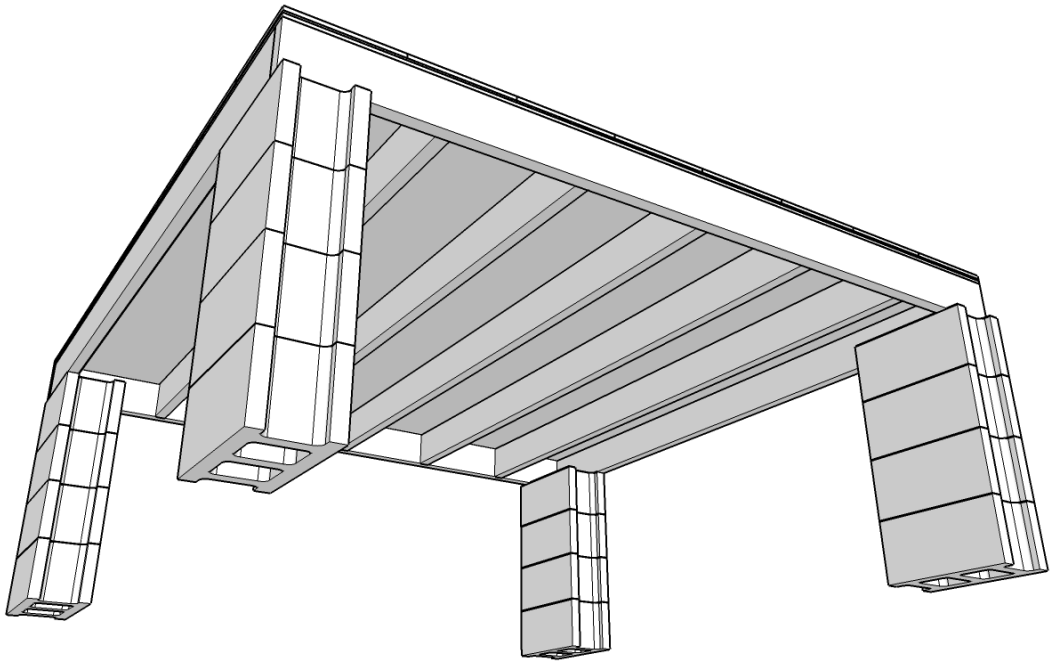
CCC Project Manual

FLOOR REPAIR



Project Components & How-To's

Floor Repair

Common Materials

- 2x6 for Joists
- 4x8 Plywood for subfloor sheathing
- 4x8 Luan for tile backing
- Scrap 2x6 for scabbing
- Peel and Stick Tile
- Joist Hangers
- 16d Nails
- 8d Nails

Flooring Specific Tools

- Reciprocating Saw
- Jig Saw
- Linoleum Knife or Utility Knife

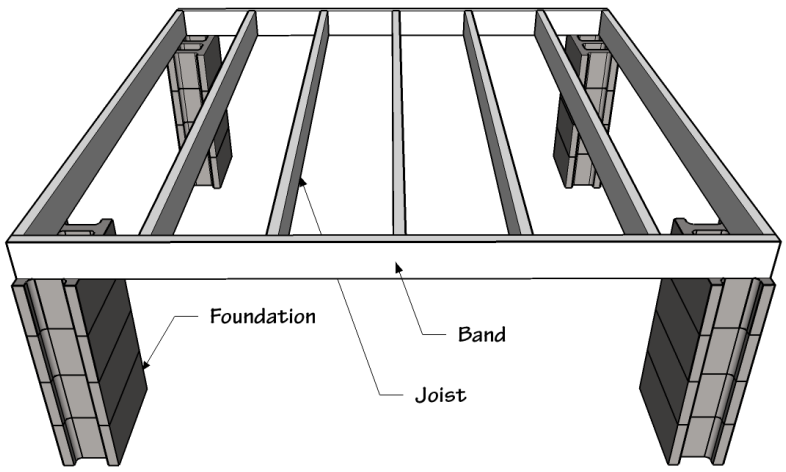
Common Measurements

- Any new joist should be spaced 16" OC (On Center).
- Any scab should extend 2 ft past the rotten/weak spot in the joist.

Floor Repair Warnings

- BE WARY OF ALL FLOOR REPAIR PROJECTS, ESPECIALLY THOSE IN THE BATHROOM! Don't get in over your head! Floor repair is often like an iceberg: on the surface, it may not look like that much, but underneath, it can be a huge disaster waiting to happen. Do THOROUGH inspections before even deciding whether or not to even embark on the project. Know when to say no.
- Don't get carried away! Don't fix more than you have to.
- NEVER JACK UP A FLOOR! Raising a floor with a jack is extremely dangerous to campers, staff, and homeowners.
- Avoid MAJOR structural floor repairs! Very large projects can be overwhelming, extremely time-consuming, and often dangerous for the average CMG. Only do small floor patches that can be fixed in 1-2 days.

