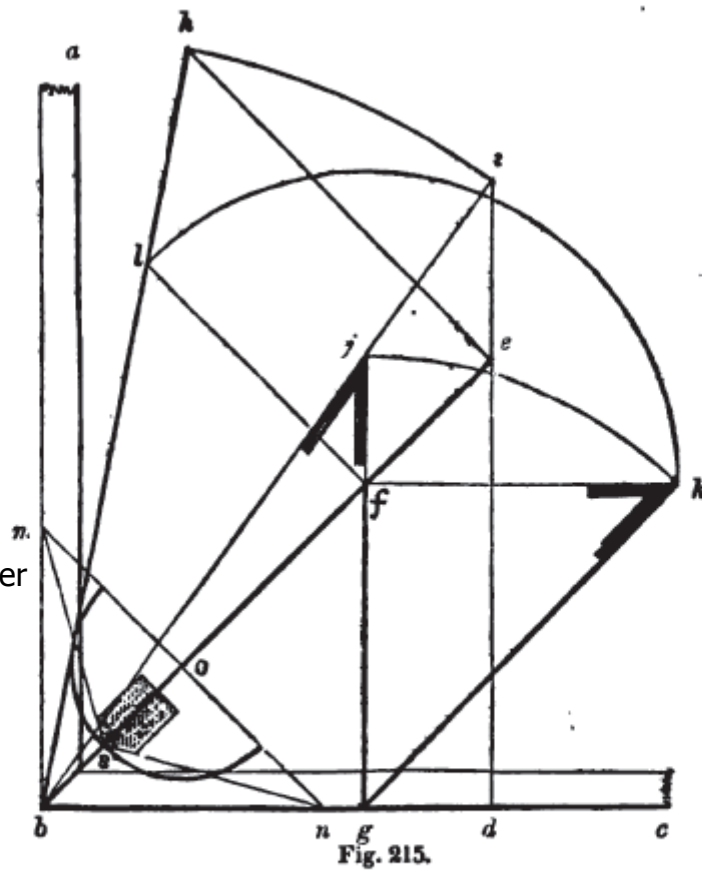
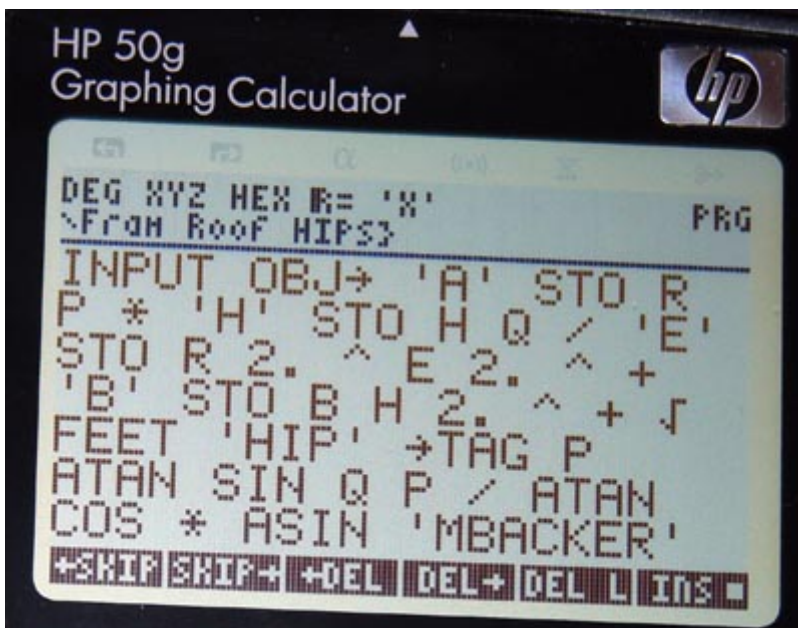


