

ISSUE 521 BULLETIN



SQUEAKY FLOORS

April 2010

■ Squeaky floor problems have been around for as long as timber flooring.

■ They can be caused by movement along the joints of flooring material, shrinkage of the framing, deflection of the framing or inadequate or inappropriate fixing to the framing.

■ This Bulletin describes the options for remedial work to address floor noise.

1.0 INTRODUCTION

1.0.1 Squeaks and creaks in framed floors have been around for as long as framed flooring itself and were typically associated with solid timber strip flooring. The introduction of reconstituted wood board (RWB) sheet flooring (particleboard) was potentially a solution to the squeaky floor problem as it eliminated most of the joints, which were considered to be a major cause of the squeaking. However, the use of sheet material has not completely eliminated the problem.

1.0.2 The increased number of multi-storeyed buildings with deeper solid-blocked timber upper floor joists make up the majority of floor noise issues with particleboard flooring. The joists tend to dry to lower moisture levels than ground floor joists, increasing the shrinkage that may occur in the timber and the potential for gaps.

2.0 CAUSES

2.0.1 Noise (squeaks and creaks) in framed floors can be caused by one or more of:

- the joints in the flooring material itself, particularly with timber strip flooring
- shrinkage of the supporting floor joists and blocking
- deflection of the floor framing
- poor fixing of the flooring to the framing.

2.0.2 Squeaking that occurs each time weight is transferred to or removed from the flooring (walking across it) results from the flooring material. A creak is a noise coming from the floor when the load is first applied but is less noticeable as the load is reapplied (as others walk over the floor) and is considered to come from movement in the floor framing.

2.0.3 Squeaking can be due to:

- movement along the joint in flooring, for example, in strip flooring where the tongue and groove joints have been poorly machined or aligned
- deflection in timber flooring boards spanning more than is permitted by NZS 3604 *Timber framed buildings* (Table 7.3) for the dry finished thickness of the species of timber – the squeaking results from friction noise along the board joint(s)
- shrinkage of flooring where the moisture content (MC) was too high at time of laying
- shrinkage (reversible moisture movement) of RWB sheets that have been subjected to excess moisture levels during construction (causing swelling) followed by drying
- poor installation of tongue and groove joints in RWB sheets
- poor fixing techniques, for example, the use of nail gun fixing of particleboard flooring rather than gluing and screwing as recommended by manufacturers.

2.0.4 Squeaky or creaky floors can also result from shrinkage of the floor joists and the longitudinal shrinkage of solid timber blocking between joists. A 200 mm floor joist installed wet can shrink across the grain by as much as 8 mm as it dries. The main adverse effects of shrinkage are as follows:

- The timber reduces dimensionally and, in doing so, exposes more of the shaft of the fixing, which causes a separation of the flooring material from its structural support, typically the floor joist. This allows movement to occur between the two surfaces, creating a squeak.
- Where shrinkage also occurs longitudinally in solid blocking and when the floor is loaded to the point that it deflects

(usually due to foot traffic), the ends of the blocking move against the sides of the floor joist, creating a squeak.

2.0.5 Noise in floors can also result from deflection (more than 1 mm in 300 mm in AS/NZS 1170 *Structural design actions*) of the floor framing (see Figure 1) because of greater flexibility of 'second generation' juvenile timber that has been used more recently. Note: Amendment No 2 to NZS 3604:1999 (May 2006) may have mitigated this problem as it introduced new maximum span tables that take account of the greater flexibility of today's framing timber.

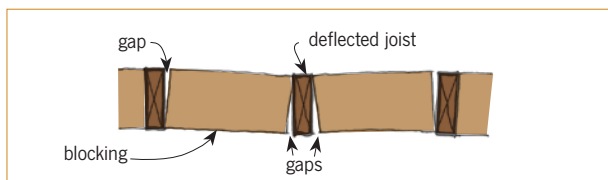


Figure 1: Deflection of subfloor framing.

2.0.6 Kiln dried framing timber is commonly used now, but in older buildings, 'wet' or green timber was the norm for floor framing. Some of that timber was installed so wet that joists would sag mid-span under their own weight, with significant shrinkage occurring when the timber dried.

2.0.7 In a number of cases, the floor joists may have never been in direct contact with the sheet flooring (also applicable to strip flooring but less likely) from the time the house was built – the resulting gap between the flooring and the joist allows the flooring to deflect and generate the noise.

3.0 LOCATION OF FLOORS AFFECTED

3.0.1 Squeaky floors can be lower ground floors subject to subfloor moisture, where the MC could range from 10–18%, as well as mid floors that are completely enclosed, where the MC could range from 8–16%. However, shrinkage of floor joists and solid blocking can apply to all wood-based floor systems, regardless of their location in the building.

3.0.2 It is worth checking the timber framing is dry enough (below 20% MC) before repairs are carried out to minimise the risk of the problem recurring. This may mean that other work needs to be carried out before the repairs are done, such as:

- allowing for increases in subfloor ventilation and/or damp-proofing of the ground where timber has a moisture content over 20% – where a mid floor is damp, the cause of the dampness needs to be identified and remedied
- allowing time for wetter timber to dry.

4.0 REMEDIES

4.0.1 There are a number of options to remedy squeaking depending on the type and location of the flooring.

4.1 GROUND FLOOR REMEDIAL OPTIONS

4.1.1 Where squeaks are isolated to single boards or, in the case of sheet flooring, to a small/localised area and the floor is exposed or covered by carpet, additional nail fixings can be driven. For carpeted floors, they need to be punched through the carpet into the joists. This may remedy the problem – otherwise, proceed to step 4.1.3.