VERY BASIC FLOOR FRAMING STRUCTURE



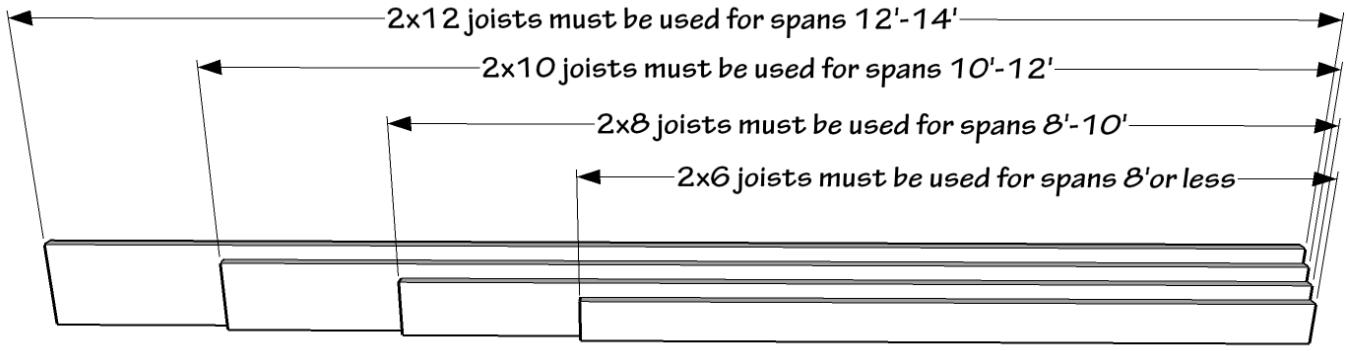
- Many floor problems occur in the bathroom. If you are addressing a floor in the bathroom, EXERCISE EXTREME CAUTION that you do not damage any of the plumbing, either in the bathroom itself or under the floor! Many homes CCC works for may very old, rusty, or deteriorating plumbing. We do not have the expertise to fix plumbing problems, nor the money to pay someone to fix them!
- Before addressing a bathroom floor, ALWAYS locate the water cutoff for the house, just in case, and make sure it works before starting the project. Turn the valve off and then turn on the COLD water at the kitchen sink. If the water flow begins to drop off after a few moments, then you know the cutoff valve works. With the COLD water still on at the kitchen sink slowly turn the water back on for the house. You may not need to disconnect any water lines to make the floor repair, but in case you accidentally hit a hidden water line ,you need to know where the whole house cut off valve is located.

Floor Components: Framing System

- Floor Joists
  - ☞ Floor joists are the structural members which create the framework for the subfloor. These members support the "load" (weight) of the floor.
  - ☞ Joists are in turn supported by larger beams, girders, posts, bearing walls or foundation.
  - ☞ Use southern yellow pine boards, treated or untreated, to repair joists.

- Floor Joist Spacing
  - ☞ The standard spacing for floor joists in "stick-built homes" (i.e. non-mobile homes) is 16" on center. In other words the open space between two floor joists (inside-to-inside) is approximately 14 ½".
  - ☞ Often in mobile homes the floor joists are 24" on center.
  - ☞ You may find other situations where floor joists are spaced differently, or where each joist is randomly spaced from the others! To be safe, any of our NEW construction should have joists spaced 16" on center.

- Floor Joist Span: This is the length-wise distance that a floor joist can travel without being held up by some other means of support, such as a beam, post, wall, footer, etc. The longer the span is, the greater the dimensions that the floor joist boards must be. The bullet points below give the minimum dimension of a floor joist in relation to its span. Remember, if you can shorten spans by adding beams or posts, you can downsize to smaller-dimension joist boards, thereby decreasing cost.
  - ☞ Span less than 8' — must use at least 2x6 boards for joists.
  - ☞ Span between 8' and 10' — must use at least 2x8 boards for joists.
  - ☞ Span between 10' and 12' — must use at least 2x10 boards for joists.
  - ☞ Span between 12' and 14' — must use at least 2x12 boards for joists.
  - ☞ Span greater than 14' — must be supported in center by beam, post, etc.



- Band (aka Exterior Joist, Exterior Band, Rim Joist)
  - ☞ The band is an exterior structural member which carries the load of the exterior wall and allows floor joists to be attached to it at a 90° angle. Think of a square with the perimeter being the band.
  - ☞ Use southern yellow pine boards (treated, if in contact with the ground at any point) to repair.

- Foundation
  - ☞ The foundation refers to the materials that transfer the load of the floor to the ground.
  - ☞ Pre-existing structures may have all kinds of foundational support, such as posts, bricks, cinder

blocks, blocks of wood, etc. CCC does not have the expertise does not have the expertise or time to install entire new foundations, however, we can provide small intermittent ground-to-floor supports for small floor repair projects. For such purposes, you should use 4x4 or 4x6 posts and cap blocks.

- ☞ Posts must rest on top of a level 4"x8"x16" masonry cap block. Bolt beams and/or joists to the post using ½" x 6" carriage bolts (do not necessarily need to be galvanized), along with washer and nut.

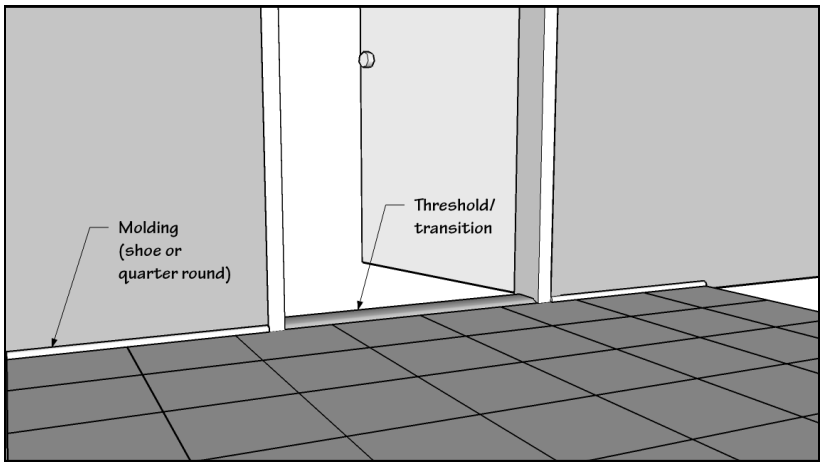
Floor Components: Sheathing

Upon the floor's framing system (joists, bands, posts, etc.) rest several layers of sheathing. When you embark on a floor project, it is important to make sure that the sum thickness of these layers will be such that the finish surface of the "new" floor is level with the finish surface of the "old" floor. In other words, the new floor should be as thick as the old floor, so make sure these layers accomplish this.

