

# Andrew Morrison's Straw Bale Special Reports

## *Bale Stacking Considerations*

**W**hen stacking bales, the most important thing to think about is how they are connected to one another. If you stack bales on top of each other without locking them into place, the wall will be weak and dangerous. Bales should be stacked in the same manner as bricks or legos in what is called “running bond.” By lapping the joints of the bales, the wall is strengthened and the bales locked into place.



It is not always possible to stack bales in running bond across the entire length of the wall, however. For that reason, it is important to plan your layout before you start baling. While planning, you may notice that starting on a specific wall and working in a certain direction will improve the layout of the bales and make a stronger wall.

Begin the first course at your starting point with a full bale. Make sure that the bales are properly anchored onto the toe-ups and that the 20 penny nails have a good grip on the bales. Continue along the wall using full bales until you reach a door opening or corner. If a full bale will not reach to the end of that run, do not place the bale so that the end of the course will need additional straw stuffing to finish it. Instead, place the full bale at the end of the run and stuff the space created in between this bale and the rest of the course you just laid down. This will affect the layout of the running bond, but not enough to compromise the wall's strength.

You may find that when you reach a corner the layout works better if you place a bale in the new wall at the corner and stuff back to the initial wall. If the gap is larger than 4", install a re-tied bale into the gap rather than stuffing it as re-tied bales are stronger and denser than stuffing. Pay attention to your corners as you bale. It's important that they interlace as you stack and that they be strong. Use bales that are as large as possible. If you are going to need to stuff or use re-tied bales close to the corner, distance them as much as you can from the corners. Continue to alternate the full and cut bales at the corners so the walls are tied together. If you have ever built with Legos®, you will fully grasp the importance of this corner connection. Always start each new course at the same starting point as the previous course and alternate full bales and half bales as you go up.

Lay the entire first course of bales before you begin the second course. Use a half bale above your starting point on the first course to start the second course. By starting with a half bale, the joints in between the bales are staggered like bricks and create a running bond pattern. Continue to alternate the whole bale, half bale layout until you reach the top of the wall or an opening that requires resized bales.

It is best to hold the bales back from openings and to use stuffing to shape them later; however, do not stop a bale too far from the window or door opening as that will

create a large amount of stuffing. Generally, I would not stuff anything over a 4" gap. Instead, slide the bale closer to the window and stuff in between the two bales further away from the window. Leave just enough room around the window to complete the shaping later on.

There are times when running bond simply cannot be accomplished. This is usually in cases where two or more openings are close together and there is only room for one bale or bale section in between them. If a large bale section fits in the space between the openings, tie your bales a bit big and then wedge them between your framing members. By wedging them in, the stack of bales will be stable. If, however, the space is small and the bales collapse, you may need to anchor them to the frame. There are a number of ways to accomplish this from simply using twine to using additional framing. I have found the best method combines wood blocking and a hand ratchet system from a company called Cordstrap® ([www.cordstrap.com](http://www.cordstrap.com)). Lay down



two courses of bales then cut two sections of cord strapping that are long enough to go around two courses of bales and drape them on top of the first two bales. Place a 2x4 block between the framing members and push it as far down onto the top of the bale as possible. Toe-nail the blocks into the wall framing, place the next two courses of bales on top, wrap the strapping around the bales, and then tighten the cord strapping around the blocking and bales.



**The strapping material provided by Cordstrap makes an excellent anchoring system.**

In order to stack bales over window and door openings, you will need to build and install box beams to carry the load of the bales above the opening. (When possible, build all the box beams ahead of time so they can be installed during the baling process without delaying the bale stacking.) Construction details of box beams depend on how many bales will be stacked on top. A general design calls for two lengths of 2x4 connected with small sections of 2x4 every 16" on center. The gaps created in this frame are then insulated and sheathed with plywood on both sides. The ends of the box beam should extend onto the bales by at least 6 inches.

Attach the box beams to the framing above the windows and doors with 16d nails. Use "plumber's tape," a form of metal strapping, to secure the face of the nailer to the ceiling joists or rafters. Attach a section of the metal every 24" on center. This strapping can be left in place or removed after the mesh has been applied. If you want curved window openings, it is best to create box beams that are narrower than the walls. If your bales are 18" wide and your post and beam system is 3 1/2" wide, build a 12" box beam. This enables you to keep roughly 3 1/2" inches away from the face of the bales and thus creates the soft curves straw bale walls are well known for.



The design of the ceiling assembly or “lid,” how the curve of the window and door openings meets the ceiling, depends on the design of the home. Some homes have flat lids above the openings while others are curved towards the ceiling. A simple detail is a 2x4 nailed to the ceiling joists so that the outside edge of the nailer is placed at 18” from the exterior of the building. This becomes the nailer for the mesh. Another option is to add plywood behind the nailer to stop the straw from entering into the joist bays. This is important if insulation and airspace will occupy the joist or rafter bays. Some engineers require that the nailer be a full box beam made up of a 4x4 on the interior wall line and sandwiched between two pieces of plywood. In either case, place a piece of 15 pound felt paper over the top course of bales and allow it to extend over the sides of the top course of bales. This is added insurance against a roof leak. Any water that runs down the rafters will hit this felt and run into the plaster. A wet spot on the plaster will indicate the presence of a leak before it causes damage to the bales.

It can be challenging when there are low windows that lie within the first course of a bale, such as those used in a window seat. The 20d nails in the toe ups make it hard to slide a bale underneath a window sill while still landing on top of the nails. You may in this case need to cut the bale into a smaller, more manageable piece.

If you are creating a window seat, do not rely on the strength of the plaster to be the major support for the seat. Create a top layer of reinforcement by screwing two 3/4" pieces of plywood together. Attach this unit to the bales by drilling at least two holes for 1/2" dowels and then driving those dowels roughly 12" into the bales. Once the plaster is placed over the plywood, the seat will be very strong. For a more polished look, you could attach a finish grade piece of wood to the plywood once the wire mesh has been installed and plaster up to that.

# Special Report Quiz

## *Bale Stacking Considerations*

1. What does the term “Running Bond” refer to?
2. Should the first course be started with a full bale or a half bale?
3. If you have a narrow stack of bales from floor to ceiling should you try and attach the bales to the house frame? If so, how would you accomplish that?
4. What does a box beam do?

5. What is a simple design for a box beam and how wide should it be? Why?

6. Do perpendicular bale walls have to be tied into each other? If so, how do you do that?

# INSTALLATION CHECKLIST

## *Bale Stacking Considerations*

1. Be sure to plan your bale layout. A little time spent planning can save you time in retying and stuffing bales and holes in the wall.
2. Build and install the box beams before starting to bale when possible .
3. Be sure to hold the face of the box beams back from the face of the bales so you can round the openings easily.
4. Always stack your walls in running bond when possible.
5. Start with full bales on the first course and continue to stack the first course until you hit a corner, a termination, or an opening that interferes with the course.
6. Start your second course with a half bale from the same place you started the first course.

7. Always return to the same starting place and alternate full bales and half bales per course .
8. Do not leave large gaps at the end of a wall run. Instead, place the bales tight to the end of the wall, or the new wall if turning a corner, and stuff the space between the new bale and the previous bale.
9. When reaching a corner, plan your layout so that the new wall will be incorporated into the existing wall. In other words, be sure to interlock the corners.
10. Small columns of bales can be attached to the frame with a 2x4 block and some twine or, better yet, Cordstrap®.
11. Reinforce window seat bales with plywood.