

Prevention and Repair of Floor System Squeaks

There are many causes of floor noise, such as dimensionally unstable building materials, hangers, nails, and utilities. Proper installation of a floor system is the most effective preventive measure against annoying squeaks. Squeaks can originate wherever floor components meet—between subfloor and joists, subfloor and underlayment, joists and bridging, fastener and panel; and at hangers, straps and other locations within the system. Most squeaks can be traced to a few common causes; this guide addresses those causes and offers advice on repair and prevention.

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PREVENT SQUEAKS WITH A PROPERLY INSTALLED FLOOR SYSTEM

Use the Right Materials

Choose dimensionally stable framing products for your floor system. Using green lumber may lead to dimensional changes as the joists dry. The result is nail pops, which can cause squeaks and bumps under a finished floor and may accelerate finished floor wear. Use Trus Joist® TJI® joists, dry lumber, or trusses, which are more dimensionally stable than green lumber. Make sure that joist size and spacing meet or exceed code-minimum requirements and that the panels are adequate for the applied loads, joist spacing, and floor system chosen. See *Figure 1* on page 2. Inadequate joists or panels can result in excessive deflection, causing nail pops and squeaks.

Space Panels Properly

Space panels with a $\frac{1}{8}$ " gap at all edges and ends. See *Figure 1* on page 2. Weyerhaeuser Edge™ and Edge Gold™ oriented strand board (OSB) flooring panels have tongue-and-groove (T&G) edges on the long sides that automatically provide the required spacing. This allows room for the panels to expand with ambient moisture conditions. Also make sure the panels are acclimated before installing. Doing this will minimize the chance for panel buckling.

Nail Panels Correctly

Use the correct nail size and spacing and make sure that the nails penetrate the

floor joists. This will help avoid nail pops, pullouts, and shiners (nails that barely hit the joist) that can cause squeaks in the floor system. See *Figure 1* on page 2 for recommended nailing and installation procedures.

Use Glue-Nailed Construction

Weyerhaeuser recommends a glued and nailed floor system, and the use of a solvent-based subfloor adhesive that meets ASTM D3498 (AFG-01) performance standards. In cases where latex subfloor adhesive is required, careful selection is necessary due to the wide range of performance between brands.

Apply the adhesive per manufacturer's recommendations. The following installation tips are also recommended:

- Joists should be dry and free of dirt before glue is applied.
- Snap chalk lines across the joists every 4' as a visual aid for aligning panels and spreading glue.
- Apply a continuous $\frac{1}{4}$ " diameter glue bead to framing members. Use a serpentine pattern on supports that are $3\frac{1}{2}$ " or wider. Apply two beads of glue at panel joint locations. A $\frac{1}{8}$ " diameter glue bead applied at the T&G joints can further improve floor performance.
- Apply only enough glue to attach one or two panels at a time, and completely fasten each panel before the glue is

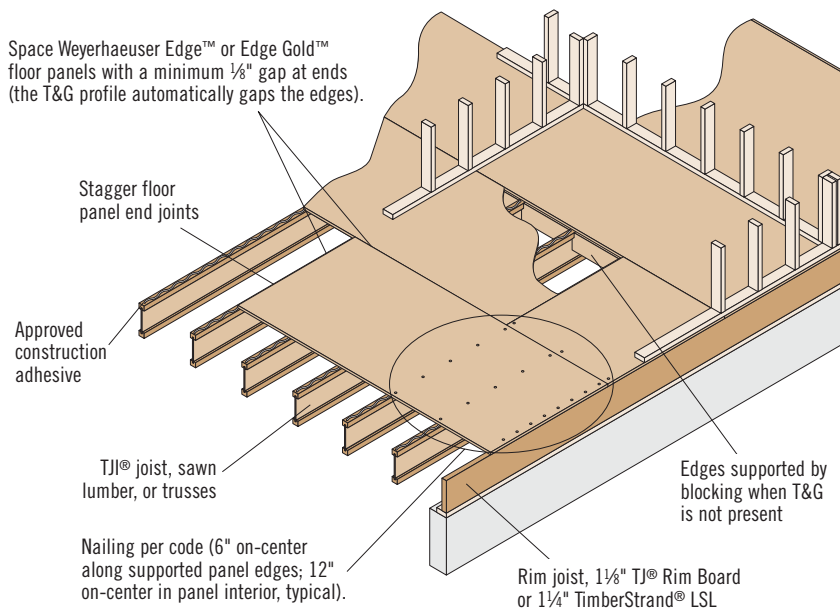


Figure 1

set. Check the glue manufacturer's specifications for setting times, and remember that warm weather accelerates glue setting times.