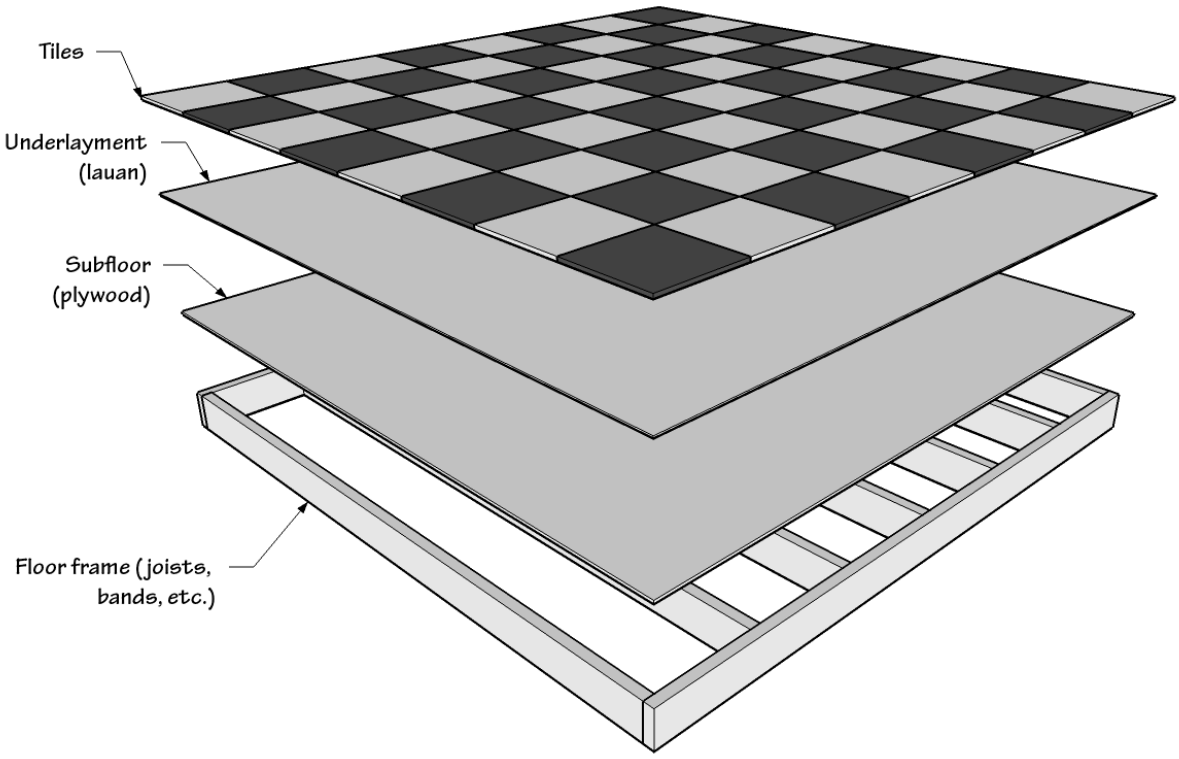
- Subfloor
  - ☞ The subfloor rests upon the floor joists and underneath the underlayment. The subfloor offers structural integrity to the floor system.
  - ☞ Subflooring should run perpendicular to floor joists. When replacing subflooring, new panels should span at least three floor joists.
  - ☞ Plywood panels (comprised of thin, glued-together layers of wood) are most often used for subflooring, and are the most sturdy option. If the floor joists are spaced 16" on center or less, use plywood that is at least 7/16" thick. If the floor joists are spaced MORE than 16" on center, use plywood that is at least 5/8" thick.
  - ☞ OSB panels (comprised of glued-together chips and fragments of wood) may also be used for subflooring, though they do not offer as strong a support as plywood. If the floor joists are spaced 16" on center or less, you can use OSB that is at least ¾" thick to repair subfloor. If the floor joists are spaced MORE than 16" on center, you CANNOT use OSB panels to repair subfloor.
- Underlayment
  - ☞ Underlayment rests upon the subfloor.
  - ☞ Underlayment provides a clean, smooth surface for attaching the finish floor (e.g. vinyl tiles).
  - ☞ Lauan (pronounced "LEW-on") is a very thin type of paneling and is the most common and cheapest form of underlayment. Lauan is ¼" thick, fine grain plywood that comes in 4'x 8' sheets.
  - ☞ Lauan should ALWAYS be used on top of plywood or OSB subflooring.

- Floor Covering

  - Floors can be covered with any number of surfaces, including carpet, linoleum, VCT and ceramic tiles.
  - Peel-and-Stick tiles are self-adhesive vinyl tiles that are much easier, cleaner, and quicker for a CMG to manage than sheet vinyl. They are manufactured to exact dimensions and thickness to give the finished floor a seamless, uniform appearance. DO NOT DO VINYL SHEETING OR VINYL TILES THAT REQUIRE A SPREAD-ON ADHESIVE!!! These are too difficult for us to work with.



  - VCT (Vinyl Composition Tile) - Tiles are applied to a smooth, leveled sub-floor using a specially formulated vinyl adhesive that remains tacky but does not completely dry. CCC is transitioning to a VCT tile since they are glued down and will stick much better than peel-and-stick tiles.



Floor Repair

Floor Components: Finishing Touches

Repairs done to the framing and/or sheathing of a floor may be sufficient for a floor repair project to be considered "complete." In some cases, however, there are still a few other components that may need to be installed. These are considered "luxury items," so use your best judgment when deciding if they are necessary or not.

- Threshold (aka Transition): If there is a wide gap and/or a great different in floor levels between the new floor you have installed and the floor of another room, you may need install a threshold strip in the doorway adjoining the two rooms. Thresholds/transitions come in many different varieties, sizes, and materials, so it's best to go to a home improvement store to determine what is needed. Make sure you make note of the width of the doorway, the space of the gap or floor-level-difference, and what the two finish floors in each room are (e.g. tile, carpet, etc.). Most thresholds we use are made of aluminum and are installed with nails. In some cases, the old thresholds may be salvaged and reused, so try to do so before purchasing a new one.

- Molding: Upon completion of tiling a floor, you may notice that there are some gaps between the finished floor and the walls. These gaps can be covered with molding, installed with finish nails, and sealed with caulk. The two types of molding that can used for this purpose are called "Shoe Molding" and "Quarter Round Molding." In some rare cases, the old molding may be salvaged, but most often, it will crack and splinter when you try to remove it.