# Hip Rafter Backing Bevel Angles from 1830 to 2009

R. G. Hatfield  
American House Carpenter  
1830

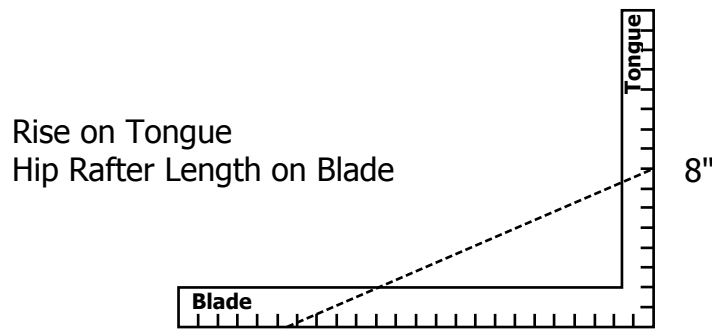


301.—*Fig. 215* is a method of obtaining the proper lengths and bevils for rafters in a hip-roof, *a b* and *b c* are walls at the angle



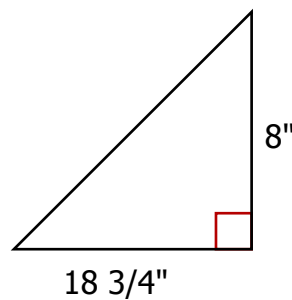
Mike Morrison  
WallMaxx, Inc.  
<http://www.wallmaxx.com/>  
2009

# 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  $90^\circ$   
Pitch 8



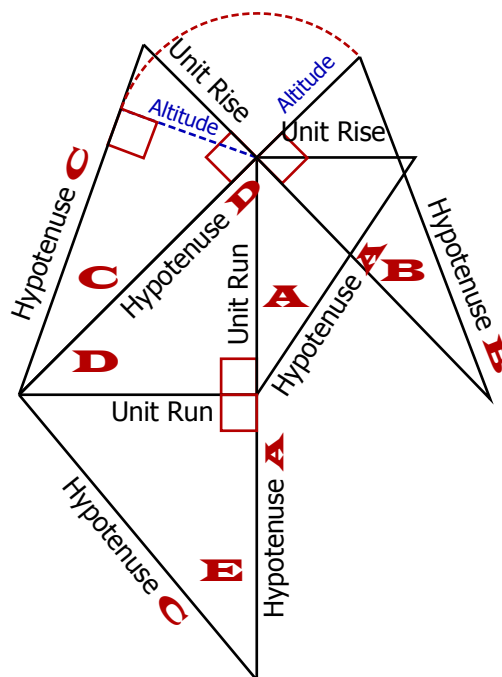
$\text{Hip bevel} = \text{arctan}((\sin(\text{hip pitch angle}) * \text{hip run}) \div \text{hip run})$   
 $\text{Hip bevel} = \text{arctan}((\sin(\text{hip pitch angle}) * 16.97) \div 16.97)$   
 $\text{Hip bevel} = \text{arctan}((\sin(25.24) * 16.97) \div 16.97)$   
 $\text{Hip bevel} = \text{arctan}(7.23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

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

Framing Square Usage

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

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



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](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