4.1.2 When nailing through carpet, check that the fixing can be inserted without being visible and without damaging the carpet. Do a trial in a concealed area such as within a wardrobe first. If necessary, where extensive re-nailing is required or screws are to be used, carpet can be lifted to gain access to the flooring then relaid.

4.1.3 Repunch the nails. If this doesn't fix the problem, try re-nailing the entire floor. Alternatively, screw fixing may be an option if only isolated areas are squeaking. Screw fixing tends to pull the flooring tighter to the surface of the joists. This method will usually be successful.

4.1.4 If the method in 4.1.3 does not fix the problem and there is reasonable access to work from underneath, it may be necessary to consider either:

- installing a timber batten (construction adhesive and screw fixed) mid span between the floor joists as shown in Figure 2, or
- installing a timber batten (construction adhesive and screw fixed) to each side of the floor joist as shown in Figure 3, or
- filling any gaps between the framing and the flooring with a polyurethane construction adhesive that expands on application to fill the gap and improve the adhesion of the flooring to the framing.

4.1.5 If the floor itself is springy or bouncy (deflecting excessively) and there is reasonable access to work from underneath, the preferred option is to provide further structural support to the underside of the floor joists by installing additional bearers and/or additional floor joists.

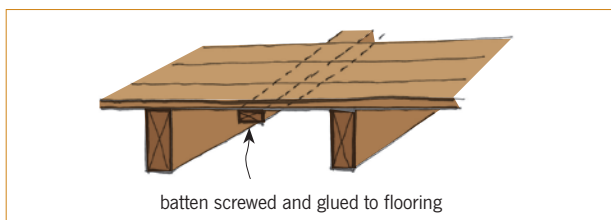


Figure 2: Adding a batten to provide mid-span fixing for strip flooring.

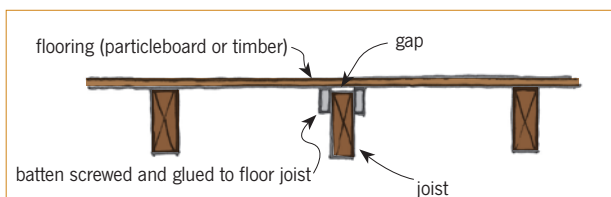


Figure 3: Adding battens to take up gaps between the flooring and the joists.

4.2 INTERMEDIATE FLOOR REMEDIAL OPTIONS

4.2.1 Where squeaks are isolated to a small area of sheet flooring or to single timber boards and the floor is exposed or carpeted, additional fixings may be driven and punched through the carpet into the joists. This may remedy the problem. See 4.1.2 if fixing through carpet.

4.2.2 If this doesn't fix the problem, try re-nailing the entire floor. Alternatively, screw fixing may be an option if only isolated areas are squeaking. Screw fixing tends to pull the flooring tighter to the surface of the joist – otherwise, proceed to step 4.2.4.

4.2.3 Before any re-nailing, it is a good idea to consider propping the ceiling of the room below during the re-nailing

phase. This will reduce the vibration that will be generated and reduce (if not eliminate) any disturbance to the joints of ceiling linings. Using screws will also reduce the risk of vibration from nailing causing minor cracking in ceilings fixed to the underside of upper floor joists.

4.2.4 Where additional fixings do not remedy the problem, the likely causes are:

- longitudinal shrinkage of any installed solid timber blocking or herringbone strutting, or
- deflection in the floor framing as a result of the span, or
- gaps between the flooring and the framing.

4.2.5 With floor noise resulting from timber shrinkage, gaps and/or loose blocking, the difficulty is gaining access to the framing to determine the cause. To carry out an inspection, some flooring has to be lifted or some of the ceiling below has to be removed – the potential cost and disruption to the interior finishes from doing this must be balanced against the level of annoyance from the noise.

4.2.6 If the decision is made to access the floor joists, shrinkage in the blocking can be remedied using the following methods:

- For solid blocking – insert wedges into any gaps between the blocking and the joists.
- For herringbone strutting – adjust the angle to tighten the junction with the joist and re-nail.
- For gaps – install a timber batten (construction adhesive and screw fix) to each side of the floor joist as shown in Figure 3 and screw fix the flooring to the batten or insert a polyurethane construction adhesive that expands on application to fill the gap and improve the adhesion of the flooring to the framing.

4.2.7 Where deflection in the framing is the reason for the noise, the movement will usually be noticeable when the floor is walked on. Remedial options are limited for upper floor joists. If the flooring or ceiling is being removed, additional framing may be able to be inserted alongside the existing framing to stiffen the floor.

4.2.8 An alternative method of reducing floor deflection may be to install a new beam under the existing floor to effectively reduce the span of the joists, rather than removing the ceiling lining. Of course, the house owner will have to accept this beam and any required supporting end posts.

5.0 FIXINGS

5.0.1 To ensure nail fixings are resistant to pull-out, it is important to provide a good flooring to framing connection and sufficient embedment into the framing timber. Hot-dipped galvanised hand-driven nails provide excellent withdrawal resistance, as do annular ringed nails. Power-driven fixings, by comparison, may not provide sufficient pull-out resistance, and they typically create a larger fixing indentation. Where the floor is to be covered and it is not a decorative native species of timber (in the case of solid timber strip flooring), the use of flat-head nails will also provide a stronger connection.

5.0.2 Screw fixing provides a stronger connection and has an advantage in that the two surfaces (flooring and framing) can be pulled together as the screw is inserted, and they can also be retightened at a later date if required. There is also less vibration during fixing.

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HEAD OFFICE AND RESEARCH STATION

Moonshine Road, Judgeford

Postal Address – Private Bag 50 908, Porirua City 6220,
New Zealand

Telephone – (04) 237 1170, Fax – (04) 237 1171

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