- Caulk: Can be used to seal molding, and around fixtures such as toilets, tubs, and sinks. ABSOLUTELY necessary to use if you are pulling up and reinstalling a toilet. Use white latex or "tub and tile" caulk.

How to Repair a Floor: Demolition

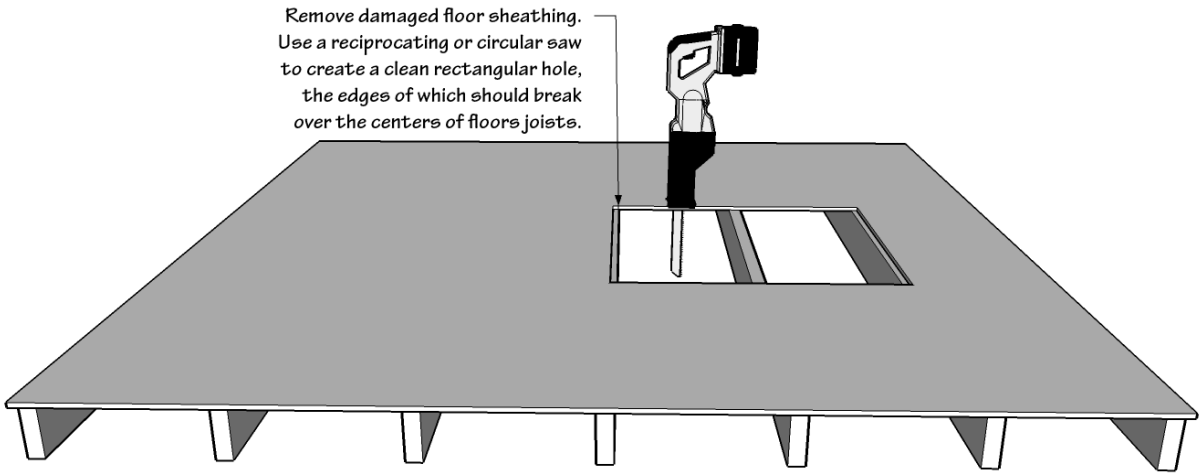
When embarking on a floor repair project, it is important to determine how much damage exists in all levels of the flooring system. If damage is extensive, you should probably not embark on this project! If the damage is feasible to fix, determine how much demolition of the old floor must be done. Occasionally, you may find that little to no demolition actually needs to occur. For situations such as these, refer to the "Can the Floor Be Overlaid?" section above. For now, we will assume the worst: that the old floor is damaged at all levels. Therefore, we must begin by carefully removing the old, damaged sections of the floor.

1. Move furniture/appliances to another room in the house.

2. Carefully remove the layers of floor sheathing. Do not remove linoleum unless cleared to do so by the CCC staff/administration. Use pry bars, wrecking bars, hammers, sledgehammers, etc. for this purpose. Try to avoid removing more of the floor than you have to. Be VERY careful not to disturb areas of the floor that do not need repairs, walls, fixtures, and plumbing. You do not want to create MORE damage by your demolition, especially in the house's plumbing system, which you will likely find is very old and brittle.

3. Whenever possible, do NOT remove old floor joists, even if they are rotten. These framing members, however rotten they may be, are what is currently holding up the floor and possibly the entire house! Sometimes floor joists may disintegrate as you remove old sheathing, but as much as possible, try to leave old joists undisturbed.

4. The goal is to create a clean hole in the floor sheathing that is (a) rectangular and (b) that "breaks" in the middle of joists. You do not want the edges of the new subfloor sheathing to "hang" above open to space, but to rest securely on floor joists. Use a circular saw and reciprocating saw for the purpose. Wear safety goggles and dust mask, as this process will send a lot splinters flying! See diagram below for help.



5. Make sure the tops of the joists are as debris-free as possible. Remove (or just drive in) any protruding nails, screws, or staples.

How to Repair a Floor: Reinforcing and "Scabbing" the Frame

Small areas of damage to floor framing can be repaired using a method called "scabbing," in which you will add structurally sound wood to damaged floor joists without removing the damaged joists. Scabbing is a little like splinting a broken bone. We don't have the expertise or the time to "heal" it completely; we are just applying a split to support, immobilize, and reinforce the broken bone (or joist) to prevent more damage being done.

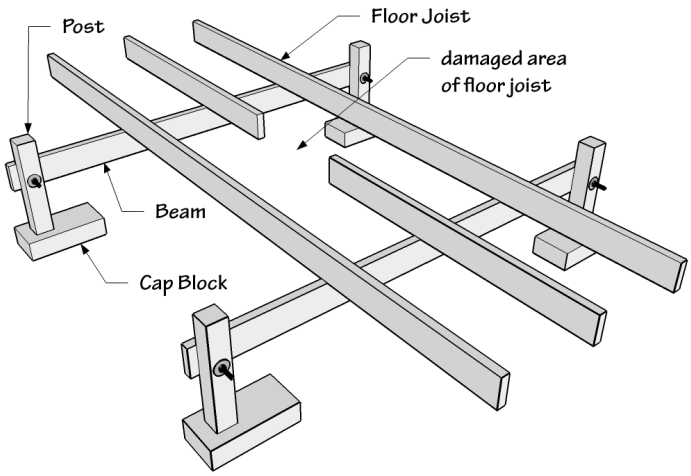
1. Joists are no good unless they are supported by a good foundation (i.e. a structure that transfers the load of the joists to the ground). If the there is not a good foundation for joists, new or old, create one using cap blocks, posts, and beams (bolted to posts, joists resting on top). Again, try to avoid disturbing the old foundation or joists.