- Install the first panel with the tongue edge toward the perimeter. This protects the tongues on the remaining panels from damage when they are slid into place.
- Panels are sized to accommodate a $\frac{1}{8}$ " space between all joints (including the self-gapping T&G) to allow for panel expansion. Stagger panel ends in each succeeding row.

FLOOR SQUEAKS: CAUSE, REPAIR AND PREVENTION

1. High Moisture Content in Framing Lumber

Cause

Wet or green lumber used in new construction has a moisture content greater than 19%. As the lumber dries, the wood can shrink along the shank of the nail, causing the head to protrude or a gap to form between panel and joist. The nail may work loose in the joist as well.

The resulting loose connection allows the panel to rub along the nail, or the nail to slide up and down through the panel and joist, generating squeaks.

Repair From Below

Attaching an additional piece of framing to an accessible joist and to the floor panel at the squeak location will create a firmer connection. See Figure 2. Predrill a 2' to 3' long piece of lumber with holes slightly larger than the outside diameter of the screw being used. Nailing is not recommended. Apply adhesive to all contact areas. If possible, have someone stand on the floor above, near the squeak, to push the floor panel down against the joist. Then fasten the repair piece to the panel and the joist using sheet metal screws. (Sheet metal screws have greater holding power than wood screws of the same size.) Choose a screw length that provides maximum penetration into the floor panel without breaking through the top surface of the underlayment. Do not use a shim or wedge between the subfloor and the top of the joist to fill in gaps because this will create new gaps on either side and result in new squeaks.

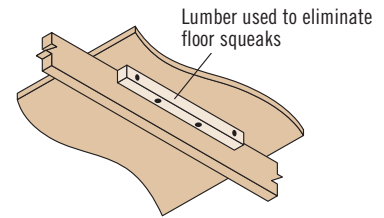


Figure 2

Repair From Above: Carpet

Pull back the carpet if possible, drive the nails flush, and install a wood screw near each nail. If the carpet cannot be pulled back, see if you can feel the popped nail head through the carpet and pad. If so, drive it home with a $\frac{3}{16}$ " drift punch. Have someone stand over the joist near the squeak to push the panel down against the framing. If the nail will not hold the panel down, drive 8d casing or finish nails at an angle—for greater holding power—through the carpet. This will not damage the carpet.

If you cannot feel the popped nail and the carpet is jute-backed, locate the joist with an $\frac{1}{16}$ " drill bit. *Do not use this method with a continuous filament rug because it can cause extensive damage.* In this case use a sharp pointed object, like a punch, and separate the carpet fibers. Use masking tape to hold them down and away from the area. Run the drill through while avoiding the carpet fibers. To reduce the possibility of snagging the carpet fibers, use a piece of heavy wire or coat hanger in the drill. Nail through the carpet as described above while someone stands near the squeak to push the flooring down to the joist. Alternatively, use a tool such as *Squeeeeeek No More®* by O'Berry Enterprises Inc. of Ringwood, Illinois. This tool attaches special screws through the pad and carpet. The screws are scored so that they can be broken off at the face of the floor panel. Follow the

Squeeeeeek No More® is a registered trademark of O'Berry Enterprises, Inc.

manufacturer's instructions included with the tool—especially when working with Berber carpets.

Repair From Above: Vinyl, Tile, or Sheet Flooring

Usually a popped nail will create a lump in the floor. If the flooring can be removed in that area, the subfloor may be reattached with a screw. It is extremely difficult to set nails through tile or vinyl because a drift punch may cause the nail head to puncture the flooring or the punch may remove the finish. Minimize potential floor damage by using a putty knife blade to cover the pop before using the punch, in order to spread the impact over a wider area. Or, tape a piece of cardboard to the punch end.

