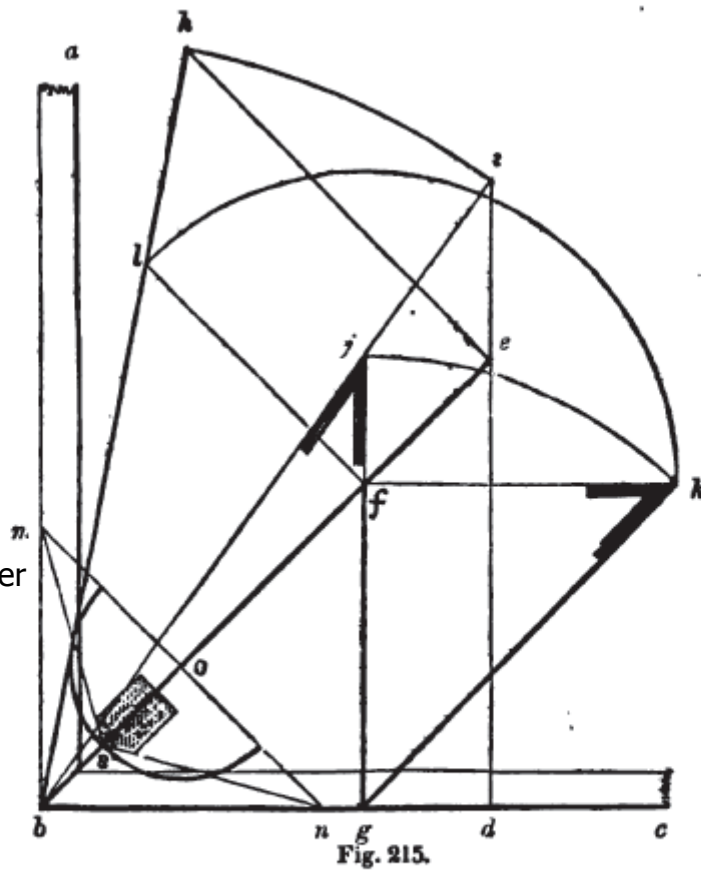
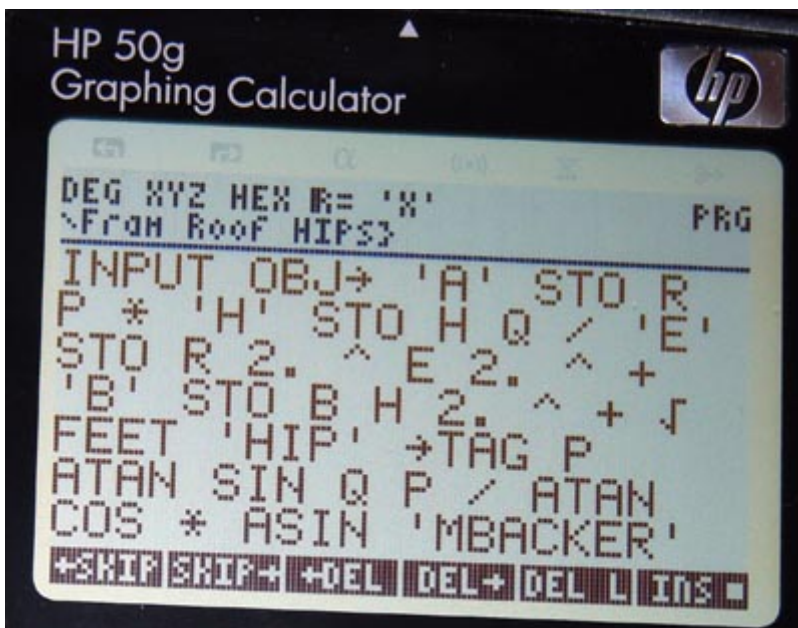


Hip Rafter Backing Bevel Angles from 1830 to 2009

R. G. Hatfield
American House Carpenter
1830

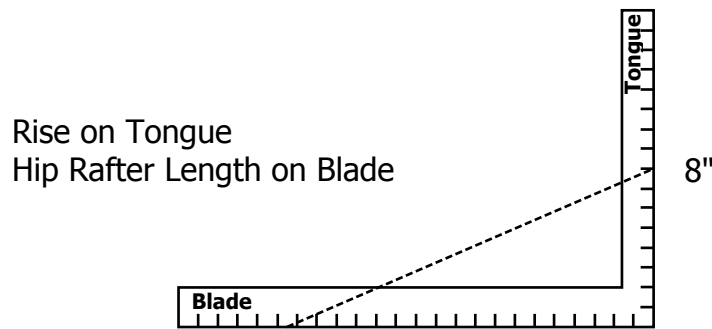


301.—*Fig. 215* is a method of obtaining the proper lengths and bevils for rafters in a hip-roof, *a b* and *b c* are walls at the angle