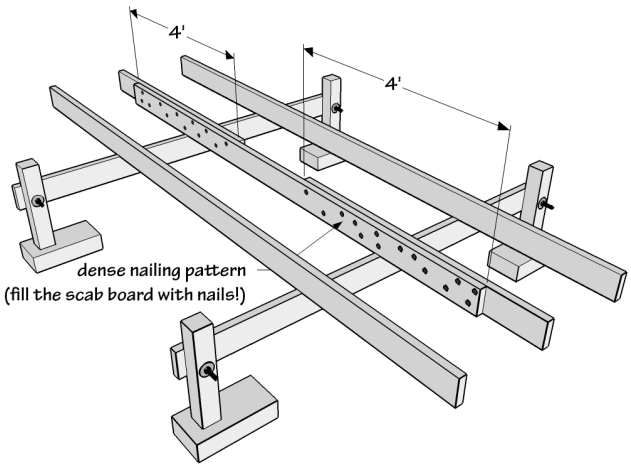
2. Measure the dimensions of the damaged joist and determine if it is a 2x6, 2x8, etc. Try to use the same dimensions for new joist scabs.

3. Determine the length of the damage done to the floor joist. The new scab should measure 4' past the damage area in both directions. Measure four feet in each direction from the edge of the floor joist damage and mark these two points on the existing floor joist. Then measure the distance between these two points to determine the length needed for the new joist scab.

4. Cut a new board for the joist scab. Place the new joist scab beside the existing floor joist so that the damaged area is in the center.

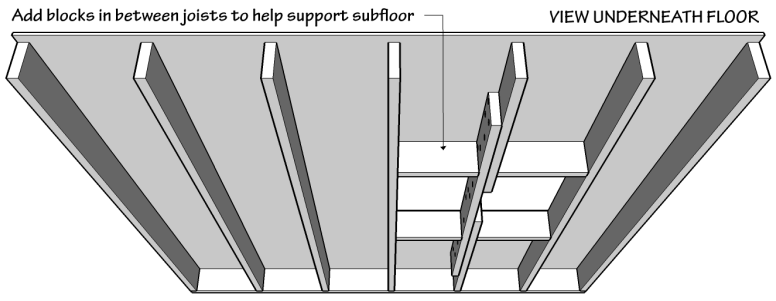
5. Nail the new board onto the old floor joist using a dozen or so well spaced 16d nails or decking screws. Nails do not need to be galvanized.





6. Nail the new board onto the old floor joist using a dozen or so well spaced 16d nails or decking screws. Nails do not need to be galvanized.

7. Once you have reinforced the framing using new foundational members, joist scabs, etc., it's a good idea to add some small blocks running in between joists for the edges of subflooring to rest on. Again, use the same dimensions as the joists for these block pieces. See diagram below for help.



How to Repair a Floor: Constructing a "Porch"

Depending on how severe the floor framing is damaged and how much space you have to work with, you may want to consider actually building a small, interior "porch" frame. Simply use cap blocks, posts, joists, bolts, and joist hangers to build a small box frame to create a completely new framing system for the floor. Refer to the "Porches" section of this manual for more information on how to construct a porch, and adapt plans to fit inside the space you're working with. Remember to create a frame that accounts for the thickness of the new subfloor, underlayment and tiles, so that the new floor patch is level with the old floor.

How to Repair a Floor: Installing Subfloor & Lauan

1. Make sure the edges of any old and newly-installed subflooring "breaks" over the center of joists. If not, correct this problem.

2. Install plywood, measured and cut to fit the rectangular hole. Use a circular saw with a plywood blade to cut plywood panels. Adjust the saw blade depth so that the blade is shallow enough to just through the panel — this helps the blade to last longer and for cuts to be more accurate.

3. Make sure the thickness of the plywood + lauan will match the thickness of the old floor sheathing. Use a jigsaw to cut any holes needed to fit around appliances, to provide any necessary openings for A/C vents, etc.

4. It is best to use screws, rather than nails, to attach a new layer of plywood (nails tend to back themselves out of a floor over time). Screws do not need to be galvanized. Snap chalk lines on the plywood as a guide for where the joists underneath are, and screw into the joists. Screws should be spaced roughly 12"-18" apart. Screw heads should be flush with the subfloor (i.e. not sticking up).

5. Make sure floor panels are butted up against each other as much as possible, with only minimal gaps. Panels should NEVER overlap!

6. Once all of the plywood is installed, inspect the subfloor. Sweep and clean out all debris that may have acquired on the subfloor. Make sure all screw heads have been driven flush to the wood. The subfloor must be very smooth before installing the next layer (i.e. underlayment, or lauan).

7. Now install the lauan underlayment. Measure and cut lauan to fit the floor space of the entire room, again, creating holes for fixtures and vents.

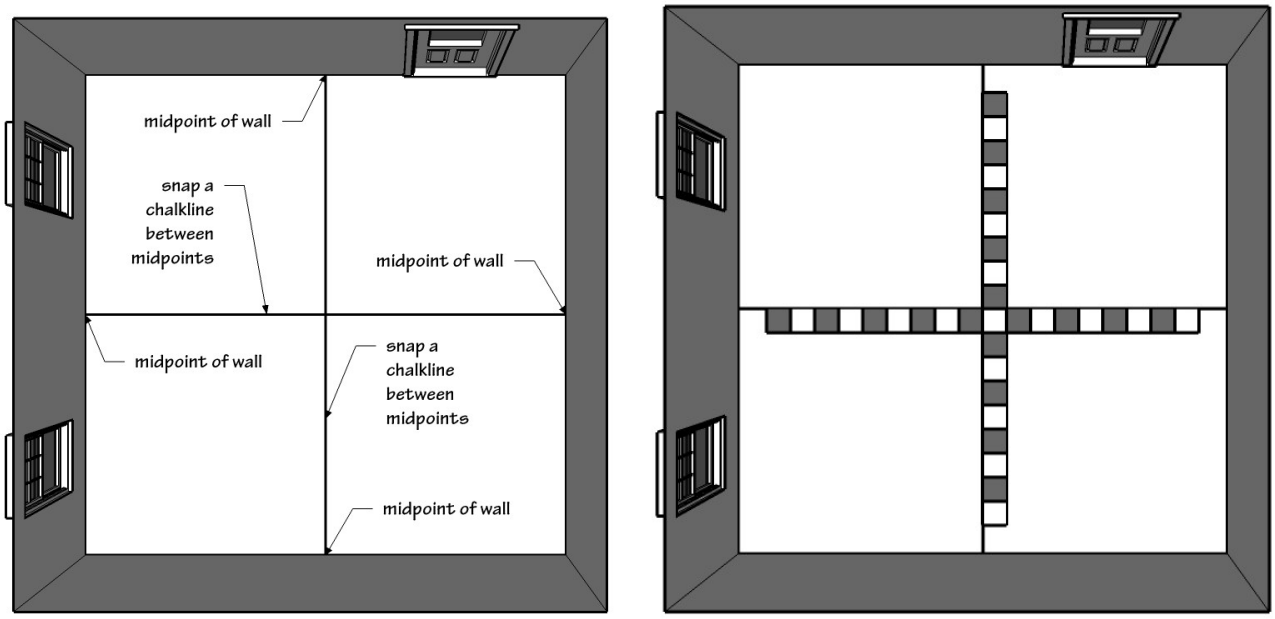
8. Use coarse thread sheetrock screws 1/4" to attach lauan. These screws need only penetrate the lauan and subfloor and do not necessarily have to penetrate the floor joists below. Screws should be spaced no farther than about 12" in both directions. Screw heads MUST be sunk perfectly flush with the lauan! If they are sticking up at all, you will create lumps, holes, and tears in the tiles.

