

REPAIR/REPLACEMENT/ REMOVAL

When a wood floor becomes damaged, or is in need of repair, it is important to evaluate the damage to make an informed determination of the most appropriate action. It is recommended that all wood flooring damage be evaluated by an NWFACP Certified Professional, NWF A Member, or equivalent, to ensure appropriate action is being considered.

PART I Repair

Damages can usually be grouped into one of several categories:



- A. Scratches may require isolation repairs, recoating, or resanding of the affected areas.
 - 1. Surface scratches are typically only in the finish coats. A fingernail can't feel the ridge.
 - 2. Deep scratches are typically through the finish coats and have torn the wood fibers.
 - 3. Cross-grain scratches are deep scratches, and are oriented perpendicular to the direction of the flooring, often crossing multiple board widths.
- B. Dents/gouges may require isolation repairs, resanding, or replacement of affected areas.
- C. Indentations are notches or depressions on the surface of the flooring. Indentations are caused by the excessive force of an object on the flooring surface. Surface finishes minimally influence the effects of these forces. Janka hardness ratings give us an idea of approximately how each species can be affected by such forces. Objects that can cause indentations can include, but are not limited to:

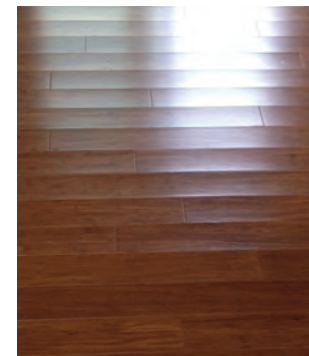


- 1. High heels
- 2. Dog claws
- 3. Appliances and furniture
- 4. Heavy grain tear or chunks of wood torn away or removed

- D. Stains can include permanent damage from pet urine, chemical/moisture spills, or may just be residues or minor characteristics of the wood itself. Oftentimes stains require resanding and/or replacement of the affected areas.



- E. Water damage can vary in severity, from minor cupping to severe buckling. Each case must be dealt with on an individual basis for repair options. The most important aspect of repairing water-damaged



flooring is having a thorough understanding of the moisture content of the flooring, substrate and ambient conditions in the space surrounding the flooring system prior to assessing repair options. (Refer to Part V, Addressing Water Damage, for more detail.)

- F. For nail-down or glue-down installations exhibiting minor deflection, hollow spots, or slight popping noises, using injection adhesives at the location that needs to be addressed is an appropriate and sometimes necessary repair.

This can be accomplished by pre-drilling a hole in the board at the designated site, with a bit that coincides with the diameter of the syringe being used. Insert the syringe into the hole and inject the adhesive. A dowel rod or toothpick may then be inserted into the hole and cut flush with the flooring surface, to act as an anchor as the adhesive is trying.



- G. Isolation repairs of damaged areas may include using fillers, putties, or colored markers to make the blemish disappear. Many times, use of these repair tools and products involves filling the damaged area to the flooring surface level, adding color to the area and replacing natural wood characteristics by use of graining tools. Once the area has been reasonably matched to the surrounding surfaces, sheen level and film build are the final steps.

PART II Replacement

When an individual board cannot be touched-up or repaired, it may need to be replaced. Board replacement may include an individual board or a grouping of boards. Whether the board replacement is happening on a nailed floor, a glued floor, or a floated floor, the process is very similar.

- A. **Removal of damaged nail-down and glue-down flooring (solid or engineered):**

NOTE: Always wear safety glasses and hearing protection.

1. Individual boards can be repaired or replaced without affecting adjoining boards.
2. Make sure you have a replacement board selected and prepared before beginning the repair.
3. Check the species (red oak, white oak, etc.), grade, cut of wood, width, thickness, bevel

profiles, sheen level, and color match, to ensure a proper match.

4. The moisture content of replacement boards should be no more than 2 percent difference between the new flooring and the existing flooring. If the difference is greater, allow the new flooring to acclimate until it is within 2 percent of the existing flooring.
5. Replacement boards do not have to be from the original manufacturer, as long as the tongue and groove profile, width, bevel, edge profile, cut of wood, and grade all match.
6. If the board to be replaced is more than four feet long, consider doing the repair in two sections to minimize the risk of the opening closing-up width-wise while you are completing the repair.
 - a. When breaking existing longer boards into smaller repairs during removal, use a carpenter's square to mark the cutting area, and score with a razor knife.