Mike Morrison
WallMaxx, Inc.
<http://www.wallmaxx.com/>
2009

Hip Rafter Backing Bevel Angle with Steel Framing Square

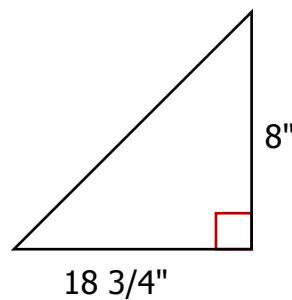


$$\text{Arctan}(8 \div 18 \frac{3}{4}) = 23.10^\circ$$

or

$$\text{Arctan}(8 \div 18.76) = 23.09^\circ$$

Eave Angle 90°
Pitch 8



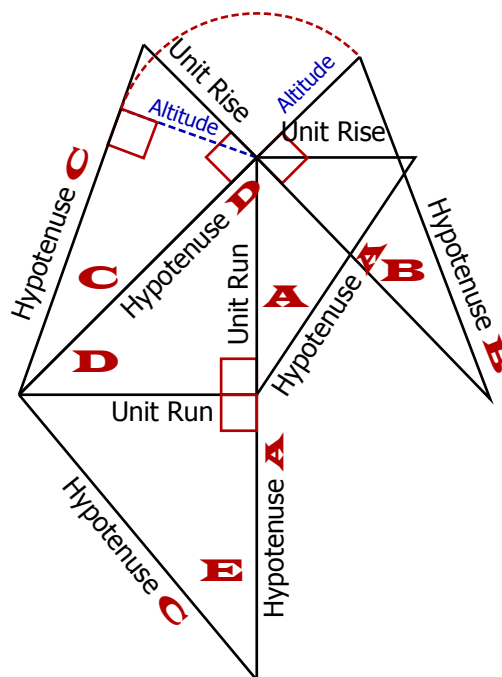
Hip bevel = $\text{arctan}((\sin(\text{hip pitch angle}) * \text{hip run}) \div \text{hip run})$
 Hip bevel = $\text{arctan}((\sin(\text{hip pitch angle}) * 16.97) \div 16.97)$
 Hip bevel = $\text{arctan}((\sin(25.24) * 16.97) \div 16.97)$
 Hip bevel = $\text{arctan}(7.23 \div 16.97)$
 $\text{arctan}(7.23 \div 16.97) = 23.09^\circ$ (Hip Rafter Backing Angle for 8/12)

$(\sin(\text{hip pitch angle}) * 16.97) = \text{altitude of hip triangle}$

Framing Square Usage

$\text{Arctan}(\text{Tonuge} \div \text{Body}) = \text{Framing Angle}$

Hip Backing Angle = $\text{arctan}(7.23 \div 16.97) = 23.09^\circ$



Joe Carola
Eave Angle 90°
Pitch 8 & 10

$10 \div 8 = 1.25$
8 [Inch] [Pitch] 12 [Inch] [Run]
10 [inch] [Conv] [Hip/Val] = 17-5/16" [=] [Run]
10 [Inch] [Rise] [Pitch] [Pitch] = 29.99° (10/12 Bevel)
[Run] x 1.25 = 21-11/16" [Run]
8 [Inch] [Rise] [Pitch] [Pitch] = 20.27 (8/12 Bevel)

Tim Uhler
Eave Angle 90°
Pitch 8

12 [Inch] [Run]
8 [Inch] [Pitch]
[Hip/Val] = 18-3/4" [=] [Run]
8 [Inch] [Rise]
(press Diag Twice)[Diag] = [PLMB]33.69°

8 [Inch] [Rise]
16.97 [Inch] [Run]
(press Diag Twice)[Diag] = [PLMB]24.24° (Hip Plumb cut Angle)
Sine [0.426413]
Conv / Tan [DEG 23.09403°](8/12 Bevel)