How to Repair a Floor: Installing VCT

1. Inspect the lauan, making sure it is clean, dry, and smooth. Drive all nail heads or screw heads flush with the surface of the lauan (protrusions like these can appear as bumps in the tiles). Use a putty knife and pull it over nails and screws. If you hear a clicking sound, then you need to drive down the nail or tighten the screw. Patch any deep holes, cracks or gouges with wood putty. Remove all furniture, appliances, and all other moveable objects from the room. If the room contains major appliances or furniture, use "skidder tiles" to move appliances around as needed. These are tiles that you lay face-down, and very carefully, you set the legs of the large object you are moving. These "skidders" will keep you from having to move the object too far, and prevent scratching on the new tile surface.

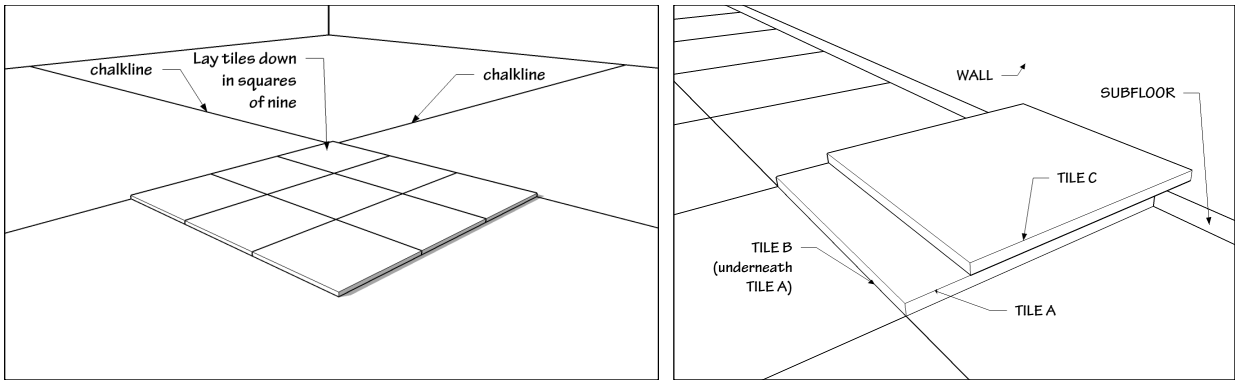
2. Create guidelines for the tiles on the subfloor. Use a tape measure to determine the middle of all 4 walls in the room. Snap 2 chalk lines from each of the opposite walls. Using a square, check that the lines are perpendicular, or use the 3-4-5 triangle rule (refer to the Basic Construction Skills section). If not, you may need to re-snap one of the lines to achieve 90 degrees at the intersection. By arranging the tiles from the middle like this, you will ensure the border tiles (tiles that run against the walls) will all be cut to the same width.

3. Using the guidelines, do a "dry run" (i.e. lay down the tiles without adhesive to see how they fit). Start at the intersection, work outward from the middle, and lay them along the lines until you reach the 4 walls. The amount remaining for border tiles should be the same on opposite sides of the room. If you find the borders are not the same, you should adjust one or both of the lines as needed. If your tiles have a directional arrow on the back, make sure to lay all tiles with the arrows pointing in the same direction.