For vinyl flooring, cut out three sides of a square (or follow the vinyl pattern) with a very sharp knife. Then peel back the small area of vinyl, set the nail, and use vinyl adhesive to reseal. Be aware that a reset nail may not have sufficient holding power to keep the floor panel attached to the joist, or it may simply work itself loose again. If at all possible, install a piece of lumber or an angle to the joist from below. See *Figure 2*.

Prevention

Minimize shrinking by using TJI® joists, dry lumber, or trusses for the floor system. For the best connection of panel to joist, glue and nail all floor panels; the glue will hold the panels tight to the joists even if nail pops occur.

2. Inadequate Panel Spacing

Cause

Because floor panels are likely to take on moisture both during construction and once in service, it is important to properly space panels during installation. If panels are spaced too closely, there is no room for expansion and buckling may occur. Buckling may force the fasteners loose and cause squeaks, especially if

the wrong fasteners or the wrong fastener spacing is used.

Repair

Pull the panel back down to the joists using the repair methods described on page 2.

Prevention

When installing floor panels, leave a $\frac{1}{8}$ " space at all panel edges and ends. Weyerhaeuser floor panels have self-gapping T&G edges on the long sides that automatically provide the required spacing. See *Figure 3*. Always use the proper fastener type, size, and spacing.

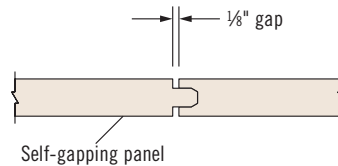


Figure 3

3. Nails That Miss the Joist (Shiners)

Cause

A worker using a pneumatic nail gun cannot always tell when the nail has missed the joist. A nail that barely hits the joist (lands close along the side) will not hold the panel down. See *Figure 4*. When this panel deflects, the nail can rub on the joist, causing squeaks.

Repair

Bend the nail away from the joist or remove the nail completely and re nail.

Prevention

After installing the panel, inspect the nailing from the joist space and replace nails that have missed.

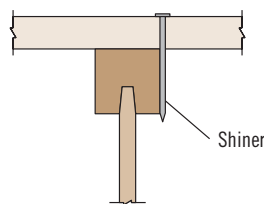


Figure 4

4. Improper Gluing During Floor Construction

Cause

An inferior glue bond can create two problems: 1) The glue will provide little or no holding power between the floor panels and the joists, allowing nail pops to occur. 2) It can cause an uneven bearing surface for the panel, which will allow the panel to move when the floor is walked on.

These problems can also occur when the glue is applied too far in advance; if the glue is applied over wet, frozen, or dirty surfaces; or if only the panel corners are tacked down before moving on to the next panel. These practices allow the glue to form a skin and start to dry before a proper bond can be made between the panel and the joist. When this happens, the glue does not have sufficient holding power to prevent pops, and the hardened glue bead may create raised surfaces or lumps under the panel. These gaps may allow the panel to slide up and down on nearby nails, causing squeaks.

Repair

If the floor covering is not yet installed, install wood screws where squeaks occur. If the flooring is in place, follow the repair guidelines on page 2.

Prevention

When applying adhesive to floor joists, apply to clean, dry surfaces and spread only enough glue for one or two panels at a time. Fasten each panel completely before moving on.

5. Improperly Installed Blocking or Bridging

Cause

Often, blocking or bridging is installed before the subfloor, with only the nailing at the top in place. If the bottom of the blocking or bridging is not securely fastened after the structure is enclosed, it may rotate or slide under load. This may result in floor squeaks as the bridging