Richard Birch
Eave Angle 90°
Pitch 8 & 10

8 [Inch] [Pitch] 12 [Inch] [Run]
10 [inch] [Conv] [Hip/Val] = 17-5/16"
Hip/V / Hip/V [PLMB 27.50°]
Sine [0.461757]
(press divide sign) ÷
(press Hip/V button till you get the 1st Cheek Cut Angle) [CHK1 38.66°]
Tan [0.8]
(press equal sign)= [0.577196]
Conv / Tan [DEG 29.999339°](10/12 Bevel)

(press Hip/V button till you get the 2st Cheek Cut Angle) [CHK1 51.34°]
Tan [1.25]
(press equal sign)= [0.369406]
Conv / Tan [DEG 20.27452°](8/12 Bevel)

Joe Bartok

$$\text{Major Pitch Angle} = \text{atan}(\text{Major Pitch} \div 12)$$

$$\text{Minor Pitch Angle} = \text{atan}(\text{Minor Pitch} \div 12)$$

$$\text{Major Plan Angle} = \text{arctan}(\text{Minor Pitch} \div \text{Major Pitch})$$

$$\text{Minor Plan Angle} = \text{arctan}(\text{Major Pitch} \div \text{Minor Pitch})$$

$$\text{Hip Pitch Angle} = \text{arctan}(\tan(\text{Major Pitch Angle}) * \sin(\text{Major Plan Angle}))$$

$$\text{Major Pitch Hip Backing Angle} = \text{arctan}(\sin(\text{Hip Pitch Angle}) \div \tan(\text{Major Plan Angle}))$$

$$\text{Minor Pitch Hip Backing Angle} = \text{arctan}(\sin(\text{Hip Pitch Angle}) \div \tan(\text{Minor Plan Angle}))$$

http://ca.geocities.com/web_sketches/framing_math_notes/backing_angle_construction/backing_angle_construction.html

Hawkindale Angles

Eave Angle 90°

Pitch 8

$$S = 33.69^\circ$$

$$D = \text{arctan}(\tan(S) \div \tan(S)) = 45^\circ$$

$$R1 = \text{arctan}(\tan(S) * \sin(D)) = 25.23^\circ$$

$$C5 = \text{arctan}(\sin(R1) \div \tan(D)) = 23.09^\circ$$

Hawkindale Angles

Eave Angle 90°

Pitch 8 & 10

$$S = 33.69^\circ$$

$$SS = 39.81^\circ$$

$$D = \text{arctan}(\tan(SS) \div \tan(S)) = 51.34^\circ$$

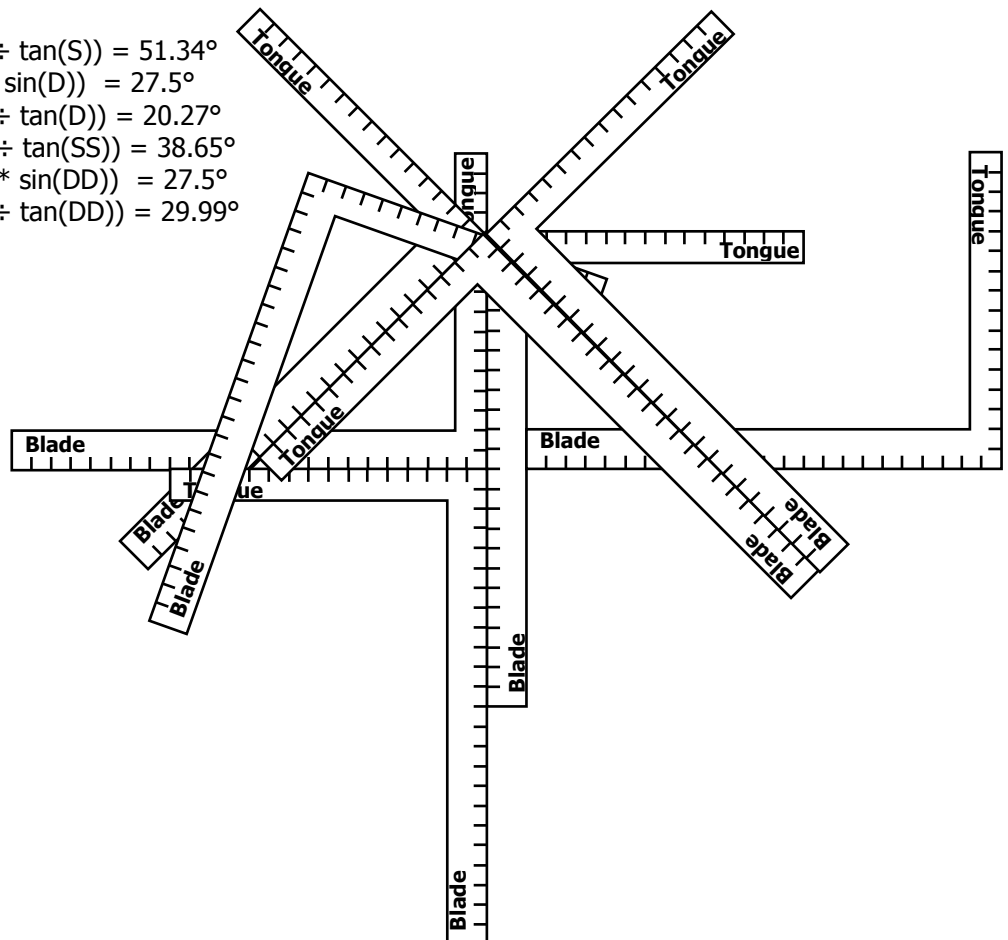
$$R1 = \text{arctan}(\tan(S) * \sin(D)) = 27.5^\circ$$

