Andrew Morrison's Straw Bale Special Reports

Framing Details and Tips

2 X 4 braces hold the walls plumb until bales or mesh are installed

When building an infill straw bale structure, the most common frame is post and beam. In and of itself, a post and beam frame doesn't have any strength in the lateral shear direction, which means if a wind load or some other load pushes against the side of the building it can wrack and fall over. The same is true for the out of plane direction. Out of plane loads are loads placed against the face of a wall, causing bowing and flex. For this reason, it is crucial to use temporary bracing during construction to hold the building plumb and stop it from wracking. Once we move further into the process of baling, permanently bracing will take the place of the temporary braces and act as an integral part of the structure.

The timing of the temporary brace removal is crucial as if it is removed before permanent bracing is ready to install, the wall will fall out of plumb and the risk of the structure falling over comes into play. For that reason, a plan of action is required before the temporary bracing is installed. On small structures, like the one above, I will brace to the outside, install the bales, and then remove the exterior bracing once the building is locked in place by the bales.

On larger structures, like the one on the right, it may be more advantageous to install the bracing to the inside so that the welded wire mesh can be applied to the exterior of the building before the bales are installed.

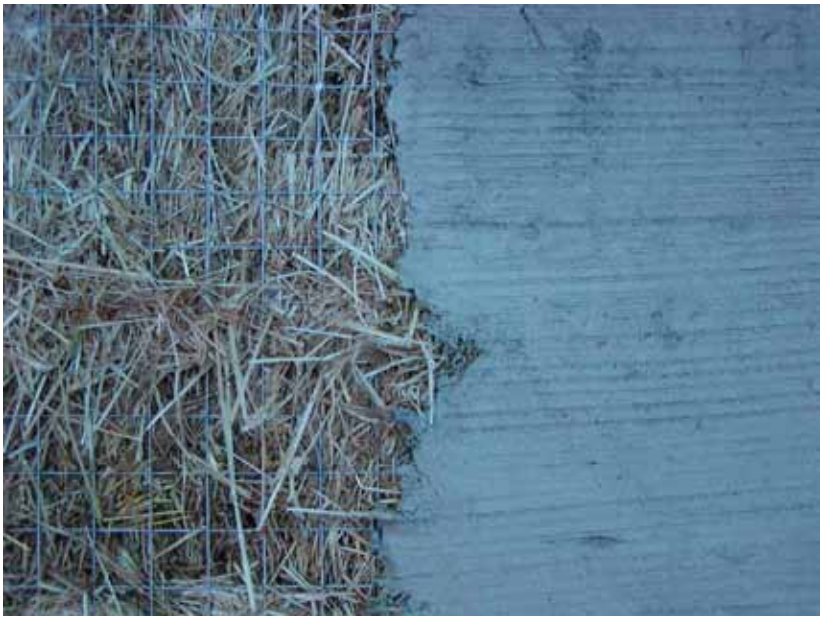
Install mesh before the bales on multiple story homes.

Conventional post and beam structures are braced with a standard angle brace or knee brace, which is basically a 2x4 with 45 degree angles cut on either side installed near the top of the union between the post and the beam. The placement of the knee braces changes depending on the engineering requirements, but typically every post will need to be anchored in this way on both sides. This type of bracing is time tested and durable; however, it creates an awkward framing member to notch the bales around. After notching for a few of these angle braces, you will quickly agree that there must be a better way.

Another option is to use Simpson Strong Tie™ hardware, HardyFrames® or other mechanical fasteners to create brace frames, so that once you've sheared one section and you've got plates at each connection tying everything together, you can't get any movement in the lateral shear direction. This system will require engineering for code approval, but works well. The biggest draw back to such a system is the cost. The metal hardware can get expensive and the labor to install it can add up quickly.

Example of a Hardy Frame™

Another option is to use let in-bracing. To create let ins, use your Skill saw and a chisel to cut a smooth channel into the exterior face of the posts and window framing so that the face of the bracing ends up flush with the face of the exterior structure. Once notched in, simply nail a 1x4 into the notches created for tight bracing. This system only works when you have enough framing to anchor the brace to. In other words, it is not a likely candidate for post and beam structures; however, there are cases when it will work. There are other kinds of bracing available as well. Local code books have a good description of what is allowed and what is not allowed depending on things such as earthquake and wind zones.