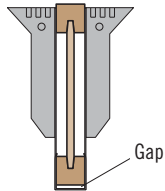


Figure 5

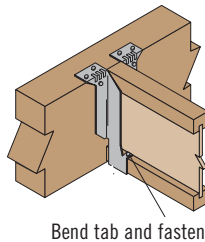


Figure 6

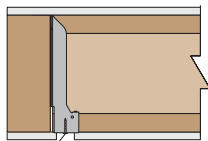


Figure 7

Install screw and draw joist into hanger

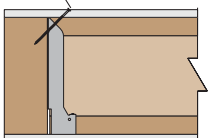


Figure 8

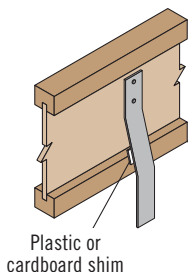


Figure 9

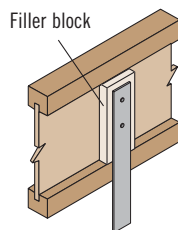


Figure 10

rub against the joists. Also, diagonal bridging members may rub against each other where the members cross, causing squeaks. To determine if loose diagonal bridging is causing a squeak, use a wooden pole to pry apart bridging members while someone above walks on the floor to see if the squeak recurs.

Repair

Make sure that adjacent diagonal bracing members do not come in contact with each other and that the bottoms are nailed securely. Blocking or bridging may sometimes need to be completely renailed or replaced to eliminate all squeaks.

Prevention

Use TJI® joists, as they do not require bridging. If mid-span blocking is required by the specifier, cut it to fit tight and glue all contact surfaces. Nail through the floor panels into the blocking with two 10d (0.128" x 3") nails, minimum. Attach to the bottom flange of the TJI® joist with 10d (0.128" x 3") nails. When installing blocking or bridging in a sawn-lumber floor system, provide adequate space between pairs of bridging members, and make sure that the bottoms are nailed in place after the rough structure is finished.

6. Joists Not Seated Properly in Hangers

Cause

When joists are properly installed in hangers, they should sit firmly on the bottom of the hanger seats and be nailed through all holes provided. When joists are improperly seated in hangers, a gap may occur between the bottom of the joist and the seat of the hanger. This gap allows movement when a load is applied, resulting in a squeak. See Figure 5. Additionally, if a sawn-lumber joist is not attached to the hanger or attached only at the top, the lumber may shrink away from the base of the hanger, allowing the joist to move in the hanger, causing a squeak.

Repair

Nail the joist to the hanger using all of the holes provided. For hanger models that include bottom flange tabs, bend the tabs over and nail them to the bottom flange of the TJI® joist. See Figure 6. If a gap has developed at the bottom of the hanger, install metal shims between the joist and the hanger seat. If the joists are covered with a directly applied ceiling, use a magnetic stud finder to locate the middle of the hanger. Then drill a hole larger than the screw shank through the ceiling and the hanger seat. Apply construction adhesive through the hole, then draw the joist down into the hanger with a single #8 x 1½" screw. Test the area for squeaks and patch the ceiling. See Figure 7.

Alternatively, install a wood screw at a 45-degree angle from above. Drill a pilot hole larger than the screw through the floor panel, the top of the joist, and into the carrying beam. Install the screw, drawing the joist down into the hanger. See Figure 8.

Prevention

Use TJI® joists, dry lumber, or trusses to minimize shrinking, and make sure all joists are properly seated in their hangers. Fill all nail holes, top and bottom, with the nails recommended by the hanger manufacturer. Make sure that all nails are set, with the nail heads driven tight to the hanger. In some circumstances, squeaks can be reduced by placing a dab of sub-floor adhesive in the hanger seat before installing the joist, and then driving a wood screw (#8 x 1½" maximum) through the bottom of the seat if a hole is provided. Install the hanger seat screw before the glue sets to ensure uniform bearing.

7. Ductwork Rubbing Against Framing

Cause

Floor squeaks can occur when the metal ductwork for forced-air heating systems rubs against the floor panel or joist member it is traveling through. Sometimes

items suspended from a joist may rub against the joist. The slight deflection in the panel or joist when walked on may cause squeaks to occur. Also, heat from ductwork may cause increased shrinkage of framing materials near the duct and thus result in a squeak.

Repair

If possible, create additional clearance between the duct and floor element or insert fiberglass insulation between the surfaces that are rubbing. With TJI® joists, use a plastic sleeve around the threaded items, or for suspended items, place a cardboard or plastic shim between the strap and the joist. See *Figure 9*.

Prevention

Ensure that adequate clearance exists between the floor element and the duct during installation. For TJI® joists, do not lap strapping over joist flanges. Connect strapping to a filler block that has been securely attached to the joist web. See *Figure 10*.