$$C5 = \text{arctan}(\sin(R1) \div \tan(D)) = 20.27^\circ$$

$$DD = \text{arctan}(\tan(S) \div \tan(SS)) = 38.65^\circ$$

$$R1 = \text{arctan}(\tan(SS) * \sin(DD)) = 27.5^\circ$$

$$C5 = \text{arctan}(\sin(R1) \div \tan(DD)) = 29.99^\circ$$



Billy Dillon

Complex Roof Framing Kernel

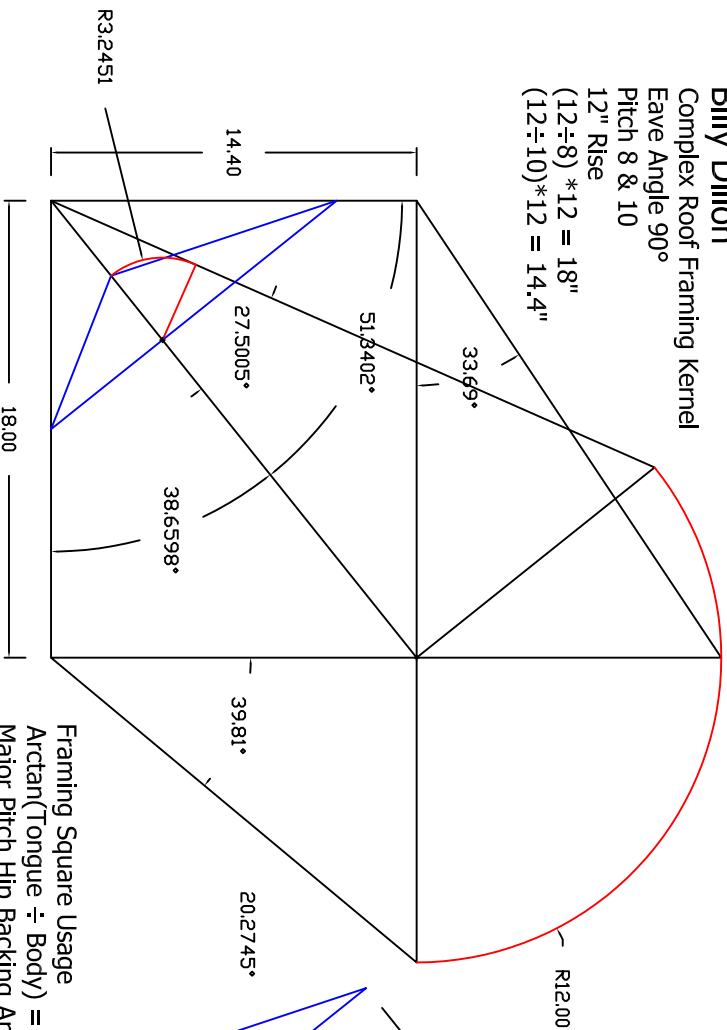
Eave Angle 90°

Pitch 8 & 10

12" Rise

$(12 \div 8) * 12 = 18"$

$(12 \div 10) * 12 = 14.4"$

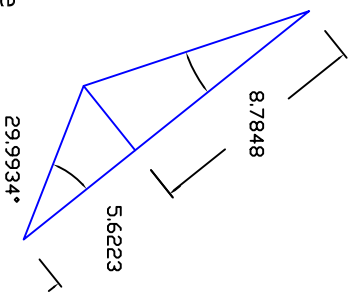


Framing Square Usage

