

FLOOR SQUEAKS: CAUSES, SOLUTIONS AND PREVENTION

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With proper materials and careful installation, wood floors are comfortable and trouble-free. Several key steps in construction help prevent the most common problems – including squeaks. There are many causes for those nagging creaks which can originate between subfloor and underlayment, subfloor and joists, joists and bridging, nail and panel, and so on. Each floor-squeak problem is unique, and usually a careful inspection is necessary to determine its cause and proper solution.

However, a few typical floor-squeak causes, which can occur singly or in combination, are the root of most squeak problems. The purpose of this technical note is to identify these typical floor-squeak causes, and to present some corrective and preventative measures.

It is worth noting that many floor-squeak problems have been eliminated through the use of the APA Glued Floor System. (For more information see *APA Engineered Wood Construction Guide*, Form E30.)

Always assure that panel thickness and joist sizes meet or exceed minimums prescribed by code. This should prevent excessive deflection which may work floor nailing loose and cause squeaks.

Cause 1 Wet or Green Lumber (greater than 19% moisture content)

Normally, lumber will dry to 6 to 12% moisture content in service. As lumber dries, shrinkage takes place. This can result in nail popping. In simplified terms, the point of the nail stays put while the lumber shrinks along the shank, thereby causing the head to protrude (see Fig. 1a) or producing a gap between the panel and joist (see Fig. 1b). The result is a loose connection with the panel free to slide up and down along the nail shank. The squeak is caused by the rubbing of the panel against the nail shank.

Solution – Floor Joist Accessible: Regardless of the floor covering, if there is access to the joist space under the floor, the squeak can be corrected. This is done by using a 2- or 3-ft.-long piece of lumber or metal

angle (see Fig. 2). The piece is predrilled so that it can be fastened with screws to both the panel and the joist. Drill holes in the piece slightly larger than the largest outside diameter of the screw. Apply construction adhesive to the edges which will come in contact with the floor and joist. If possible push the floor down against joist. Fasten to both with screws. (Sheet metal screws are recommended since they normally have greater holding power than wood screws of equivalent size.) Screw length should be selected to maximize penetration into the floor panel without penetrating the top surface of the underlayment.

Do not use a shingle wedge to fill the gap between the subfloor and the top of the joist. Although the shingle wedge may support the floor at the point of the squeak, it may tend to lift up the floor on both sides of the wedge. This can result in the development of new squeaks.

FIGURE 1

**RESULTS OF NAIL POP:
(A) PROTRUDING NAIL HEAD
(B) GAP BETWEEN PANEL
FLOOR AND JOIST.**

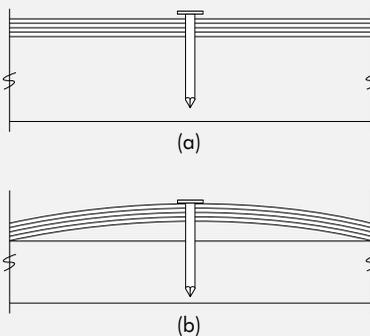
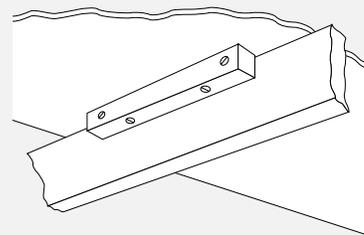


FIGURE 2

**LUMBER USED TO ELIMINATE
FLOOR SQUEAKS DUE TO
NAIL POP.**



Floor Joist Inaccessible: The popped nail-head can sometimes be felt through the carpet and pad. If the popped nail is found, it can be driven home with a 3/16" drift punch. When setting the nail, it is advisable to have someone stand over the joist near the squeak to push the panel down against the joist. If the nail will not hold the panel against the framing, 8d casing or finish nails can be driven through the carpet without damaging it. It is best to drive these at an angle to get increased holding power.