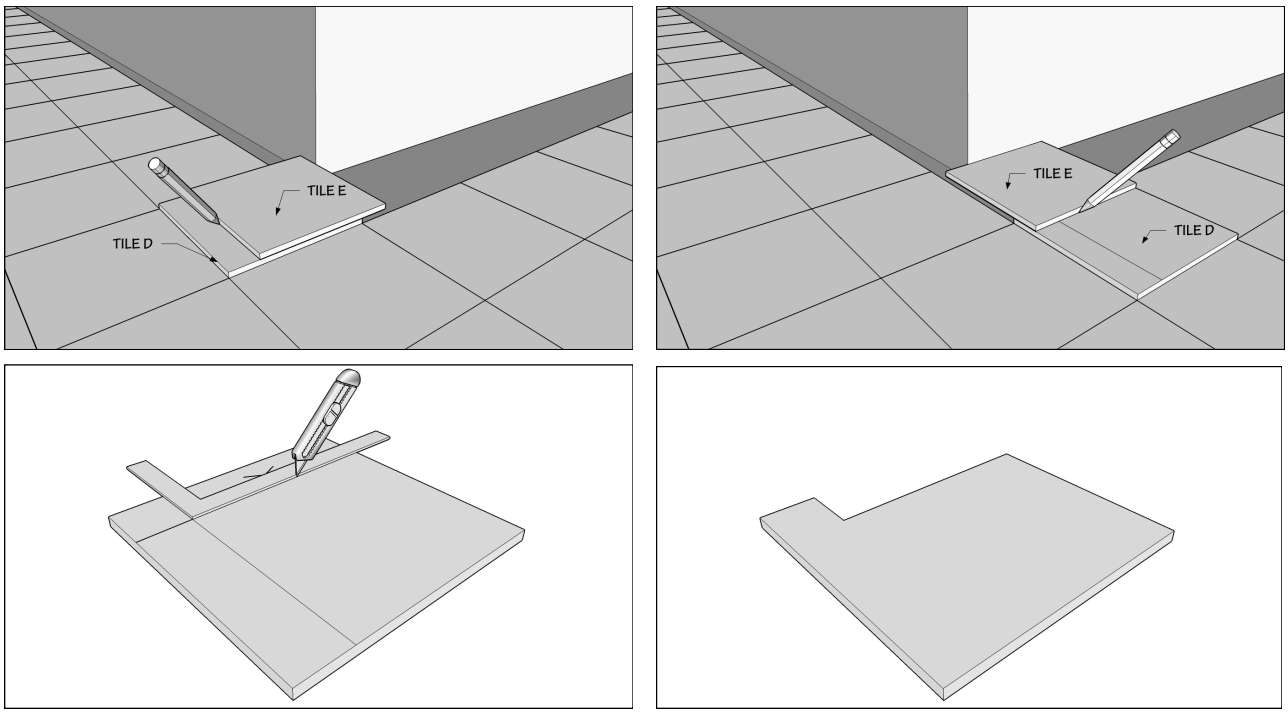
4. After you have made adjustments and are satisfied with you dry run, you are ready to install the "field tiles," the full pieces that do not run against any of the walls. Use a 1/8" V-notch trowel to spread the adhesive. Spread in small areas to be sure you don't get too far ahead with the glue. Start at the intersection of the two guidelines. Lay the tiles down in squares of nine (3 rows of 3). Work outward from the middle. The tile can't be moved but a small amount once lay it down, so make sure you line it up correctly before placing on the sub-floor. Work your way around the room until all the full, field tiles are in place. Press the tiles down using a rolling pin or have someone sit on an extra tile to press tiles firmly into place.

5. To install the border tiles, those that touch the walls, you will probably need to mark and cut them to fit. Refer to the diagram below. Use a pencil or non-permanent pen to mark tiles. Lay a tile (TILE A) squarely over the last full tile closest to the wall (TILE B). Take another full tile (TILE C) and place it flush against the wall with the edges lined up with the TILE A. Make a line across TILE A. This is the line you need to cut. When make cuts, make sure you put a piece of scrap tile, cardboard, scrap wood, magazine, or some other material underneath the tile you're cutting. Make sure you don't cut over the new tile you've already laid down! Line up a straight edge along the marked line, such as a framing square. Use several passes with a utility knife to score the tile then snap it off. Be careful not to cut yourself!



6. Install border tiles, being mindful to keep with the pattern of the rest of the tiles.

7. For corners, use a variation on the technique you used for straight borders. Place the tile (TILE D) on one side of the corner exactly over a full tile. Use another tile (TILE E) to mark your cut line. Move the TILE D over to the other side of the corner and repeat this process. This should give you a correct profile of the corner for cutting. Make sure you cut out the correct part of the tile.



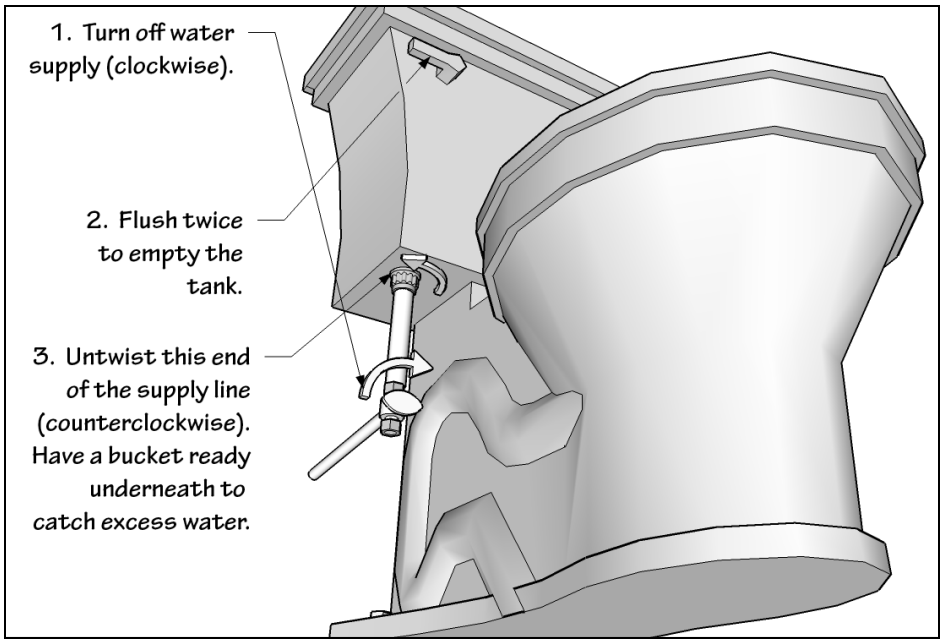
8. Attach molding (shoe or quarter round) and threshold/transition, if necessary.

9. Sweep off the floor. Caulk in the seams between tiles, and then wipe the excess off with a damp sponge.

10. CAREFULLY replace furniture and appliances, using upside-down skidder tiles. Be careful not to scratch or scuff the new floor. Remind homeowner that the floor should not be washed for 5 days to give the tile adhesive time to set.