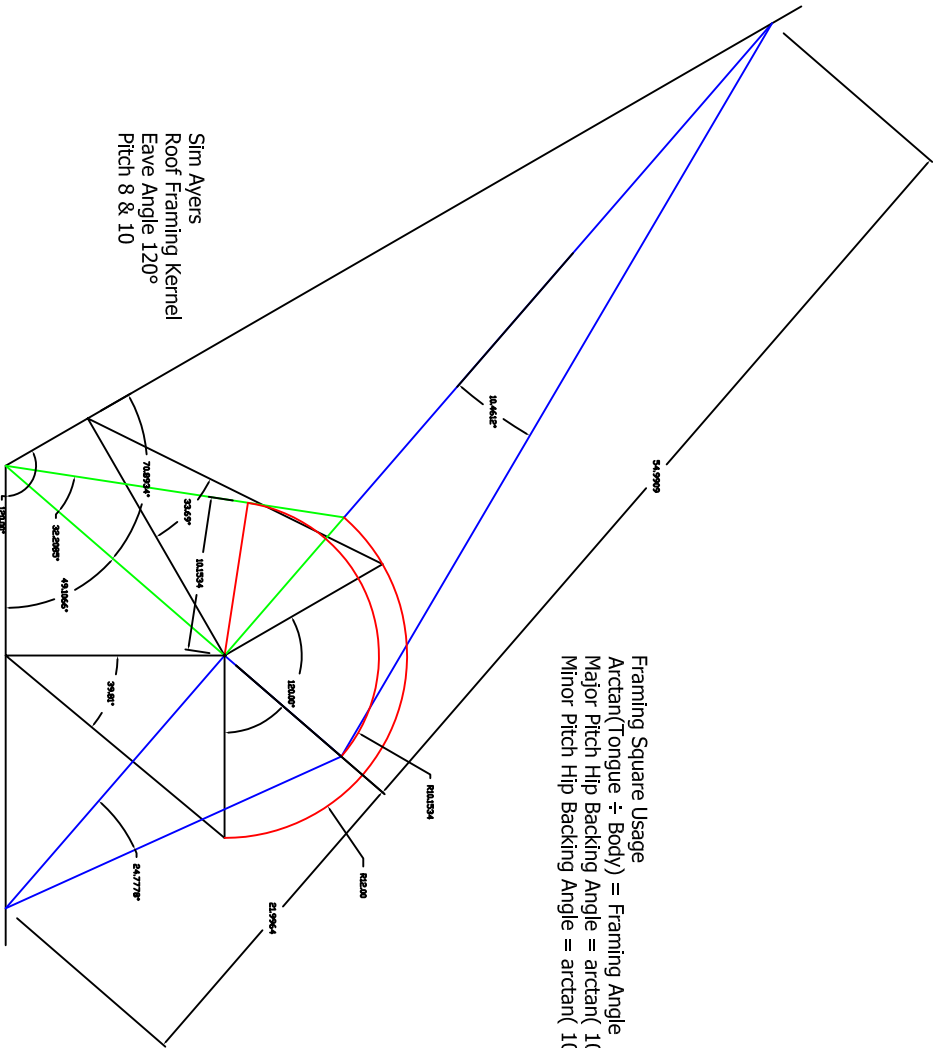
Arctan(Tongue ÷ Body) = Framing Angle

Major Pitch Hip Backing Angle = $\arctan(3.2451 \div 8.7848) = 20.27^\circ$

Minor Pitch Hip Backing Angle = $\arctan(3.2451 \div 5.6223) = 29.99^\circ$



Framing Square Usage
 Arctan(Tongue ÷ Body) = Framing Angle
 Major Pitch Hip Backing Angle = arctan(10.1534 ÷ 54.9909) = 10.4611°
 Minor Pitch Hip Backing Angle = arctan(10.1534 ÷ 21.9964) = 24.7778°



Sim Ayers
 Roof Framing Kernel
 Eave Angle 120°
 Pitch 8 & 10