If the popped nailhead cannot be felt through the carpet and pad, the joist can sometimes be located by using a 1/16" drill bit. First, separate rug fibers of jute-backed carpet with a sharp pointed object such as punch, awl or nail set. Next, use masking tape to hold carpet fibers away from hole site. Then, run the drill through the hole and avoid snagging rug fibers. Don't try this with continuous-filament-pile carpets. Damage to the carpet from snagging on drill bit or chuck can be extensive. To reduce the potential for snagging the carpet, a short section of coat-hanger wire can be used in the drill in place of a drill bit. Remember, when nailing through the carpet, it's best to have someone stand over the joist near the squeak in order to push the panel down against the joist.

Vinyl Tile or Sheet Flooring: Usually a popped nail can be seen as a lump in the floor. If affected tiles can be removed, the floor may be screwed down to the joist. However, it is extremely difficult to set a nail through a tile or sheet flooring. Although a 3/16" drift punch has been used successfully to set popped nails, it is possible that the nailhead can cut the flooring or the punch can remove the

surface sheen. If this approach is taken, the following measures may be considered in order to avoid damaging the floor surface:

1. Tape a piece of cardboard to the end of the punch. Or,
2. Place the blade of a putty knife flat over the nail, then drive the nail home with the punch. The blade should distribute the load over a larger area which may prevent marring the floor surface. Or,
3. With a sharp utility knife, cut through the surface of the vinyl, to the top of the backing. Cut three sides of a square about 1" on a side or follow natural pattern lines in vinyl. Peel back surface layer, set the nail, reglue vinyl with vinyl adhesive, and seal cuts in vinyl with sealer. See vinyl supplier for proper technique.

Note that setting a popped nail may only provide temporary relief. The popped nail may not have sufficient holding power to keep the panel against the joist, or it may work itself loose under foot traffic. Therefore, along with setting the nail it is best to install the piece of lumber or angle if the joist space is accessible.

Prevention – The best way to prevent floor squeaks is to use dry lumber and the APA Glued Floor System. Even dry lumber will usually dry further in service, resulting in some shrinkage. The glue, however, will hold the panel tightly against the framing, regardless if nail pop occurs as joists dry.

Another good preventative practice is to use deformed shank nails of the shortest length possible in the required penny weight. The deformed shank gives increased holding power, while the shorter length provides less shank to "pop" and squeak.

Cause 2 Improper Panel Spacing

Floor panels will expand slightly when exposed to high levels of moisture in service and during the construction period. If panel ends and edges are not spaced according to APA recommendations, the panel will not have sufficient room to expand and buckling may occur. This buckling may lift panels and withdraw the fasteners as shown in Figure 1b. This is particularly true if improper fastener types, sizes and spacing are used. The result is a loose connection with the panel free to slide up and down along the nail shank. The squeak is caused by the rubbing of the panel against the nail shank.

Solution – Follow procedures shown under Cause 1, Solution.

Prevention – Follow APA recommended panel spacing requirements and use proper fastener types, sizes and spacing, as shown in *APA Engineered Wood Construction Guide*, Form E30.

Cause 3 Improper Glued Floor Construction Practice

When applying construction adhesive to joists, only enough should be spread to install one or two panels at a time. After a panel is placed in proper position, all recommended nailing should be completed immediately. It is incorrect to apply the construction adhesive for several panels in advance and/or to only tack panel corners after the panel is positioned. Delaying complete fastening for even a few panels can allow the glue bead to skin over and begin to harden. The result is not only a poor adhesive bond but also built-in gaps as the panel hangs up on an uneven bead or lumps in the glue. At these gaps squeaks can result if the panel is free to slide up and down along the nail shank.

Solution – If floor covering has not yet been installed, screw the panels down to the joists with wood screws where squeaks occur.

If floor covering is installed and joist space is accessible, install the piece of lumber or angle as discussed under Cause 1, Solution and as shown in Figure 2.

Prevention – Use proper glued floor construction methods (for more information see *APA Design/Construction Guide: Residential & Commercial*, Form E30).

Cause 4 Improperly Driven Nails

Power nailing has become common because of its speed. One problem with power-nailing is that the nail gun operator cannot always tell when he has missed the joist. A nail which barely misses or barely hits the joist will not hold the panel flat against the joist. As a result, when the panel deflects, the nail can rub on the joist and cause a floor squeak.

Solution – If there is access to the joist space, bend the nail away from the joist and re-nail where possible.

Prevention – Inspect the joist space after nailing and replace nails that miss.