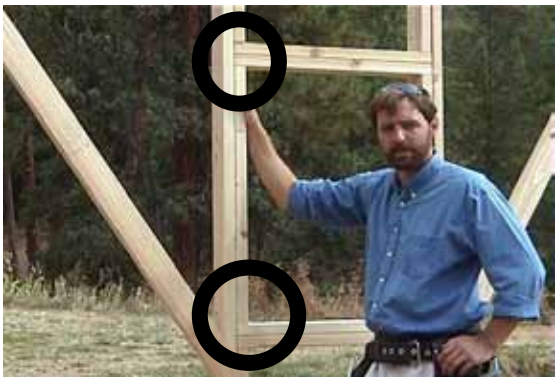
In older baling systems, people installed chicken wire as a stucco netting on the face of the bales. Not only is chicken wire a nightmare to work with, but it does not do a very good job of holding material used to shape and stuff walls. In the new system, a 2 inch x 2 inch, 14 gauge, welded wire mesh is used to replace the chicken wire and to act as part of the lateral shear design for the building. Depending on the required engineering in your area, a simple shear design can be accomplished with the mesh applied to the inside and the outside of the building.

Straw bale construction is a little bit different when you get into the design process, mostly because of the size of the bales. “standard” straw bales can vary from one source to another. Different size balers yield different size bales. It is important to know the size of the bales you will be using and where they are coming from before you start

designing, or certainly before you start framing. If, for example, you design for 14 inch tall bales and then you go to your local source and find they actually have 16 inch tall bales, all of your window sill heights will be off as will all of your window and door header heights. Most importantly, the height of the top beam will be off. It's important that your bales meet up with the sills to create a flush union between the top of the bale and the sill. What is equally, if not more important, however, is for the bale courses to line up tightly with the top of the beams and the top plates of interior partition walls.

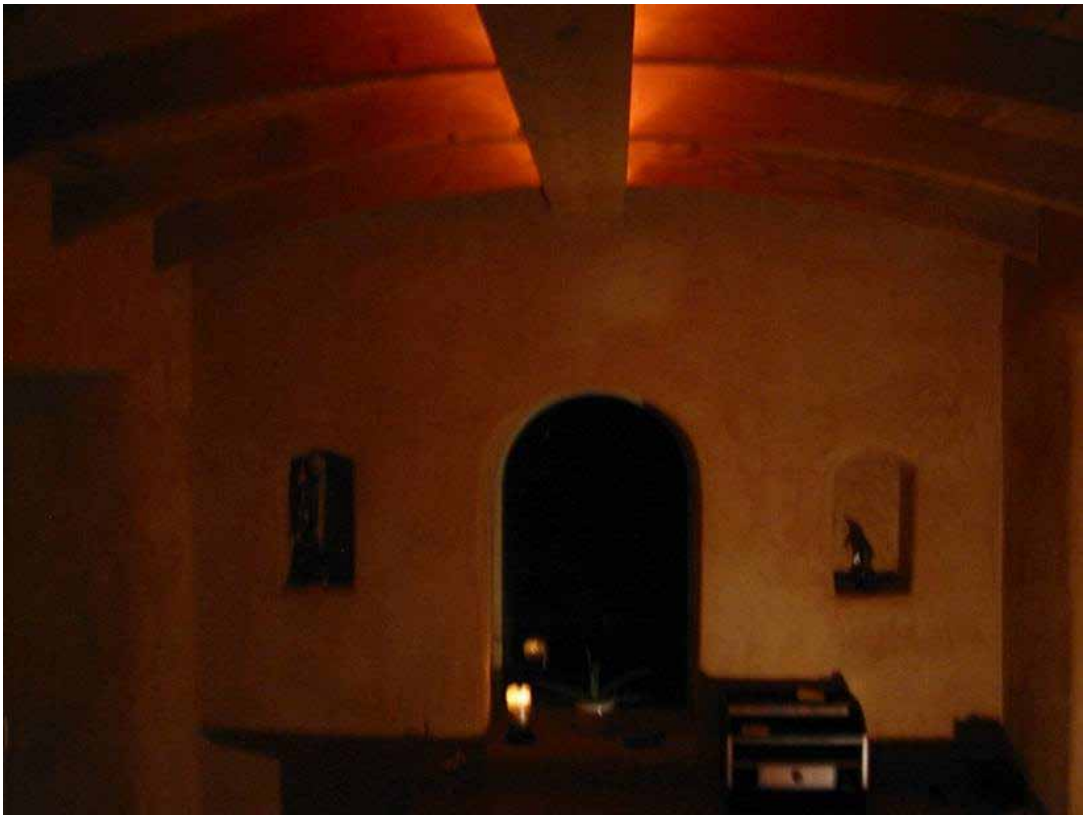
Welded wire mesh applied over the bales and ready for plaster.