$$S = 33.69^\circ$$

$$SS = 39.81^\circ$$

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

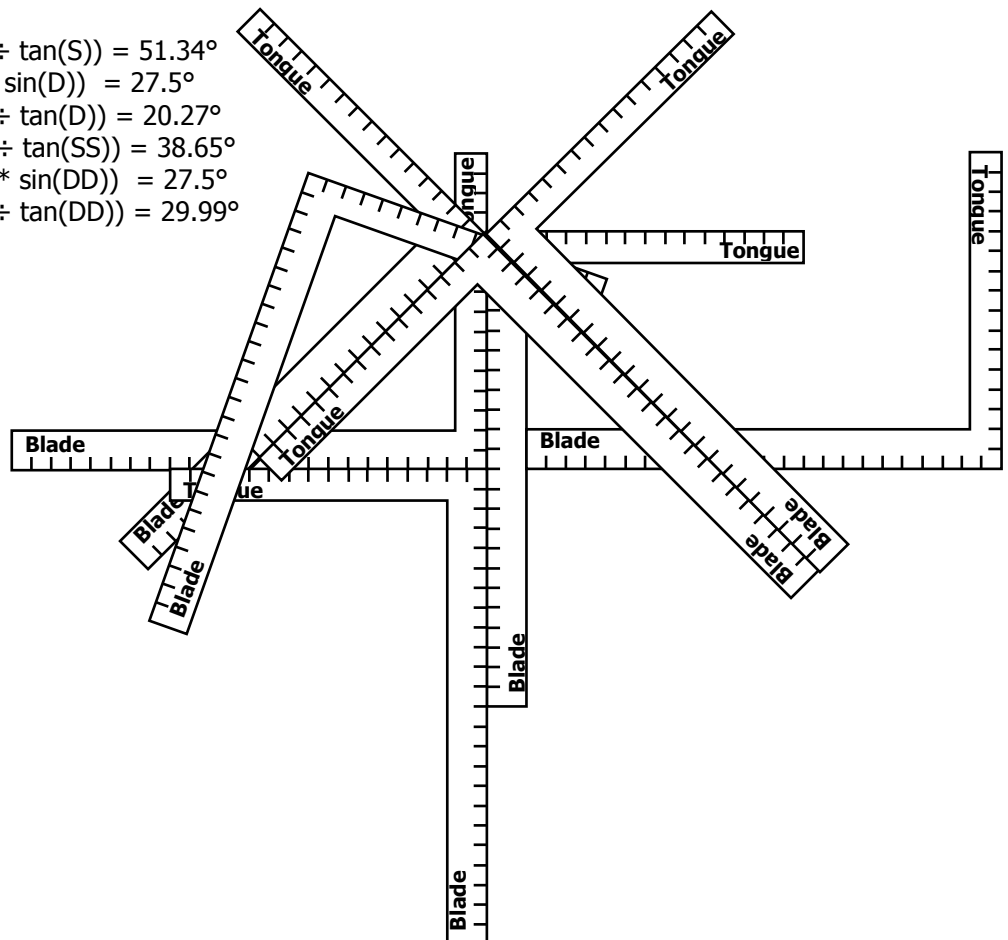
$$R1 = \text{arctan}(\tan(S) * \sin(D)) = 27.5^\circ$$

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

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

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

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



# Billy Dillon

Complex Roof Framing Kernel

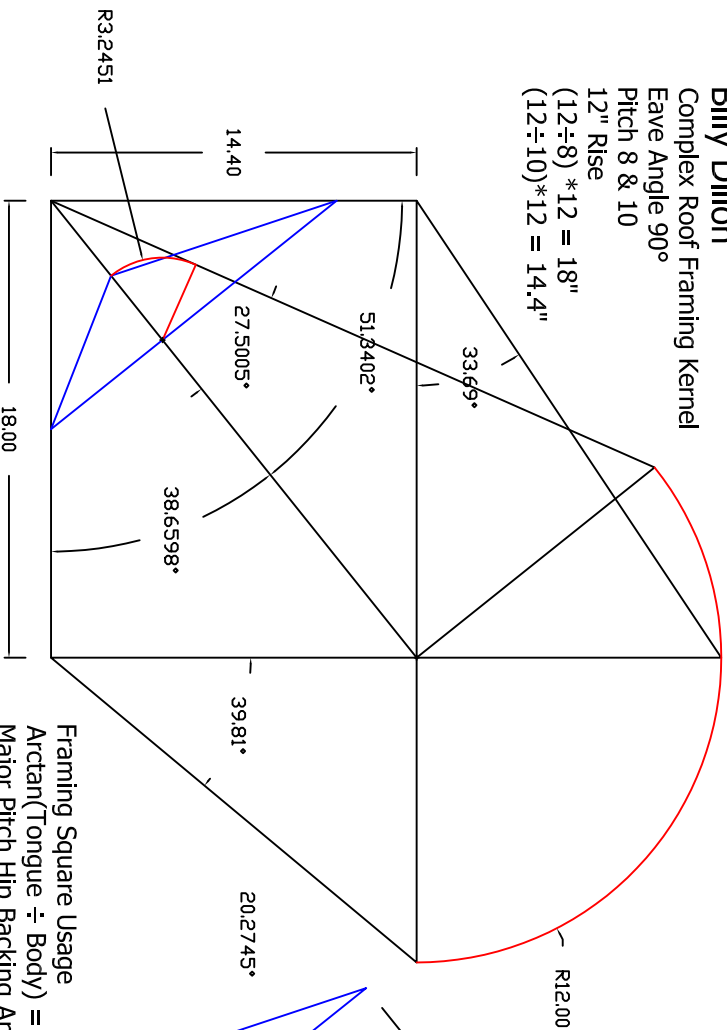
Eave Angle 90°

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 =  $\arctan( 3.2451 \div 5.6223 ) = 29.99^\circ$