8. Squeaky T&G Joints

Cause

T&G connections are designed to force adjacent panels to move together. This prevents damage that could occur to floor finishes if the panels were allowed to move independently. T&G joints are usually silent and tight-fitting. However, if they are damaged the connection may be loose, which can cause squeaks when the panels experience foot traffic.

Repair

Cut a shallow saw kerf at the panel joint; be careful not to cut the tongue of the joint. Make sure the cut is free of debris, then fill the gap with Gorilla Glue® or a similar glue. Staple the joint using 1" x 3/8" 16-gauge staples at 6" on-center. See *Figure 11*.

Alternatively, install blocking per *Figure 1* on page 2 and *Figure 12*, or use adhesive

and screws to attach panel blocking flat to the underside of the joint. See *Figure 13*.

Prevention

Do not use damaged floor panels. Apply construction adhesive to T&G joints when installing floor systems to ensure tight joints.

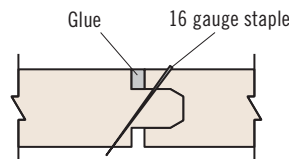


Figure 11

9. Improper Nailing of Interior Partition Wall

Cause

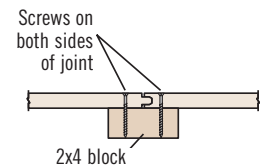
Squeaks commonly occur between the bottom plate of an interior partition wall and the floor when the plate is nailed directly to the panel rather than to the joists. See *Figure 14*. As the floor panels deflect under load, they can rub on the plate nails and cause a squeak. Squeaks at partition walls may also result when studs that are cut too short slide along the connecting nails.

Repair

Clinch nails that penetrate only the subfloor. It may also be necessary to drive screws up through the subfloor into the plate. Minimize differential movement by installing diagonal bracing under the wall. See *Figure 15*. If the floor is not accessible from the underside, remove the baseboard along the partition wall and drill a pilot hole larger than the screw shank though the bottom plate at a 45-degree angle. Install a screw to catch and pull the panel up to the partition plate. See *Figure 16* on page 6.

Prevention

Nail the lower plates of partition walls only where they intersect a joist. If the partition runs parallel to the joists and extends over more than half of the joist span, add a joist under the partition. If the only option



Section A-A

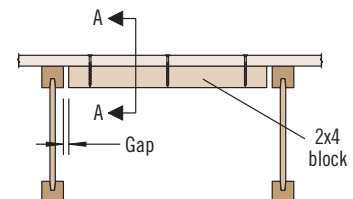


Figure 12

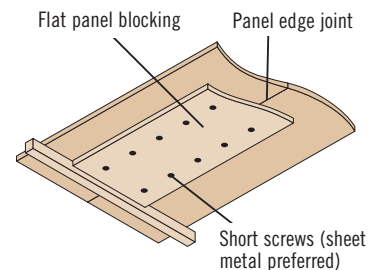


Figure 13

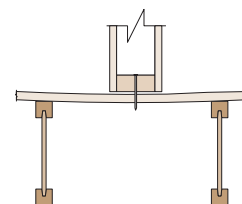


Figure 14

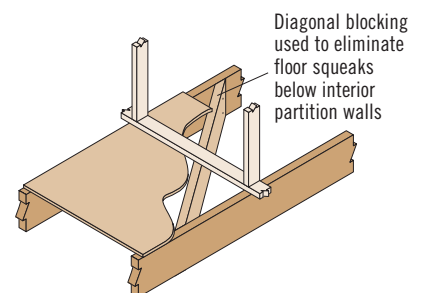


Figure 15

Gorilla Glue® is a registered trademark of the Gorilla Glue Company.