Cause 5 Blocking and Bridging

Blocking and diagonal bridging is normally installed before the subfloor. When blocking or bridging is installed, it is initially nailed only at the top. After the structure is enclosed and rough-finished, the bottom of the blocking and bridging should be securely nailed. Occasionally, however, the bottom nailing is not completed. As a result, the blocking and bridging, rather than transferring load to the adjacent joist, tend to rotate or slide. The rubbing on the joist results in a floor squeak.

Squeaks can also occur when adjacent pairs of diagonal bridging members come into contact where they cross. Joist deflections can cause the bridging members to rub each other, resulting in squeaks.

To check if diagonal bridging is loose or rubbing, place a broom handle between the cross members and pry them slightly apart. At the same time, have someone walk on the floor to see if the floor squeak continues.

Solution – After making sure that adjacent diagonal bridging members will not contact each other where they cross, securely nail the bottom of the blocking or bridging. Completely re-nail, or replace if necessary.

Prevention – When blocking or bridging is installed, use proper construction practice by providing a space between pairs of bridging members to ensure that they will not contact each other, and securely nail the bottom after rough structure is in place.

Cause 6 Interior Wall Partition

If there is a floor squeak near an interior wall partition, the squeak may be occurring at the connection between the wall

plate and the floor. It is common practice to nail the lower plate of the interior wall partition to the panel subfloor rather than to the joists. Floor panels will deflect slightly under load. When this occurs, the subfloor can rub on the nail shank and thus cause a squeak.

Solution – Clinch nails which penetrate the panel subfloor. If this does not correct the problem, screws can be driven up through the subfloor into the lower plate, or diagonal blocking can be inserted under the partition, as shown in Figure 3.

Prevention – Nail lower plate only where it crosses the joist. If it is necessary to nail the plate to the panel flooring, clinch nails during the construction phase while joists are still accessible. Putting a bead of construction adhesive along the bottom plate may also help prevent the problem.

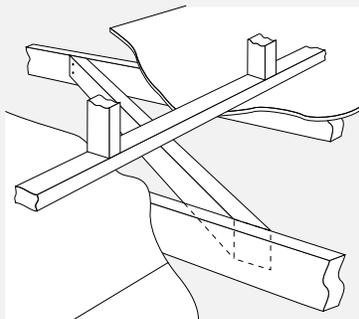
Cause 7 Joist Hangers

When joists are properly set in hangers, they should rest firmly on the bottom of the hanger and should be nailed through all the holes provided. Occasionally the joist is not fastened to the hanger or is fastened only at the top. As the lumber dries, it shrinks away from the base of the hanger. When this occurs, the joist can move freely in the hanger and thus can cause a floor squeak when the parts rub together.

Solution – Shim between the joist and the base of the hanger. Avoid using a single shingle wedge for a shim. A tapered shim such as shingle provides little bearing area and thus may only temporarily relieve the problem. Nail the bottom of the joist to the hanger through the holes provided.

FIGURE 3

**DIAGONAL BLOCKING
USED TO ELIMINATE FLOOR
SQUEAKS BELOW INTERIOR
PARTITION WALLS.**



Prevention – Use dry lumber and fasten the joist to the hanger at both top and bottom through the holes provided. Make sure joist is properly seated in the hanger.

Cause 8 Subfloor and Underlayment or Finish Wood Flooring Connection

Squeaks can sometimes occur between the subfloor and underlayment if proper nail type and/or nailing schedules are not followed. If the connection is not adequate to keep panels in tight contact, the underlayment panel can slide up and down on the nail shank and cause a squeak.

Squeaks can also be caused if underlayment is laid on a dirty or gritty subfloor.

Solution – If there is access to the joist space, then underlayment panels may be pulled down by screwing up through the subfloor into the underlayment. Screw length should be selected so as to get maximum penetration into the underlayment without penetrating the top surface of the underlayment.

Prevention – Sweep the subfloor thoroughly before installing underlayment. Use APA recommended fastener types and schedules. To be further assured of a squeak-free floor, underlayment adhesive may be appropriate along with the nails. Check with floor-covering manufacturer for recommendations on underlayment adhesives.