When framing in window openings I use a trimmer detail that's a little different than most people use. Refer to the diagram below for the details of how this system works. Instead of running a solid trimmer stud along the king stud, cut it to the base of the sill, add a double 2x4 sill - and then another section of trimmer on top of that sill going up to the bottom of the header. Add the header per design requirements, and then a final piece of trimmer on top of the header to the bottom of the beam or wall plate. This system takes a little



Notice the cut trimmer details and how they "hold" the sills and headers in place.

longer to build than a single trimmer, but it is a great detail for stabilizing window framing and reducing plaster cracks. For example, on the west coast the framing lumber is green, which means it hasn't been kiln dried, so once it sits out in the sun it has a tendency to twist and to warp. The warp and twist place stress on the plaster joints around the window, increasing the risk for cracks in an already susceptible area. Having the sill and header sandwiched in between the trimmer pieces, as well as being nailed and crossed nailed in different places, makes for a really solid framing application. A little attention here can save headaches later by reducing cracking in the finish plaster.



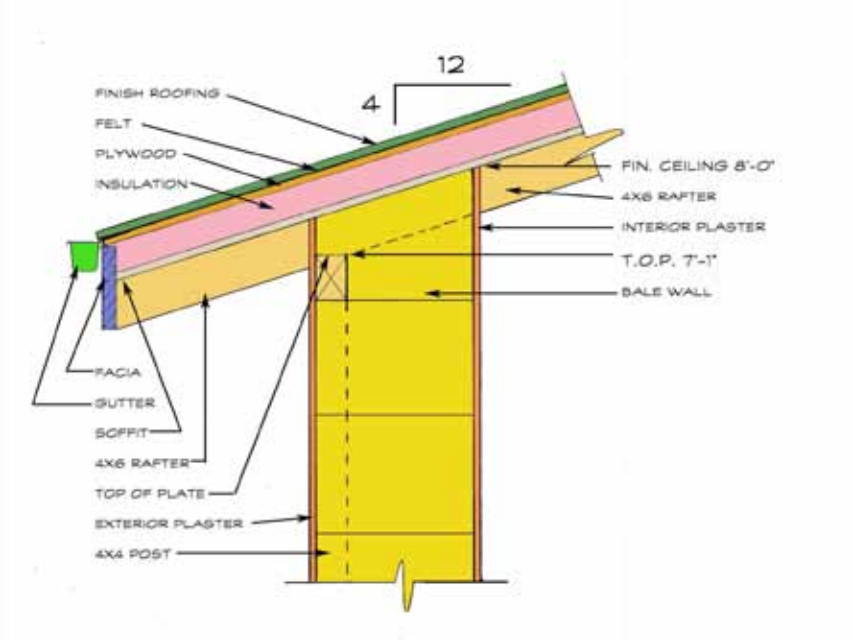
Note the change in height as the rafters move into the room. Significant gain can be made if the run concealed within the bale walls is considered during design.

I've already talked about the importance of paying attention to the height of your top plate/beam as it pertains to the bales; however, there is another reason to pay attention to this detail. While in the design phase, it is possible to take advantage of the thickness of the walls by utilizing a steeply pitched roof to lower the wall height. There is at least 18 inches of wall thickness from the exterior to the interior. With a steeply pitched roof and a vaulted ceiling, the wall height can be kept lower than standard to save verti-

cal space since by the time the rafters come in 18 inches they are going to be significantly higher. It's kind of thinking outside of the conventional framing box – you've got an extra 18 inches of run that you lose in the bale wall. This is most useful in smaller structures, especially those restricted to height conditions

In the following cross section, the rafter enters into the left side of the wall at the top beam and then rises through the 18 inch thick bale wall and exits on the right side at a higher elevation.

One final tip: plan on using 2x exterior trim because 1x material is not thick enough to span the thickness of the three coats of plaster.



Cross section noting the gain of rafter height through the bale wall.

Special Report Quiz

Framing Details & Tips

1. What is the best way to frame a window trimmer/sill/header assembly?

2. Name two good ways to permanently brace a building for lateral shear.

3. What size exterior trim should you use?

4. Is it important to know the source and size of your straw bales before you start framing?

5. How can you save on headroom for buildings with height restrictions?

6. What is shear bracing?

7. What is out of plane shear?

8. Was is the thickness of a standard two string bale, ie where do you place the interior sills?

9. How many boards make up a bottom window sill?

10. What reason besides strength do you think the thickness of the sills, headers, and trimmers are important for?