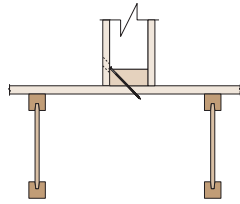


Figure 16

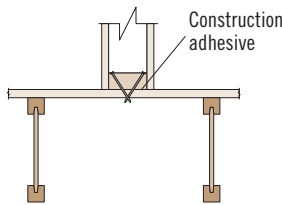


Figure 17

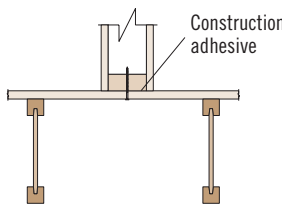


Figure 18

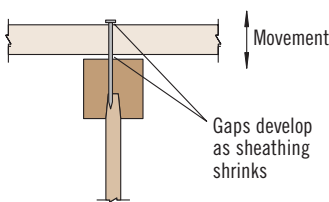


Figure 19

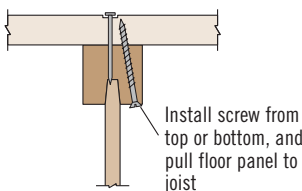


Figure 20

is to nail directly into the subfloor, run a bead of adhesive along the bottom of the plate and clinch all nails while they are still accessible, use cross nailing, or screw tight from below. See Figures 17 and 18.

10. Floor Panels That Become Excessively Wet During Construction

Cause

A floor panel that becomes excessively wet during construction may swell and move the nail head as it expands. When the panel dries and shrinks, it may leave a gap under the head of the nail, allowing the panel to move up and down along the nail shank, causing a squeak. See Figure 19.

Repair

See the repair recommendations on page 2. If joists are accessible from below, drill a pilot hole larger than the screw shank up through the top flange of the joist and partly into the sheathing. Install a screw through the joist and into the sheathing, pulling the sheathing tight to the joist. See Figure 20.

Prevention

Keep all building materials dry, and properly glue the panel to the joists. In regions where job sites are exposed to substantial rainfall, use Weyerhaeuser's Edge Gold™ flooring panels with self-draining Down Pore™ technology. The Dow Pore™ drainage grooves channel water through the panel and off the joists below to help prevent material from swelling and then shrinking as it dries.

11. Variations in Joist Depth or Straightness

Cause

When sawn-lumber joists dry, some shrinkage in joist depth occurs, depending on the moisture content of the lumber. Because wood has variable characteristics, adjacent joists may have dimensional differences after drying. When this occurs, the floor panel will stay in contact with the high spots but pull away from

the low spots, creating gaps. The resulting loose connections allow the panel to slide up and down on the nails, generating squeaks. Nail pops may also occur with this condition. Likewise, sawn-lumber joists may develop crook as they dry, resulting in a warped or bowed joist. Additionally, if care is not taken to install all joists with the crowns up, the floor panel will have to span between these low and high points, creating loose connections as noted above.

Repair

See repairs on page 2.

Prevention

Ensure a solid connection by attaching the panels with both glue and nails. Stand over the joist at the fastener locations when installing fasteners to make certain that panel and joist are in contact. Use TJI® joists, which are uniform in dimension and resist bowing, twisting, and shrinking. If sawn lumber is used, sight along the edge of each joist for straightness, and install crown up.

12. Inadequate Connection Between the Subfloor and Underlayment or Finish Flooring

Cause

Squeaks that occur inconsistently and vary with changes in temperature and humidity can sometimes occur between subfloor and underlayment if the proper nail type is not used and/or nailing schedules are not followed. A poor connection will allow the underlayment to move up and down on the nail shank, causing a squeak. Squeaks can also develop if the underlayment was placed on top of a dirty or gritty subfloor.

Repair

Underlayment panels can be pulled down to the subfloor by screwing from underneath through the subfloor into the underlayment. See Figure 22. Select a screw length that provides maximum penetration without breaking through the top of the underlayment. Install the