Cause 9 Cement-coated Nails

Cement-coated nails are occasionally used to attach the panel floor to joists. Although the cement coating initially increases holding power, this increase is only temporary. In fact, the coating may eventually break away from the nail shank, resulting in a weaker connection and a potential floor squeak.

Solution – Use the methods described in Cause 1, Solution, to bring the subfloor tight against the joist.

Prevention – Never use cement-coated nails. For increased holding power, use deformed-shank nails.

Cause 10 Ductwork

Heating ducts for forced air heating systems normally run between joists and come up through the floor where discharge vents occur. Floor squeaks can result when the hole cut in the floor provides a snug fit for the discharge vent. A slight deflection of the floor near the vent can cause a squeak as the floor rubs on the metal ductwork. (Note: Heat from ducts often causes increased drying in the vicinity of the duct which can result in the development of squeaks due to lumber shrinkage. See Cause 1, Solution and Prevention.)

Solution – Either provide clearance or stuff fiberglass insulation between the ductwork and the floor element on which it is rubbing.

Prevention – Provide a small clearance between floor elements and ductwork during installation.

Cause 11 Variation in Joist Depth or Straightness

As lumber dries to its in-service moisture content, shrinkage in joist depth occurs. Variability of wood may result in some dimensional differences in depth of adjacent joists. The floor panel may “bridge” across low or high joists, producing a gap between the panel and joist when installed. When the floor is subjected to foot traffic, the resulting loose connection allows the panel to slide up and down along the nail shank, causing a floor squeak. Nail pop as shown in Figure 1 also may be evident in this case.

A similar condition may occur if joists are not “crowned” upward when installed. Lumber joists may deviate from a straight line between the ends (“crook”) due to variability of wood upon drying. If joists are installed in a random manner, adjacent joists may be straight or crowned upward or downward. The floor panel may bridge across low or high joists as described above, generating a floor squeak due to the loose connection between the panel and joist.

Solution – Use the methods described in Cause 1, Solution.

Prevention – When installing floor joists, visually sight along the edge of each joist to determine if the joist is straight along its length. If the joist is curved (crook), install the joist with the crown oriented upward.

Use the APA Glued Floor System and ensure contact of the floor panel and joist by standing over the joist at or near the fastener location when installing fasteners.

Cause 12

Noisy Tongue-and-Groove Joint

The primary purpose of a tongue-and-groove (T&G) joint is to force adjacent panels to move up and down in unison. This prevents damage to floor finishes that can occur if adjacent panels are permitted to move up and down independently from each other.

Normally T&G joints fit tightly together and are completely silent. In rare cases, often due to damage during construction, the fit between the grooved panel and the tongue of the adjacent panel may be slightly loose. When these panels flex under traffic they may emit a squeak or popping sound.

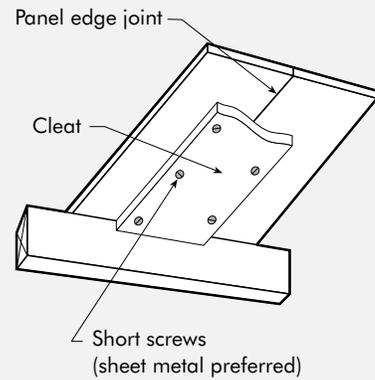
Make sure that the noise isn't from some other nearby connection or contact point, such as a floor-joint connection. The previously listed squeak sources are far more common than noises from a T&G joint.

Solution – To silence a T&G-related squeak the blocking and bridging method described in Cause 5 will probably stop the sound if there is access to the underside of the floor. Another solution is to attach panel blocking to the underside of the joint with construction adhesive and with screws long enough to provide maximum penetration of the floor panel without protruding through the panel surface. See Figure 4.

If there is no access, remove the finish flooring and install No. 6 flat-head wood screws, spaced 3 inches o.c., 3/16 inch from panel edge to penetrate the T&G. If unable to determine which side of the joint contains the T&G, install screws on both sides of the joint. Pre-drill lead holes for screws (use drill with smaller diameter than screw shank). Use screws slightly longer than the panel thickness.

Prevention – A fully glued floor system will include the application of construction adhesive to the T&G joint. This not only minimizes the possibility of squeaks but adds additional stiffness to the floor system.

FIGURE 4



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