- b. Use an oscillating saw to make a precise cut, developing an end-joint. Ensure the newly made end-joint falls within the appropriate stagger from adjoining end-joints.
7. In areas where high humidity is prevalent, or during humid seasons, only remove and replace one board at a time to ensure the existing flooring doesn't close in on the exposed repair area.



8. Protect adjoining boards from damage with tape, cardboard, or paper, specifically on any previously finished or factory finished floor.

9. Set a circular saw or track saw to the depth of the thickness of the board to be removed. Make one cut inset about 3/8" from the groove-side, running from end-to-end on the board to be removed. Stop the cut approximately 1/8" from the ends of the board. (Alternative tools include a router with the appropriate up-cut bit or an oscillating saw with appropriate wood/metal blade.)
10. Make a second cut inset 3/8" from tongue-side, running from end-to-end on the board to be removed. Stop the cut approximately 1/8" from the ends of the board. (CAUTION: Older floors may have been installed with cut-nails. The blade on a circular saw will not cut through these types of nails. On older floor installations, make first and second cuts approximately 1/2" inside the edges of the boards to ensure not hitting these types of nails.)



11. Make 1-2 additional cuts across the center of the board at a 30-45° angle from the first long cut to the second long cut.

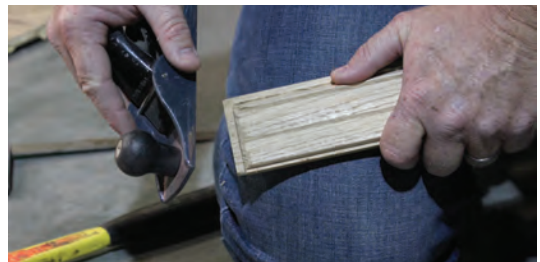


12. With a chisel or oscillating saw, cut through both ends at the cut-lines, and lift out the center of the board. The groove-side piece can now be removed.
13. Carefully remove nails or staples and the tongue-side pieces. Avoid damage to adjoining boards.
14. For glue-down board replacements, carefully remove all board pieces as well as the remaining adhesive from the substrate. Oscillating type saws work great for cuts and glue clean-up.
15. Clean all debris from the area, including from all remaining tongues and grooves.

B. Replacing the damaged nail-down and glue-down flooring (solid or engineered):



1. Measure the opening and then cut the length of the replacement board to size. Cut the butt-end tongue of the new board. When applicable, use miter saw to cut from the bottom of the wear layer to the underside of the material at a 5-10° angle to allow for easier placement.
2. Carefully check the new board against the opening for precise fit.
3. For factory finished flooring with a beveled- or eased-edge, replicate the end-bevel using a saw, router, sand paper, or steel rod (depending on the extremity of the bevel). This may also require color matching and finish replacement on the bevels.
4. From the back side of the replacement board, remove the lower half of its groove side and end match so that it will create a shiplap joint with the tongue of the adjoining boards in the replacement area. Set the table saw or hand plane the underside of the replacement board at an angle to help the board slide into place more easily.





5. Carefully dry fit and loose-lay the replacement board without damage to adjoining boards to check its fit.
6. Check that flooring is relatively flush with surrounding boards. Adjustments to the backside of the replacement board may be necessary where thickness of the replacement product differs from the surrounding boards.
7. Apply liquid or sheet vapor retarder to the exposed substrate as necessary in order to control moisture migration from unconditioned spaces below the floor.
8. For glue down applications, spread approved wood flooring adhesive to the substrate using the notch trowel recommended by the adhesive manufacturer.



9. Apply a fast-setting adhesive to the topside of all adjoining tongues to adjoin the shiplap joint.
10. Insert tongue, and then drive it into place, using a tapping-block and hammer or mallet.
11. Use color putty to fill holes and joints. If unfinished, refinish to match the surrounding flooring.
12. When replacing multiple boards in one area, blind nail the replacement flooring where possible. Follow instructions for remaining installation procedures.