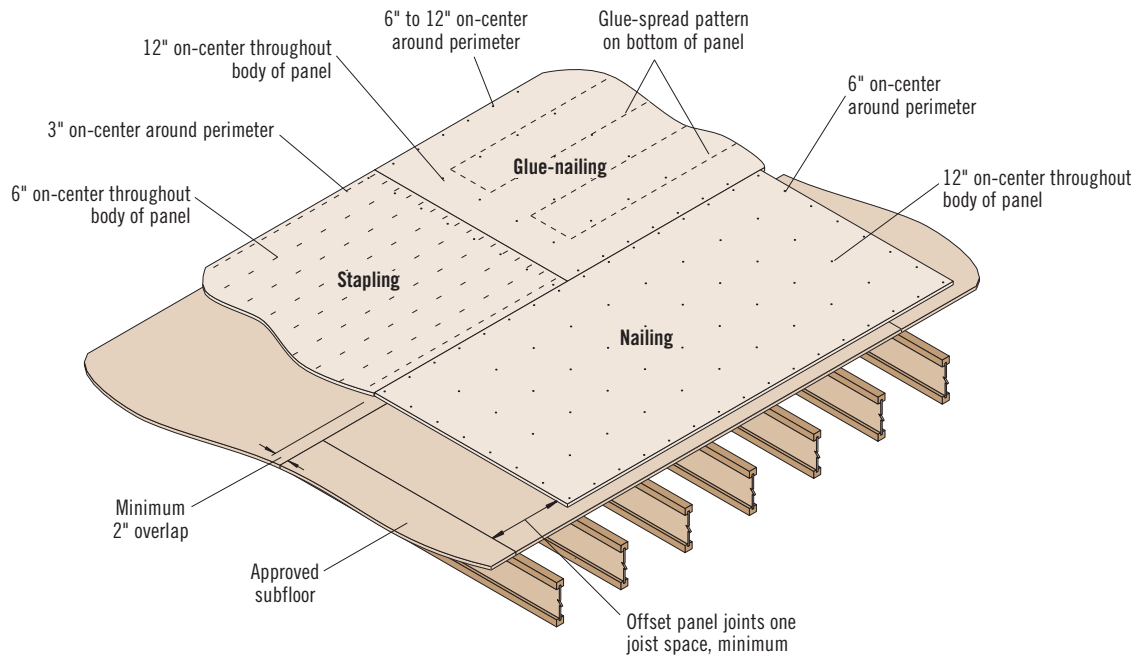


Figure 21

screw through the subfloor and into the underlayment, pulling the underlayment tight to the subfloor. If there is no access from below, the carpet may be pulled back and the subfloor reattached from above. If possible, have someone stand on the floor, near the squeak, to push the underlayment down against the subfloor.

Prevention

Make sure the subfloor is clean before installing underlayment. Use the recommended nails and fastening schedules, and consider applying underlayment adhesive. See Figure 21. Check with the floor covering manufacturer for a recommended underlayment adhesive.

13. Improper Location of Sill Plate

Cause

When the sill plate is not installed flush to the inside face of the foundation or beam,

the top of the hanger cannot be fully supported. When a load is applied, the hanger may distort, compromising its load-carrying capacity and allowing it to rub up against the concrete or beam, causing a squeak. See Figure 23.

Repair

Jack up the joist to eliminate the gap and install a wall or other support below. See Figure 24.

Prevention

Always install sill plates flush with the inside edge of the beam or foundation.

14. Use of Inadequate Floor Panels

Cause

Using floor panels on joist spacing that exceeds the panels' maximum span rating can lead to excessive deflection. The resulting movement or friction may

cause nail pops and squeaks throughout the floor.

Repair

Improve the floor by adding another layer of structural panels over the existing one. Or, if the floor is accessible from below, install blocking between the joists along the panel seams. Glue all contact surfaces and nail blocking carefully to avoid causing new squeaks. See Figure 25.

Prevention

To help prevent excessive deflection, ensure that the floor panel has an appropriate span rating for the joist on-center spacing. Make sure that joist size, spans, and spacings meet or exceed code minimum requirements and are adequate for the applied loads.

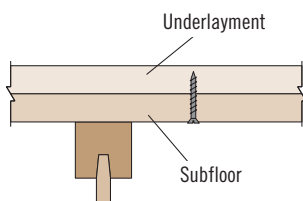


Figure 22

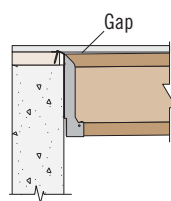


Figure 23

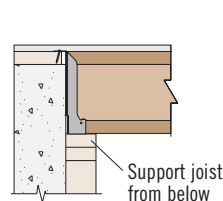


Figure 24

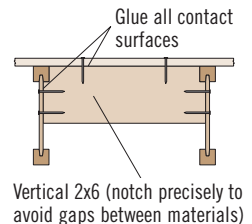


Figure 25

15. Other Causes of Squeaks

The causes of squeaks in floor systems are not limited to the problems described in this guide. Floor squeaks that occur near a wall can be caused by underlayment rubbing against the metal corner bead of the sheetrock as the floor is walked on. Noise that comes from the floor near a foundation support could be the result of a joist hanger rubbing against a deformity or lump in the concrete foundation wall. See *Figure 26*. Other possibilities exist as well. Contact your Weyerhaeuser representative for help with solving your squeak problems.

