

Yes. For a **symmetrical gable roof**, you can treat sidewall height, building width, roof pitch, midpoint height, and peak height as variables and constrain whichever ones you want.

Let:

- S = sidewall/eave height, ft
- W = total building width, ft
- M = height from ground to the midpoint of the roof slope, ft
- P = height from ground to roof peak, ft
- R = roof rise
- N = roof run
- $q = R/N$ = roof pitch as a decimal ratio

For a **7/12 pitch**:

$$q = \frac{7}{12} = 0.583333$$

Master equations

The horizontal run from a sidewall to the peak is half the building width:

$$\text{Roof run} = \frac{W}{2}$$

Therefore, the total roof rise from eave to peak is:

$$\text{Roof rise} = q \frac{W}{2}$$

So the **peak height** is:

$$P = S + \frac{qW}{2}$$

Because the midpoint is exactly halfway along a straight roof slope, its vertical rise is half the total roof rise:

$$M = S + \frac{qW}{4}$$

For your required **7/12 pitch**, this becomes:

$$M = S + \frac{7W}{48}$$

and:

$$P = S + \frac{7W}{24}$$

These are the two main equations you'll use.

Rearranging them lets you control whichever variable you want

If you know **sidewall height and desired midpoint**, solve for width:

$$W = \frac{4(M - S)}{q}$$

For 7/12:

$$W = \frac{48(M - S)}{7}$$

If you know **width and desired midpoint**, solve for sidewall height:

$$S = M - \frac{qW}{4}$$

For 7/12:

$$S = M - \frac{7W}{48}$$

If you know **sidewall height, width, and midpoint** and want to determine the required pitch:

$$q = \frac{4(M - S)}{W}$$

To convert that decimal pitch to an $x/12$ roof pitch:

$$x = 12q = \frac{48(M - S)}{W}$$

So the roof pitch would be:

$$\frac{x}{12}$$

There is also a particularly useful relationship between midpoint, sidewall, and peak height:

$$M = \frac{S + P}{2}$$

Therefore:

$$P = 2M - S$$

and:

$$S = 2M - P$$

Your 7/12 design system

You could essentially build your calculations around these:

$$\begin{aligned} M &= S + \frac{7W}{48} \\ P &= S + \frac{7W}{24} \\ W &= \frac{48(M - S)}{7} \\ S &= M - \frac{7W}{48} \\ P &= 2M - S \end{aligned}$$

For example, if the regulation says:

$$M \leq 12$$

then your controlling design constraint is simply:

$$S + \frac{7W}{48} \leq 12$$

That equation lets you trade **building width against sidewall height** while maintaining the required 7/12 pitch.

For example:

- Want taller walls? Reduce W .
- Want a wider building? Reduce S .
- Change the allowable midpoint? Change the 12.
- Change roof pitch? Replace 7/12 with the new rise/run ratio.

A convenient **universal version**, where roof pitch is entered as Rise/Run , is:

$$M = S + \frac{W}{4} \left(\frac{Rise}{Run} \right)$$

That's probably the most useful single equation for building a spreadsheet or calculator where you can change all the constraints independently.