PART III Floating Floor Board Replacement

A. Removal of damaged floating flooring:

1. Individual wood flooring boards can be repaired or replaced in any floated engineered floor without affecting adjoining boards.
2. Make sure you have replacement flooring prior to cutting into the existing floor. The replacement flooring must be the same species, grade, width, edge profile, length, thickness, and cut. The replacement board should also be identified as a glue-together T&G or a locking mechanism.
3. Set your circular saw or track saw just to the thickness of flooring being replaced. Do not cut into or through the underlayment material.
4. Make your first two cuts. The first cut is from end-to-end, parallel with the length of the board at the location of the T&G or locking mechanism. Make your second cut on the opposite side of the board at the location of the opposite T&G or locking mechanism.
5. For easier extraction, an additional diagonal cut (or cuts) may be made across the center of the board from one end to the other, reaching near, but not contacting the surrounding board.
6. Using a sharp chisel or oscillating multi-tool, finish the cuts through top wood layer to the edge of the existing floor, being cautious not to damage the underlayment or adjoining boards.



7. For locking mechanism floors, the center pieces of the cut board should be removed easily, like opening an envelope. Using a sharp wood chisel, remove any remaining pieces (being careful not to damage adjoining boards).
8. For glue-together floors:
 - a. Remove the long sides of the board with a sharp wood chisel. Carefully remove any remaining adhesive from the grooves in the adjoining flooring.
 - b. Carefully scrape off all glue residues from along the factory tongues.

- c. It may be necessary to use a router with the appropriate-sized profile grooving bit to clean out the grooves, and to remove the tongue from the remaining end-joint.
- d. Thoroughly clean all debris from the area.
- e. All tears in underlayment should be taped or replaced with the appropriate underlayment materials.

B. Replacement of floating flooring:

1. Shiplap joints and bridges

a. Shiplap joints:

- i. To create makeshift shiplap joints in the space receiving the replacement board, use a router to develop a groove into all end-joints and long seams of the adjoining boards. The groove size must coincide with the flooring thickness.
- ii. Glue spline into the end-joints and the long-seam grooves. The opening in the floor should now have four tongues to create a shiplap joint. Clean up any excess glue.
- iii. Remove the tongues or locking mechanisms from the replacement board.
- iv. Use a router to develop a groove into all end-joints and long seams of the replacement board, and then remove the underside of the groove on all four sides.

b. Bridges:

- i. Install a bridge on the underside of the adjoining boards. This bridge will allow the replacement board to remain floating within the system.
- ii. The bridge should be something thin that will not result in peaking of seams between boards (e.g., laminate chips or tongue depressors, etc.).



- iii. Glue the bridge to the underside of the adjoining boards on all four sides, and allow it to extend into the workspace opening approximately 2".

- iv. Glue should be compatible with the backing of the flooring and the bridge material for adequate adhesion.

2. For locking mechanism floors:

- a. Measure the opening and cut the replacement flooring precisely to length, altering the locking mechanism on the butt-end of the board, as well as along the run of the board.
- b. The mechanism may need to be replicated or altered to allow for the replacement board to properly fit. Anywhere the locking mechanism has been altered, adhesive will be required. Check with the flooring manufacturer before altering any of the locking mechanisms.
- c. If you are unable to replicate or modify the existing locking mechanism, you may need to develop a shiplap profile to allow the replacement piece to fit into the opening without damaging adjoining boards.
- d. Dry-fit the piece and make adjustments as necessary. To reduce the chance of over-wood, use a sharp chisel or block plane to remove material from the underside of the top of the groove of the replacement board.
- e. Apply a low-viscosity, elastomeric, nonexpanding adhesive along the perimeter membrane that is acting as a bridge on the underside of the board.
- f. Carefully insert the new board into place, using a wood block and mallet to gently tap into place if necessary.
- g. Add weight to the board as it dries to avoid any potential lifting after the replacement board has been installed.
- h. Clean the entire area surrounding the repaired board and ensure the repair is acceptable.