How to Remove and Reinstall a Toilet

1. If you are doing floor repair in a bathroom, you will likely have to pull the toilet. Before you begin, try to get into the crawl space to assess the situation from underneath, if you haven't already. Look for the pipes that are attached to the toilet. Try to determine how much of the floor is rotten around those pipes and needs to be replaced before setting a new toilet. Have someone flush and see if any of the pipes themselves are leaking. If they are, do NOT touch this project! All plumbing needs to be working properly before we will do any repairs.

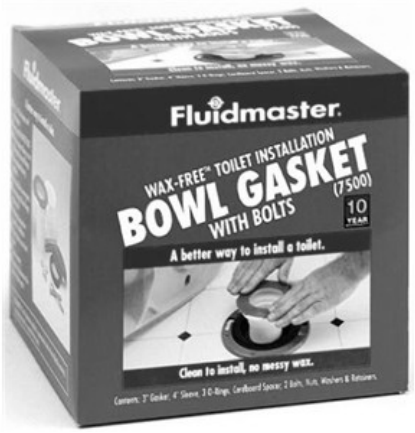


2. Because you are dealing with a potentially very unhealthy area, thoroughly clean the toilet, all connected hardware, and all areas around with bleach solution. Wear rubber gloves and safety goggles! Use one of the following disinfecting solutions (a) 1 tablespoon liquid bleach per 1 gallon water OR (b) 1 teaspoon liquid bleach per 1 quart water OR (c) ½ teaspoon liquid bleach per 1 pint water.

3. Allow surfaces to air dry for 2 minutes (i.e. no rinsing).

4. Now clean the inside of the toilet bowl. Flush toilet, then add 1 cup liquid bleach to bowl. Brush the entire bowl. Let stand for 10 minutes, then flush again.

5. Before removing a toilet, turn the water valve off (clockwise). This valve is protruding from the wall to the lower left or right of the toilet. Usually the valve has a handle, but if it does not, use a wrench, pliers or vice grips.



6. Flush the toilet twice so that all the water in the tank empties out. Plunge out the rest of the water in bowl with a plunger.

7. There is a tube running from the water valve up to the tank, called the supply line. Remove the end of the supply line that is connected to the tank by untwisting. While you are doing this, place a bucket underneath to catch any excess water left over in the tank.

8. Remove the nuts connecting the toilet to the bolts in the floor, using a wrench, pliers, or vice grips. Sometimes they sometimes have plastic covers that you can remove by hand first. Sometimes the nuts and

bolts may be so corroded that you will need a hacksaw to cut them. If so, you will have to replace this hardware.

9. Now lift the toilet! Have towels ready; you WILL spill water. Set the toilet in the bathtub while you continue to work or take it outside and hose it down. Use extreme caution not to break the porcelain, or the toilet will be useless!

10. Scrape off the old wax ring using a putty knife. You will likely have to clean wax off the floor AND the underside of the toilet. Clean with bleach, water, gloves, and goggles. Wash your hands thoroughly.

11. If needed, now is the time to repair the floor AND install new linoleum. Complete all necessary repairs to the floor. Make sure that framing members and subfloor underneath the toilet are VERY sturdy.

12. Since you have removed the toilet, it will be necessary to install a new wax ring (these are what interface the toilet with the "flange"). Hopefully you have been provided with a wax-free bowl gasket, which is much easier to work with than a wax ring. Wax-free bowl gaskets are cheap, can be purchased at most any home improvement store, and are worth every penny! Follow the directions that come with the bowl gasket, and install it. If you do not have a wax-free bowl gasket, you will have to install a new wax ring. To do this, make sure the flange (the metal or plastic ring on the floor that bolts to the toilet) is in its proper place. Install the new wax ring onto the flange, and ensure that you have a good seal.

13. Set the toilet back in place, making sure the bolts in the floor fit back in their holes. Press the toilet down firmly but gently to ensure a good seal.

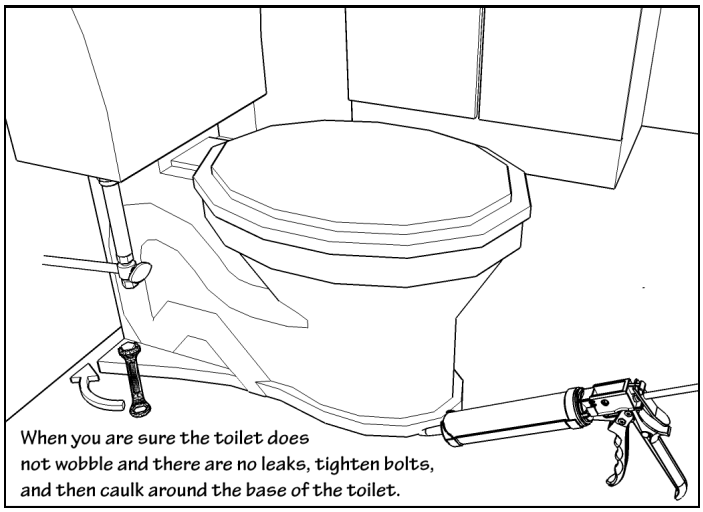
14. If the toilet does not sit flat on the floor or wobbles, you may need to shim it. Use whatever thin scrap wood is necessary to stop the toilet from rocking (i.e. a piece of a yardstick, etc.). Slide the shim in place and secure with nails.

15. Replace and tighten nuts to the floor bolts. Again, be careful you not to bust the porcelain as you tighten bolts, or the toilet WILL leak and you WILL need to replace it with a new one!

16. Once the toilet has a good seal and does not wobble, replace the water line, turn on the water valve, and flush to ensure that there are no leaks anywhere. If the toilet leaks, you will need to make adjustments in order to get a better seal.

17. Once the toilet has a good seal, clean up any water on the floor. Once it is dry, caulk with white latex caulk around the base of the toilet. This creates both a seal and additional adhesion between the toilet and the floor. Do not caulk until you are positive there are no leaks! Otherwise, you are simply perpetuating the problem of a rotting floor underneath the toilet.

18. Wash your hands, and then smooth out the caulk around the base with your finger.



When you are sure the toilet does not wobble and there are no leaks, tighten bolts, and then caulk around the base of the toilet.