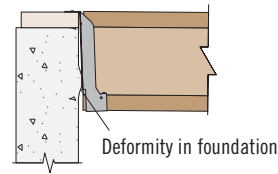


Figure 26

ACCESSING ENCLOSED FLOOR CAVITIES

Accessing a floor squeak may be difficult when the finished floor and ceiling have already been installed, but can be accomplished using the following steps:

1. Pull back the carpet and pad.
2. Locate the joists with the aid of a stud finder or by probing through the floor panels with a pattern of nailing.
3. Drill or cut a 4" hole through the panel between the joists.
4. Reach through the hole and fix the problem (using shims, nails, glue, etc.).
5. Repair the hole by inserting glue-laden 2x4 blocks through the hole, pulling them up against the underside of the floor panel and screwing them in place.
6. Glue and screw the cutout piece of floor panel back in place on the 2x4s. See *Figure 27*.

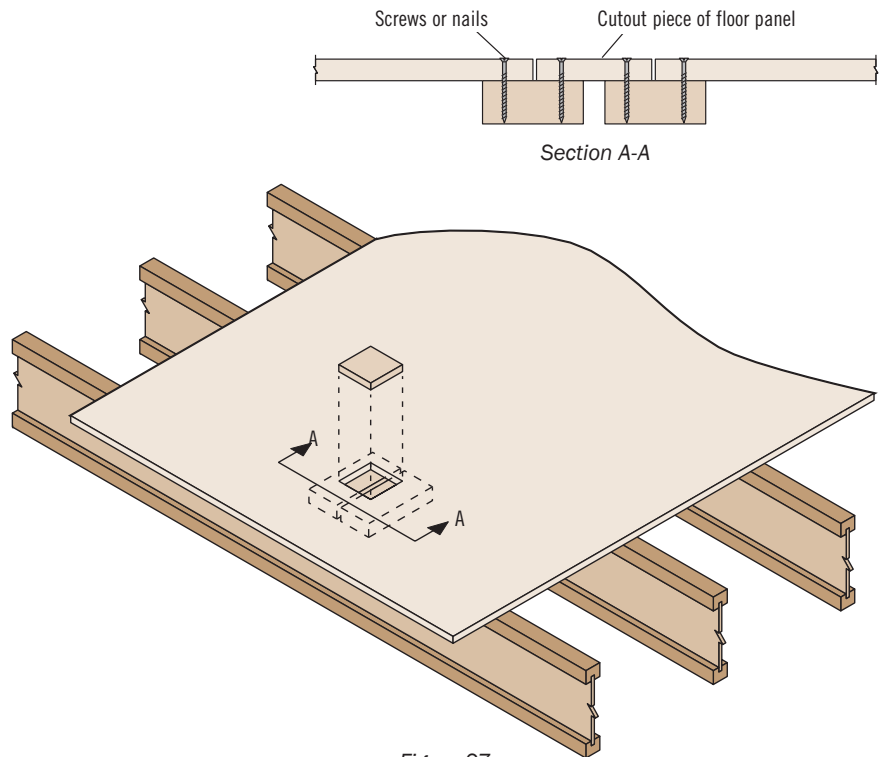


Figure 27



WARNING: This product can expose you to chemicals including wood dust which are known to the State of California to cause cancer, and methanol, which are known to the State of California to cause birth defects or other reproductive harm. Drilling, sawing, sanding or machining wood products can expose you to wood dust. Avoid inhaling wood dust or use a dust mask or other safeguards for personal protection. For more information go to www.P65Warnings.ca.gov and www.P65Warnings.ca.gov/wood.