3. For glue-together floors:

- a. Measure the opening and cut the replacement flooring precisely to length, removing the tongue or locking mechanism on the butt-end of the board, and the bottom groove side of the replacement board on the butt-end, as well as along the run of the board.
- b. You may need to chamfer, or back-bevel, the underside of the board where the groove was removed to allow the piece to fit into the opening without damaging adjoining boards.
- c. The replacement board should have a tongue along the length of the board, and two grooves missing on the underside.

- d. Dry-fit the piece and make adjustments as necessary. To reduce the chance of over-wood, use a sharp chisel or block plane to remove material from the underside of the top of the groove of the replacement board.
- e. Apply a low-viscosity, elastomeric, nonexpanding adhesive along the perimeter membrane that is acting as a bridge on the underside of the board.
- f. Apply the recommended glue (PVA, or quick-setting adhesive, such as epoxy or carpenter's wood glue) to the top side of the tongues of the adjoining boards in the floor.
- g. Carefully insert the new board into place, using a wood block and mallet to gently tap into place if necessary.
- h. Add weight to the board as it dries to avoid any potential lifting after the replacement board has been installed.
- i. Clean the entire area surrounding the repaired board and ensure the repair is acceptable.

PART IV Lace-Out/Lace-In

Lacing is a method used to integrate a new wood floor with an existing wood floor. This is often necessary when extending or adding to an existing wood floor, where removal of the old floor is not the best option, or to replace damaged sections of existing hardwoods.



A. Lace-out

1. Identify the existing flooring installation method. Make sure that you are aware of radiant heat systems or underlayments that may be installed below the flooring.
2. Identify the boards in the existing floor that will need to be removed. This generally will be determined based on the existing pattern of the old floor. When possible, try to remove and avoid "H" patterns and blatant stair-steps.
3. The objective of removal is to not damage adjoining boards and to leave a stagger that flows with the existing floor.

4. Some boards may be easier to remove using alternative methods and tools than those listed in this section.
5. Set your circular saw or track saw to the thickness of the flooring being removed.
6. Be careful not to damage adjoining boards while removing material.
7. Make two cuts along the length of each board being removed.
8. In order to release the board for easier removal, you will need to complete the cuts with a chisel.



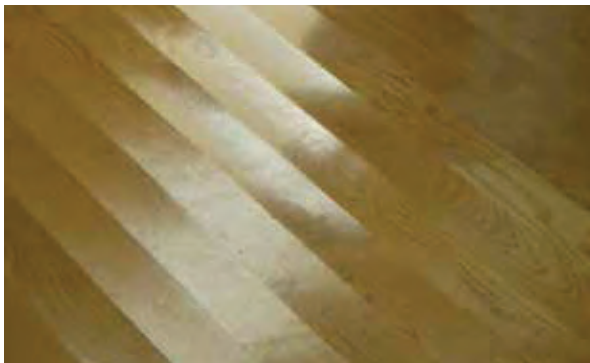
9. Carefully extract all of the cut pieces from the area using a hammer, chisel, and pry bar, without damaging the adjacent boards.
 10. Remove or set the remaining fasteners in the subfloor.
 11. When possible, try to leave tongues and grooves intact on remaining boards.
 12. Thoroughly clean all debris from the area.
- B. Lace-in
1. Identify the flooring material being matched. It must be the same species, grade, width, edge profile, bevel, average length, thickness, and cut. Modifications to replacement material may be necessary in some cases.
 2. The new material being laced should be within a minimum of 2% MC of the existing, surrounding flooring.
 3. Existing flooring may not have been installed in the same manner in which the new floor will be installed. It is likely there will be pre-existing conditions that may include gaps between boards, squeaks, inadequate subflooring material, crooked installations, different fasteners, adhesive or other items that could adversely affect the performance of the newly installed flooring. It may be more aesthetically pleasing, and sometimes necessary, to replicate existing installation conditions when lacing into an existing, improperly installed floor.
 4. The new boards are staggered into the existing pattern of the old floor.

5. Where tongues or grooves in the existing flooring have been compromised, it may be necessary to create a shiplap joint between old and new floors. This can be accomplished with a router and the appropriate profile grooving bit to allow for spline to be used as the shelf for the shiplap joint.
6. Where new flooring can be blind-nailed, follow the nailing schedule as detailed in the Nail-Down Installation chapter.



7. Where new flooring cannot be blind-nailed, elastomeric wood flooring adhesive should be used.
8. Where moisture control is necessary, use of a quality wood flooring adhesive, or a liquid-applied moisture retarder may be used.

PART V Addressing Water Damage



When a wood floor has been damaged by a leak or a flood, it must be addressed before further damage occurs. The first step in repairing a water-damaged wood floor is to identify and eliminate the source of moisture. Once the moisture source has been identified and removed, the floor can then be assessed.

- A. It is important to understand that water will migrate to areas below the wood floor system anytime there is a flood.



- B. When water damage occurs, the wood flooring and subflooring systems must be evaluated to determine the extent of damage and ensuing repairs. As a hidden condition, the subfloor may be compromised further than the wood floor above it.
- C. Subfloor Materials Evaluation:
 1. **Plywood:** swelling, distortion, and delamination can occur when exposed to high levels of moisture. Moisture tests should be conducted using insulated pin, hammer probe-type meters on the surface, on the backing, and within the core of the material in several areas of the damaged material to properly assess the extent of moisture intrusion. Replace when the damage is evident. Ensure replacement material is within acceptable MC ranges prior to reinstallation of wood flooring.
 2. **Oriented Strand Board (OSB):** swelling can occur with OSB when exposed to water. Swelling in OSB can create a decrease in density and a reduction in within-board strength due to the release of compaction stress created during the pressing process of manufacturing. This will directly affect how existing fasteners hold the wood flooring to the subflooring material. Replace when damage is evident. Ensure replacement material is within acceptable MC ranges prior to reinstallation of wood flooring.
 3. **Concrete:** concrete is a porous material. It typically does not become damaged when exposed to water; however, installed flooring, adhesives, sealers, and other compounds will slow the drying of a wetted concrete slab. Moisture levels must be evaluated and properly addressed prior to installation of new flooring. Concrete substrates should be dried by use of airflow, heat, and dehumidifiers until moisture levels are within the flooring and adhesive manufacturers' required ranges.

D. Wood Flooring Materials Evaluation and Remediation:

1. Identify the type of flooring and installation methods.
 - a. Identify type of substrate.
 - b. Existing materials below the flooring surface may create additional mitigation costs and concerns (e.g., asbestos underlayment, radiant heating systems, etc.).
2. Determine the target moisture content for the geographic area and for the facility.
 - a. Reference the EMC chart.
 - b. Consider the time of year the repairs are to take place and assess the HVAC system's ability to sustain an adequate environment.
3. Conduct moisture testing.
 - a. Use insulated pin, hammer probe-type meters to achieve readings at multiple depths of flooring and subflooring material.
 - b. Use pinless, dielectric meters to scan the flooring surface and map the damage.
 - c. Check existing, unaffected wood for reference.
 - d. Target moisture content should be within 2% of expected "in-use" moisture content.
4. Use dehumidification systems to stabilize the ambient conditions and bring them within the target range.
 - a. Some of the most effective types of dehumidification systems include desiccant systems and low-grain refrigerant systems.
 - b. Dehumidifiers should be placed on the flooring surface as well as below the flooring surface (when applicable).
 - c. Unconditioned areas directly below the wood subflooring system or sleepers, such as basements and crawlspaces, should also be opened to introduce heat and airflow. Any insulation on the underside of the floor joists should also be removed.

5. Many times, minor damage will dissipate or even completely disappear as the flooring dries out over time.
6. Airflow and heat can be used to speed the natural drying process. Care should be taken not to cause collateral damage to other wood products within the drying space when using forced dry air or heat.
7. Vacuum extraction systems include placement of large mats/panels that are attached to vacuum/suction systems designed to pull water from the flooring surface.
8. Negative and positive air pressure systems force airflow beneath and within the flooring systems in order to decrease the moisture content by direct use of airflow.



9. A buckled wood floor requires replacement wherever the buckling has occurred. Once the flooring has buckled, the fasteners or adhesives are no longer effective, and the system will never return to its original state. Once the moisture source has been identified and eliminated, the buckled portion of the flooring may be replaced. The remainder of the flooring should be treated as noted.